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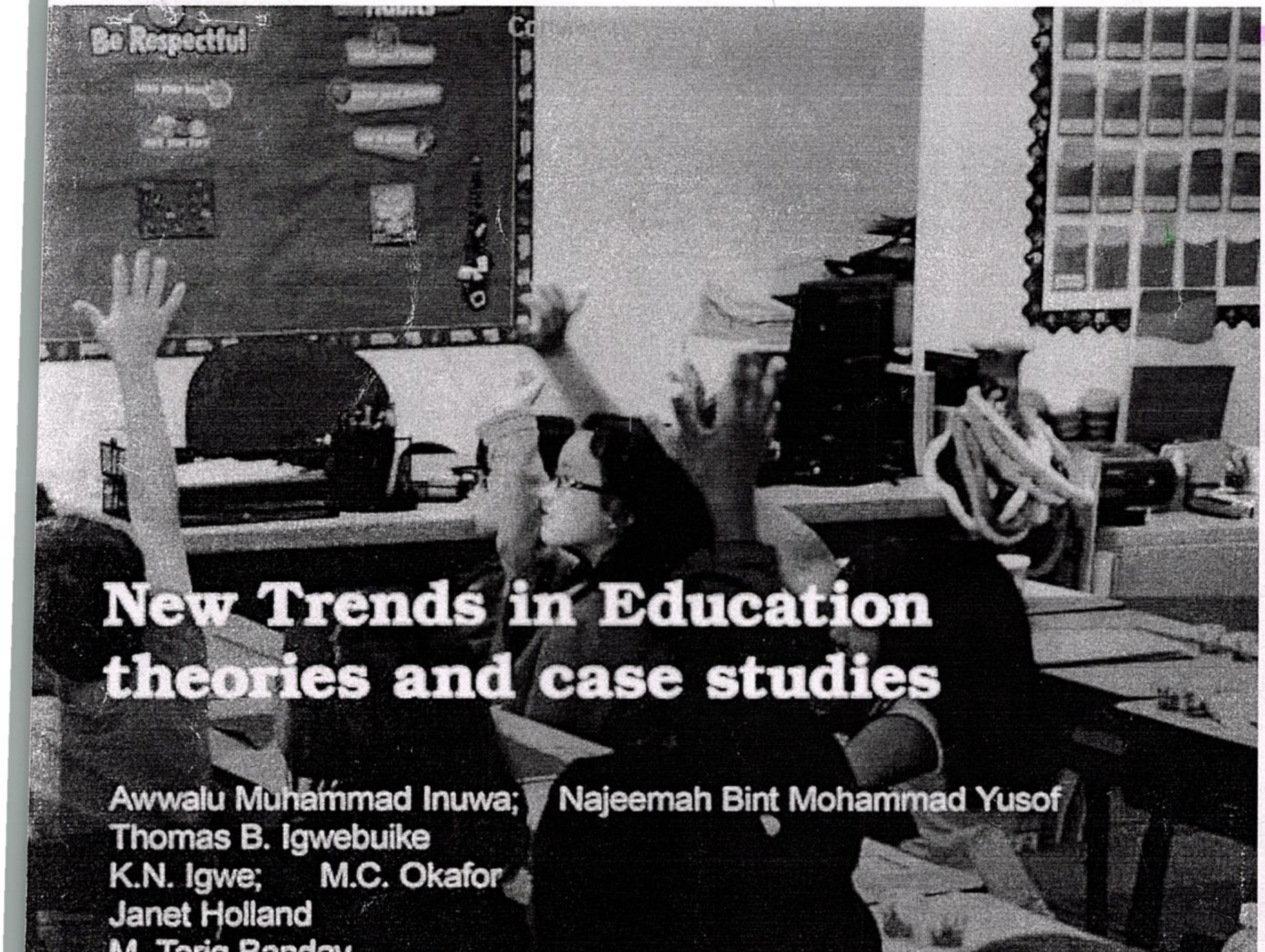
Web in Engineering



New Trends in Education theories and case studies

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ISBN-13: 978-1497507432
ISBN-10: 149750743X

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ISBN-13: 978-1497507432
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ISBN-13: 978-1497507432
ISBN-10: 149750743X

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Book Chapter

Web in Engineering Education: Opportunities and Challenges

In

New Trends in Education: theories and case studies

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▪ Abstract

Technological advancements in the Web have made substantial impact on every aspect of life and education is no exception. Both traditional and emerging engineering models have been influenced by enormous opportunities offered by the Web for collaboration, communication, dissemination of content and implementation of emerging pedagogies. The different types of online resources supported by the Web include a) digital content such as e-books, tutorials, and lecture notes, b) learning objects such as simulations, animations and structured lessons, and c) interactive, dynamic and multi-user learning environments. Professional communication is supported through synchronous and asynchronous Web tools and tools for real-time interactions and collaborations are integrated with the learning environments. This chapter outlines opportunities created by the Web in improving engineering education by discussing major Web enabled initiatives implemented by various engineering institutions with reference to the recent research. It also discusses factors that in some cases may impede use of Web in engineering education despite its established usefulness and need. Further, it discusses measures that could be placed to foster computer and Web based training in engineering pedagogy.

Keywords: e-Learning; Engineering Education; ICT; Higher Education; Applications of e-Learning; Engineering Paradigm

▪ Introduction

Engineering is a discipline of facilitating acquisition of scientific, mathematical, economic, social, and practical knowledge to design and build structures, machines, devices, systems, materials and processes and to translate it to address the needs of society in challenging and complex environment. Traditionally, engineering education has been content-centric, design-oriented, and permeated by the development of problem solving skills having societal implications. Some non-engineering subjects like management, finance, law, humanities have been included in the course structure of all denominations of engineering as these deal with contemporary and social issues besides helping in acquiring soft skills. Collaboration, team-work, leadership and entrepreneurship have become important aspect of engineering education. Further, the course layout and curriculum contents thereof are frequently updated to contemporary requirements.

Desired competencies for engineers include domain knowledge, project handling capability, finance management and soft skills besides having temperament to work in trying circumstances as an individual or in a team. Besides, an engineer is required to possess skills to address societal and environment issues and ability and zeal for lifelong learning [1]. Accreditation Board for Engineering and Technology (ABET) (http://www.abet.org/), requires that engineering programs equip their graduates to: a) apply knowledge of mathematics, science, and engineering in problem solving, b) design and conduct experiments, to analyze and interpret data, c) design a system, components, or develop process to meet intended needs, d) function

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on multi-disciplinary teams, e) identify, formulate, and solve engineering problems, f) use the techniques, skills, and modern engineering tools necessary for engineering practice, g) communicate effectively, h) understand professional and ethical responsibility, i) understand the impact of engineering solutions in a global and societal context, j) recognize the need for, and an ability to engage in, life-long learning, and, k) knowledge of contemporary issues. Further, engineering education must be dynamic and adaptive to inculcate competencies in engineers that support current engineering practices and research. The approach to engineering education has transformed from traditional to constructivist paradigm worldwide, however, the traditional paradigm is still practiced at most institutions around the world especially in developing countries. Adoption of ICT and Web in engineering education is considered as a major enabler for this transformation as they permit easy implementation of new pedagogy with or without displacing the traditional setup of classrooms. ICT and Web when applied in traditional engineering paradigm extends communication between its peers and makes relevant content timely available to learners. When applied in emerging engineering paradigm they besides permitting greater communication and extensive content also create ambiance for problem based learning, lifelong learning, discoveries, innovations, entrepreneurial opportunities, social linkages, etc. Web creates a platform for modern learning theories such as blended learning and community of practices where traditional learning theories are both supplemented and complemented by online facilities. Web throws open diverse opportunities for institutions to exploit and share its teaching expertise and learning resources through widely adopted standards and software tools which can benefit not only learners and teachers but institutions as well.

▪ Engineering Paradigm (Traditional vs. Emerging)

Traditional engineering education is based on positivism and is teacher-centric while as emerging or modern engineering education is based on constructivism and is learner-centric. A recent study conducted by McCabe [2] has demonstrated how two approaches of teaching and learning engineering differ in curriculum structure, course design, delivery of lessons and student assessment. The key findings of the study are as follows: a) In traditional paradigm, curriculum is deductive, curricula and courses emphasize content, courses are compartmentalized, self-contained and taught by an individual instructor, content is determined by the syllabus, and design is taught in capstone design courses while as in emerging paradigm curriculum is integrated, curricula and courses balance content and skills, courses are horizontally integrated across subjects and disciplines and/or vertically integrated across years of curriculum, content is determined by learning objectives, and design is taught throughout the curriculum, b) In traditional approach, teaching is conducted deductively, teaching style addresses only one learning style, most in-class activity (theory classes) is done by the instructor, homework and tests involve exclusively convergent problems, all homework outside of projects and labs is done individually, teaching evaluation is based on student evaluation, and courses are taught by lecturing in classrooms. While as in emerging approach teaching is conducted inductively, teaching style addresses a broad spectrum of learning styles, active learning is used where courses are shared by instructors, homework and tests involve convergent and divergent problems and troubleshooting, interpretation and problem formation exercise, some homework is done individually and some cooperatively, teacher evaluation is based on student rating, peer rating, self-rating and learning outcome, and courses are taught by lecturing using technology based tools, using interactive multimedia tutorials and also online, c) In traditional approach, teachers are Ph.D. degree holders specializing in frontier disciplinary research while as in emerging approach teachers are people specializing in scholarship of discovery or integration or application or teaching and learning, and, d) In traditional approach, faculty members are not prepared to teach while as in emerging approach, faculty is prepared through staff workshops, seminars, learning committees and mentorship. The study concluded that some of the emerging practices require no additional resources while as other require some costs to be implemented.

In traditional approach of education, teacher presents material as clearly as possible to the students who understand it. Students' inability to understand the presented material indicates either their lack of aptitude or diligence or the instructor's lack of teaching skills. Traditionally, engineering curriculum comprises of four components namely theory courses, practical courses, seminar on contemporary topic and project work. In traditional mode of teaching and learning, all topics of the theory courses are taught in the classrooms using black/white boards, experiments of practical courses are conducted in the laboratory using relevant equipment under the supervision of teachers. The students prepare seminar paper under the guidance of teachers on a topic duly approved by the seminar evaluation committee. Students collaborate in groups to complete assigned project work in the laboratories. Students' performance in theory courses is assessed on

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the basis of score obtained by them in written tests. For practical courses the knowledge of instruments used, theory of experiment, graphical representation of data obtained in measurements and write up are evaluated to grade the students. Continuous assignment component is assessed through transparent open evaluation system comprising of quiz tests based on multiple choice questions, assignments, seminars and viva voce.

Traditional engineering education model is inadequate for preparing students to address complex issues of the twenty-first century [3]. Engineering education has been studies by Rugarcia, et al, who have given an exhaustively enumerated list of deficiencies in its various components [4]. Teaching and learning suffers on account of various factors that include: i) inadequate student-teacher interaction, ii) complexity of teaching and learning, iii) loss of synchronization, iv) weakness in collaboration and communication, and, v) massive curriculum, and, v) difficulty in student management, vi) lack of teaching aids and facilities, vii) unstructured study material, and viii) inadequate classroom environment. Time allotted to classroom and laboratory sessions often are inadequate to complete the course curriculum and therefore, all queries of students cannot be answered adequately. Further, slow learners are worst sufferers. Since in almost all theory and laboratory courses of engineering programs, diagrams (circuit diagrams, network diagrams, process diagrams, flowcharts, etc.) are drawn to explain a particular topic or to demonstrate the functioning of a circuit or process, the timing for interaction between students and teachers and students and students is further reduced. Lab demonstrations are of limited durations and students have to learn at the pace of the teacher which may be too short for some slow learning students who fail to synchronize learning with teaching. Demonstrating an experiment in laboratory sessions has to be repeated for each group of students as it is not possible to demonstrate the same to entire class in one go. Further, hands on training in laboratories can suffer due to high enrolment and disproportionate number of requisite apparatus and components. To keep abreast with the developments purchase of new apparatus and consumable components and maintenance of apparatus has to frequent. An academic disconnect between students and teachers occurs during winter/summer vocations and examination preparatory holidays. Students make most of the study during examination preparatory days and vocations where many questions and queries surface but due to physical disconnect between students and teachers, and students and students these queries cannot be responded. The functioning of a particular component, circuit, program or process has to be imagined by both the teachers and the students. Every theory course is supported by sufficient experiments in laboratory courses. Teaching them separately creates disconnect between these courses and quite often synchronization is lost between a particular session of theory course and respective experiment in laboratory course. The work undertaken in seminar paper, project report, experimental write ups, etc. is collaborative in nature where students and teachers have specific roles to play. This activity demands communication and collaborative preparation of the content between a group of students and the mentor. Due to overwhelming workload of teachers, it becomes very difficult for them to check the content of these reports and suggest improvements during working hours. As a result, there is not only delay in the submission of such reports but content is also not well organized. Hand written or computer printouts of continuous assessments pertaining to each theory course are submitted by students to respective teachers for evaluation and assessment. Each teacher award marks to students for the continuous assessments component but do not provide descriptive comments to each student and also finds difficulty in establishing the ownership of the content.

Engineering practices and research worldwide has undergone changes due to impact of technology on global economy. Engineers are required to have deep understanding of global market, possess capability to work in different cultures and interdisciplinary intellectual span rather than focused practice within traditional disciplines [5]. Further, the offshoring of engineering positions and outsourcing of engineering jobs have complicated the engineering practices. State funding for research is inadequate to research in new knowledge generated by fundamental scientific discovery into the innovative new products, processes, and services required by the society, therefore, private investments are necessary to produce the ingredients essential for innovation to flourish. These changes have surfaced serious deficiencies in traditional engineering education and raised calls for changes in curriculum structure, its delivery and assessment to meet the new challenges such as globalization, demographic change, and disruptive new technologies by transforming old paradigms into new paradigms. Research work [6] suggests that the new paradigms for engineering education must: a) respond to the incredible pace of intellectual change, b) develop and implement new technologies, c) accommodate a far more complete approach to address social needs and priorities, link social, economic, environmental, legal, and political considerations with technological design and innovation, and, d) reflect in its diversity, quality, and rigor the characteristics necessary to serve a 21st century nation and world. Twenty first century engineers must be globally sophisticated, culturally aware, JNO - 1(f)

technically competent, innovative and entrepreneurial, nimble, flexible, and mobile [7]. Research works such as those of Clough [8] and Duderstad [9] have recommended that engineering education must be able to produce engineers capable to meet national challenges. They further, advocate that the new paradigm of engineering education must include lifelong learning as the shelf life of taught knowledge has declined to a few years and broadening of engineering curriculum to provide opportunities to students to learn the innovation and entrepreneurial skills. The study further recommends that institutions must strive hard to provide exciting, creative, and adventurous educational experiences capable of attracting the most talented students. In emerging approach of education teacher present new information in the context of what students already know and help them to develop understanding and skills through activity and reflection rather than making them passive recipients of information [2]. Several research such as Svinicki et al [10], Ambrose et al [11], Sousa [12], Prince [13] and Bransford et al [14] have confirmed the advantages of learner-centric educational paradigm over traditional teacher-centric paradigm for almost any targeted learning outcome.

▪ Web in Education

The last decade has seen Information and Communication Technologies (ICT) dramatically transforming the world, enabling innovation and increasing productivity, connecting people and communities, improving standards of living and opportunities across the globe, bridging economic and social divides and reducing poverty [15]. Different ICT tools for use in education are: tools for data collection, processing and interpretation, databases, spread sheets, and simulators, graphing and modelling tools, multimedia software for audio, video and 'virtual experiments', publishing and presentation tools, recording equipment, optical character recognition tools, computer projection technology, etc. ICT makes conceivable target oriented practical and theoretical aspects of teaching and learning as it: a) Increases Efficiency by Expediting and enhancing work production, Offering release from laborious manual processes and more time for thinking, discussion and interpretation, b) Establishes Linkage by increasing currency and scope of relevant phenomena by linking school science to contemporary science and Providing access to experiences not otherwise feasible, c) Facilitates Experimentation through supporting exploration and experimentation by providing immediate, visual feedback, focusing attention on over-arching issues, and increasing salience of underlying abstract concepts, and d) Promotes Collaborative Efforts by fostering self-regulated and collaborative learning, and improving motivation and engagement. ICT is a major enabler for education as it can help meet different learning objectives. It has transformed the roles of teachers from knowledge transmitter to learning facilitator and that of learners from passive recipients to active participants. ICT increases efficiency of teaching, learning, planning and management, facilitates experimentation and lifelong learning and promotes linkage and collaboration [16]. Widespread acceptance of ICT and their advancements especially advent of the Internet and its continuing progresses revolutionized the global economy and made its impact on all aspects of society. These new ICTs were swiftly adapted to provide learning opportunities to anybody without restrictions of time and place. A new concept of learning which uses electronic means for learning called e-learning got conceived. It is believed that this concept has been developed by Nonaka et al among other innovators [17]. No single agreed upon definition of e-learning exists in the literature. Different researchers have defined e-learning in different perspectives either to supplement formal or informal learning modes of traditional education or to enable emerging educational approaches. A broader definition of e-learning as given by Wentling et al [18] defines e-learning as "the acquisition and use of knowledge distributed and facilitated primarily by electronic means". The study further explain that "this form of learning currently depends on networked computers but will likely evolve into systems consisting of a variety of channels (e.g. wireless, satellite) and technologies (e.g. cellular phones, PDAs) as they are developed and adopted". E-Learning is learning with a motto "Anytime, Anywhere and Anybody" sometimes also called as A3 which in recent years has been added with Anyhow. E-learning uses ICTs particularly the Internet technologies such as Web to deliver content and instructions synchronously and asynchronously for enhancing efficiency of learning and to increase knowledge. Recent development in Web especially, the Web 2.0 Apps, frameworks, and architectures made online interaction, collaboration and information sharing possible, giving its users deep and rich experience. Social aspects of e-learning, support for varied pedagogical approaches, and facilitation for integrating self-directed and collaborative learning into lecture management systems has been made possible by the read-write characteristics of Web. Web 2.0 applications provide users with a deep and rich experiences. It makes easier for people to find information and connect with one another online, allows users to create and share information on the web and allows users to collaborate with others interactively. It is not a new version of the World Wide Web, and does not

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necessarily refers to any updated technical specifications. Where previously online users were restricted to viewing web content passively, the new Web 2.0 applications allow users to change web content in some websites, while in other sites they can keep in touch with friends, organize meetings, exchange news and photos. With Web 2.0 anyone can easily create their own materials and publish or communicate these among groups of friends and colleagues, or to a worldwide audience. There are many Web 2.0 apps available for use in education or that can be some or the other way used in education. These apps or tools have facilities for personal note, book marks, tags, peer to peer learning, comments and feedback, live instructions, collaborative classroom, teacher absence preparation, notebook share, bulletin boards, group communication, reusable APIs, collaborative class projects, fun and creative activities, micro-blogging, stalking, FOSS, learning management system, online course management system, etc.

The emergence of semantic Web which employs artificial intelligence for intelligent searching, personalization, three dimensional visualizations, and interactions, it is envisaged that learning shall be further benefited as tasks such as finding relevant courses, most relevant books, and connections between peer groups of learners, finding most competent teacher shall be automated.

▪ Web Tools for Education

The core components of e-learning are the learner, the content, the teacher and the technology [19]. E-learning has been defined by Resta et al [20] as learning by communicating and interacting using Internet with contents accessed on Internet within the context of sound pedagogy. It has content and communication dimensions and can be categorized into four categories namely e-resources, online courses, blended learning and community of practice. This classification along with relevant web tools has been explained by Banday [21]. Figure 1 shows this classification along with relevant web tools in each form. Web tools including social networking sites are being extensively used in e-learning. A study [22] has examined and studies the opportunities created by these tools in various areas of education other that engineering.

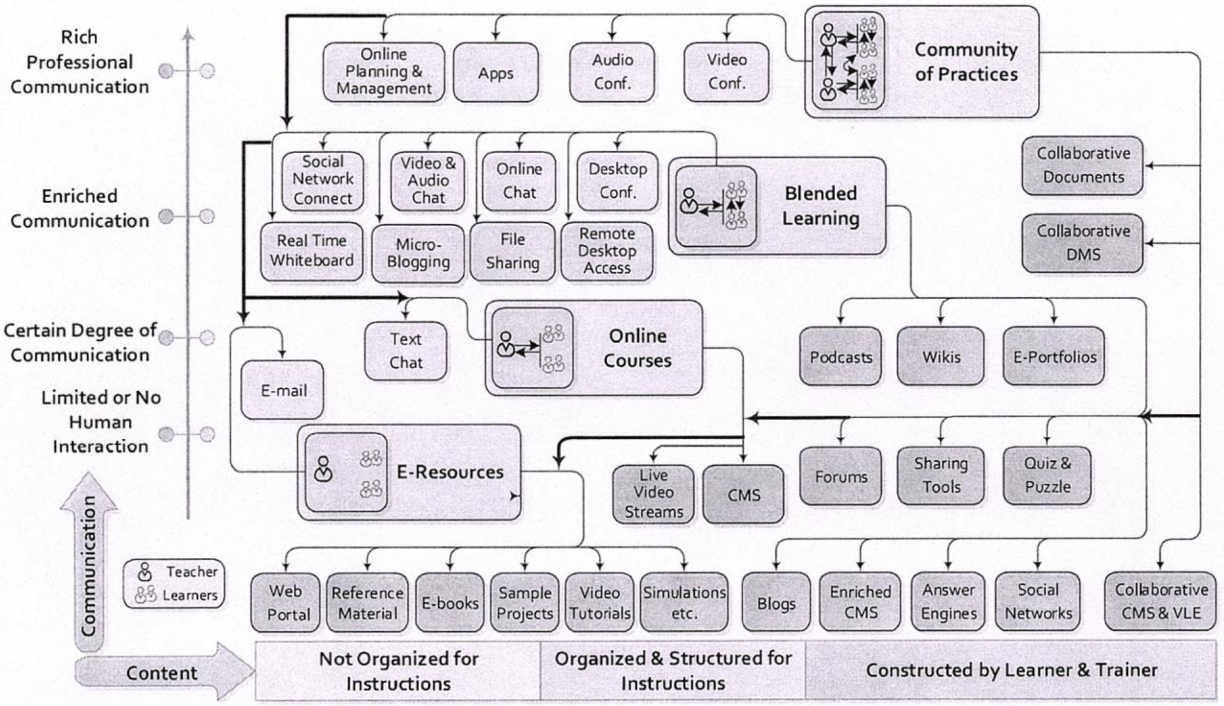
Rich Professional Communication
Enriched Communication
Certain Degree of Communication
Limited or No Human Interaction
Communication
Teacher
Learners
Content
Online Planning & Management
Apps
Audio Conf.
Video Conf.
Community of Practices
Social Network Connect
Video & Audio Chat
Online Chat
Desktop Conf.
Blended Learning
Real Time Whiteboard
Micro-Blogging
File Sharing
Remote Desktop Access
Collaborative Documents
Collaborative DMS
Text Chat
Online Courses
E-mail
Podcasts
Wikis
E-Portfolios
E-Resources
Live Video Streams
CMS
Forums
Sharing Tools
Quiz & Puzzle
Web Portal
Reference Material
E-books
Sample Projects
Video Tutorials
Simulations etc.
Blogs
Enriched CMS
Answer Engines
Social Networks
Collaborative CMS & VLE
Not Organized for Instructions
Organized & Structured for Instructions
Constructed by Learner & Trainer

Figure 1. Forms of e-learning and relevant web tools in each form

E-Resources: In this form of e-learning, the content is not organized for instructions and there exists little or no human interaction between teachers and students or teachers and teachers. The content can take several forms such as Websites/Web Portals, reference material, e-books, video tutorials, sample projects, models, demos and simulations. A website is a set of web pages hosted on a web server which can be accessed using a network such as the Internet or an Intranet. A website can be accessed using a unique

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address known as a URL. World Wide Web is a collection of a large number of websites globally accessible via the Internet. Websites consist of one or more web-pages which are documents containing plain text, images, graphs, charts, animations etc. The various web-pages in a website are interlinked to each other using hyperlinks to allow easy navigation. Website usually contains information and resources intended for a particular audience. There are large number of websites on the Internet providing study material for students and scholars for the purpose of education and learning. The Internet is full of reference material for students and scholars including digital versions of various books, references, user guides, thesis, research papers and scholarly articles. This kind of online reference material helps in learning online effectively and efficiently. An e-book (electronic book) also known as e-edition is a full book publication in digital format containing text, images, charts, etc., which can be read on computers, laptops and other hand-held devices. An e-book is usually a digital version of a printed book or reference. Some e-books exist only in digital format without a printed version. E-books can be downloaded directly from the Internet or from the publisher's websites. E-books are very helpful and popular in e-learning because they are very easy to acquire, buy, carry, store and read. They can be read across multiple devices without having to carry them around including computers, laptops mobile phones, e-book readers, tablet computers etc. The Internet provides access to a number of video sharing websites like *YouTube*, *Vimeo*, *DNA Tube,* etc. These websites contain a large number of educational videos used for education and learning purpose. Video tutorials may contain recorded lectures, step by step instructions and walkthroughs for problem solving, experiments and procedures. Video tutorials can be viewed online on the Internet and may also be available for download and storage for future reference. Video tutorials enhance the process of e-learning because videos are highly effective for quick learning and thorough understanding of subject matter. Sample projects available in digital format can be a very effective mode of learning and understanding via the electronic media. Students and scholars can acquire and analyze sample projects online for the purpose of developing and carrying out new projects effectively. Software applications which can be downloaded and installed or used online provide educational models, demos and simulations of real world objects and situations with a vast amount of information e.g. medical instruments, human and animal body models, flight simulators etc. These models help effectively speed up the process of learning at minimum costs and risks. A limited interaction in terms of asynchronous messaging such as e-mail may exist in this form of learning. E-mail (Electronic Mail) also referred to as email or e-mail is one of the widely used asynchronous communication application over the Internet. The use of email has increased due to the increasing level of globalization. E-mail is the most basic and popular way of communication among learners, facilitators and instructors.

Online Courses: In this form of e-learning, the content is organized and constructed by the teacher and there exists a certain degree of communication between the teacher and the student. Online courses are often used in distance education. Internet is used to reach the website(s) offering online course. The important web tool used include Course Management Systems and live video streaming. Content Management System (CMS) which is a dynamic web application used for easy management of various types of content such as text, images, videos etc. The CMS allows easy categorization, classification and cross linking of various articles or web pages. Various educational institutes, colleges and universities across the world use different types of content management systems for providing a vast amount of learning material to their students registered for various online courses to study remotely. Websites like *ustream* allow users to stream videos online in real-time. Trainers and teachers can create their own channels and provide their lectures via Internet in real-time to students all around the globe. The channels are usually assigned to a unique access link with proper permissions which can be shared with students allowing them to attend the lectures and trainings. Besides e-mail, various text chat tools are used for communication between peers. Text chat unlike e-mail is a synchronous way of communication between two or more users. The users login through their respective accounts and can write and read messages in real time and discuss their subject matter. In text chat, communication is made via written text, exchange of diverse types of files and links to resources in real time. Students make use of text chat to interact with their teachers and colleagues to discuss subject matter.

Blended Learning: In this form of e-learning the content is not only organized and constructed by the teacher but is also supplemented and complimented easily by the teacher and there exists a highest and enriched level of communication between teachers and students and between students. In this form face to face learning is supported by technology. The important web tools used besides CMS include various communication tools that enable students and teachers to collaborate and share resources such as Podcasts, Wikis, e-Portfolios, Forums, Quiz and Puzzles, Blogs, Answer Engines, and Social Networking. A podcast also known as a *netcast* is a digital medium in which audio, video, PDF, or e-books are made available in

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episodic series. These resources are made available through web syndication, online streaming, download or sent to the subscribers directly through e-mail or website account inbox. This type of media is very effective e-learning tool for various organized online courses. A blog is a website consisting of posts or articles published by individuals or organizations on the Internet. Most of the blogs are dynamic and interactive, allowing the readers to leave comments or discuss the posts or articles. Scholars, teachers, colleges, universities and other educational institutions can set up blogs to post various educational articles for their students to read and discuss. Blogs are becoming a very common source of knowledge for e-learning. A Wiki is a web based application which allows users to manage its content in collaboration with other users. Wiki is a type of CMS but there is no single owner or author of the content that exists in the system. Wikis are a great source of information as well as information sharing and maintenance tool. Wikis have been successfully used to enable hundreds of students to participate in a collaborative icebreaker exercise at Deakin University illustrating how e-learning practitioners can use wiki technology to enhance social interaction amongst students online. An e-portfolio is a learner-centered approach of learning, training and development. It is a demonstration and record of work, achievements and goals of students in electronic format usually published online. E-portfolios allows users to get comments, reflections, suggestions and support from other users and scholars. This way, the students are able to take their learning process in their own hands. Online forums are a type of dynamic and interactive web based application which allows users to post topics for discussion and brainstorming. The forum usually has a way to organize and classify the topics under various sections or subjects. The users can post a topic of their interest in the relevant section of the forum so that other users can read and discuss the topic. The forums usually allow comments on topics as well as comments on comments known as threaded comments and these threads are displayed in a very user friendly manner. The forums allow e-learners to seek the views and understanding of other users on their topics for in depth and more clear understanding of subject matter. Education institutions also set up official forums for their students and teachers to discuss course material. Answer engines like Yahoo Answers, Wiki Answers, etc. are dynamic web based applications that allow users to post a question and other users can attempt to answer the questions being asked. The asking user usually has the possibility of choosing the correct and most helpful answer from all the received answers. The process of asking questions and answering the questions is encouraged by reward points or reputation points in the answer engine. The answer engines are a useful tool in e-learning allowing students to seek answers to questions and solutions to their problems online from anywhere while learning. There are number of web application allowing learners to participate in quizzes and puzzles to help them assess their understanding of subject. These applications provide quick results with thorough performance reports. Social networks are websites which allow people to connect to each other, share information and send messages. The e-learning process is enhanced by the proper use of social networks in education. Students, teachers and educational institutions can share valuable information with each other to benefit students as well as teachers. Sharing links to useful articles on the Internet, sharing educative videos, images, blogs, new discoveries on related subject matter can transform e-learning further. Besides all tools used for communication in previous discussed forms of e-Learning, various other communication tools such as Online Chat, Audio/Video Chat, Real-time Whiteboards, Social networking Connections, Microblogging, Desktop Conferencing, Remote Desktop Access and File Sharing tools are used for enriched communications. Online chat is a synchronous mode of communication between multiple users. The users can join predefined chat rooms online and even create new chat rooms. In some cases unregistered users can also participate in online chat in read-only or read-write modes depending upon the policies of the chat rooms. Online chat systems may allow storing the chat and a transcript can then be mailed to participants or placed on the website for participants and others to read later. Audio and video chat is the most effective mode of online communication using Internet or intranet. This involves sharing of voice and video stream between two communicating users. The quality of the video or audio is depends on the hardware, software and network performance. A number of VoIP applications e.g. *Skype* etc. allow audio, video chatting on the Internet. Students and teachers participate in audio and video chats to improve e-learning process. Real-time whiteboard is an online application that allows various users to view a virtual whiteboard online. The users can write on the board using available tools like markets, painting tools, etc. Anything drawn by a user is reflected on the whiteboard of all other participants in the real time. A teacher for example can write on the board, make drawings, and solve equations while the students located globally view the changes immediately thus making an online remote classroom look like a real life classroom. Social networking platforms allow students, teachers to stay in connection and learn in collaboration with each other. The social networking tools allow personal messaging, newsfeeds from connected users, text streams and even live chat. In e-

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learning, these communication, collaboration and sharing capabilities of social networks serve as efficient communication tools to help learn effectively. Microblogging sites are web based applications which allow sharing small and short messages, links to articles, images and other resources with connected peers. Microblogging is an excellent tool for asynchronous communication for students learning remotely using the Internet. Desktop conference is a mode of communication where the participants can share their screens with each other. The users can remotely view demonstrations, presentations, etc. from the computers of other remotely located users via the Internet. Desktop conference is usually accompanied with text, audio and video chat for explanation of the content being shared. Teachers find desktop conference beneficial for e-learning as they can teach their students online by sharing their pre-prepared presentations, slideshows, and whiteboards in real time. Remote access is a technology with which a user (host) can provide control on their computers to remote users (guest) via Internet or Intranet. The guest user can control the computer of the host, perform various tasks, demonstrate some steps or techniques while the host user can watch and track the actions. File sharing is a mode of communication by which users can share files online. The users are able to upload their files to their accounts and send a link to their friends in order to share the files. Through the medium of file sharing, students located across globe can send content and files to each other. These file sharing services usually allow sharing large size files which are not possible to share using other means of communication like email etc.

Communities of Practice: In this form of e-learning, teacher and students co-construct courses, regularly update, upgrade and share them on the Web and there exists not only communication between teachers and students, and between students but also between teachers to share their experiences and ideas. This form of learning uses extensive Web tools that include Collaborative Documents, Collaborative CMS, and Online Document Management Systems besides all those discussed earlier. Collaborative documents are an online real-time dynamic application allowing creating, editing, sharing and downloading documents. These tools allow editing the document in collaboration with other users in real-time. Multiple users can work on a single document at the same time and each user can use what and where the other users are working on. The changes made by each user are reflected across all users in real-time without any delay. The documents may be in form of word documents, spreadsheets, slideshow presentations etc. The collaborative documents allow learners to collaborate and create documents, charts, spreadsheets, presentations together remotely. Online document management systems are web based applications allowing users to store files and documents and track the changes made by different users. It is the responsibility of the document management system to keep versioned copies of documents after every modification to them. The document management system is a handy tool on working together on collaborative assignments, projects and tasks provided by the trainers. The communication tools used in this mode of learning are Video Conferencing, Audio Conferencing, Online Planning and Management tools, Mobile Apps besides all those used in other modes of learnings. Video conferencing is a Web tool for groups of users to interact with each other while sharing their live video streams. This type of communication is helpful in holding group meetings and conferences. All users can see all other users on their screens. This is an effective way for brainstorming, discussion and learning. Audio conferencing is a Web tool for group discussions and e-conferences using voice. All users are constantly listening to the speaker. A user can indicate the need to talk by a method called hand-raising. Once the user raises hand, he is added to the queue and the system provides the users a chance to speak based on the hand raising in a first cum first serve basis. Online planning and management Web tools allow users to plan their activities, share tasks and track the progress of each other. Each user has an account while they update the status of their projects, tasks and assignments, letting other users know information and further actions. The online planning tools typically have the tools to allow discussions and planning online.

▪ Web in Engineering Education

Currently, ICT and e-learning are implemented in engineering institutions all over the world, however, the breadth and depth of this implementation differs importantly between nations and across institutions despite its perceived need and strong desire. These differences are much more in case of e-learning (web based learning) in which different types of resources are made available online to learners.

One such resource is digital or digitized content such as lecture notes, tutorials, e-books, etc. available for download or studying online using some online system such as *OpenCourseWare* Consortium (http://www.ocwconsortium.org), and Open University *OpenLearn* project (http://openlearn.open.ac.uk/). The *OpenCourseWare* Consortium is a worldwide community of hundreds of higher education institutions

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and associated organizations committed to advancing open education and its impact on global education. It is the name given to open educational resources that are presented in course format, often including course planning materials, such as syllabi and course calendars, along with thematic content, such as textbooks, lectures, presentations, notes and simulations which are developed by experienced educators and are available for use, repurposing, and modification (including translation), in whole or in part, by everyone, everywhere in the world free of cost. As on Jan 2014, it tracks 22868 courses from 72 providers besides other resources such as Webcasts, toolkits and Open Textbooks. Free and open sharing increases access to education and knowledge for anyone, anywhere, anytime and allows people to make changes to materials or to combine resources in new ways to build something new. *OpenLearn* aims to break the barriers to education by reaching millions of learners around the world, providing free educational resources such as online courses including engineering and technology. As on January, 2014, it offers 650 online courses besides other educational resources.

Second type of online resources are learning objects such as simulations, structured lessons, animations, videos, etc. such as *MERLOT* (www.merlot.org) and *JORUM* (www.jorum.ac.uk/). *MERLOT* is a program of California State University in partnership with educational institutions, professional societies and industry. It is a community of staff, volunteers, and members who work together in various ways to provide users of OER (Open Educational Resource) teaching and learning materials with a wealth of services and functions that can enhance their instructional experience. In *MERLOT* there are over a dozen communities, over 50000 educational material of varied types such as animations, assignments, case studies, collections, drill and practices, *ePortfolios*, learning objects, online courses, open journal articles, open text books, presentations, quiz/tests, reference materials, simulations, tutorials, workshop and training material, etc. Several tools for content creation such as content builder, development tools, assessment tools, and social networking tools are also hosted on it. *JORUM* is a service for further and higher education, to collect and share Open Educational Resources (OER), allowing their reuse and repurposing. In *Jorum* educational resources can be deposited as well as linked to. This online repository service is part of the wider landscape of repositories being developed institutionally, locally, regionally or across subject areas.

The third type is multi-user, dynamic and interactive learning environments permitting constructive learning, where a learner learns by doing such as *Finesse* [23], and *WiFi Virtual Laboratory* [24] such as Advanced Network Technology Virtual Lab (http://virtual-labs.ac.in/). The Advanced Network Technologies Virtual Lab has been to impart state-of-the-art knowledge on advanced topics in Computer Networks in an interactive manner through the Web. It introduces the concept of network simulation to the students and involves them in analytical studies of computer networks through network simulation. To provide a complete learning management system around the Virtual Labs in subjects of Science and Engineering where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self-evaluation has been setup by the Ministry of Human Resources Development, Government of India (http://www.vlab.co.in/). There are scores of such virtual labs that have been come up from various academic institutions recently. Recent research works such as [25], [26], [27], [28] shows that several institutions have created their own virtual and remote laboratories to support life-long learning and students' autonomous learning activities in various disciplines including electronics and microelectronics, power electronics and electrical drives, chemistry, physics, and control and automation. Virtual Learning Environments (VLE) besides supporting online delivery of content also support e-mail, newsgroups, and bulletin boards. These VLEs evolved into managed learning environments (MLE) that also support notice-boards, chat rooms, online assessment, whiteboards, and other web tools. Both commercial and open source VLEs and MLEs such as *Moodle* (http://moodle.org) (most popular LMS) [29], *WebCT/Blackboard* (http://www.blackboard.com), *Ilias* (http://www.ilias.de), *.LRN* (http://www.dotlrn.org), *Sakai* (http://www.sakaiproject.org/), *Claroline* (http://www.claroline.net) are used in engineering education. *Moodle* is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalized learning environments. It is a Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It is a free web application that educators can use to create effective online learning sites. As on January 2014, over 46 thousand virtual learning environments have been created in over 200 countries which hosting over 7 million courses. There are over 65 million users, 1 million teachers, and over 77 million enrolments to these courses. *Blackboard* offers solutions to higher education, K-12, career colleges, corporations, associations, government and military to improve individual and institutional performance by using a range of platforms such as *Learn*, *Collaborate*, *Connect*, *Transact*, *Analytics*, *Mobile*, and *Engage* to make teaching and learning more effective in the classroom and on the Web. *.LRN* is a full-

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featured application for rapidly developing web-based learning communities. Using *.LRN* instructors can administer classes or communities, customize various aspects of their courses. Currently *.LRN* includes various applications such as Assessment, Forums, E-mail, LORS Management, Curriculum, News, Photo Album, Project Manager, Homework Dropbox, Survey, Gradebook, etc. *Sakai* is a vibrant community creating technology that enhances teaching, learning and research. Currently, Over 350 educational organizations use Sakai as a learning management system, research collaboration system and *ePortfolio* solution. *Claroline* available in many languages is an open source and free software to create a dedicated learning and online collaboration platform which includes generic tools such as calendar, documents, videos, etc. allowing the platform to be used in a variety of contexts. It is based on a flexible instructional model and is driven by the motivation and interaction. The wide range of tools available to the user allows any teacher or learner to establish or operate a pedagogical device that promotes learning. Web enabled lifelong learning projects such as *nQuire* (http://www.nquire.org.uk/) and *LIFE* (http://life-slc.org/research/reports.html) support complementary of both formal and informal learnings. The *nQuire* software enables to design and run science inquiries. Students are guided through the inquiry process, in creating their research question, planning research, collecting data, and in sharing and presenting results. Teachers can choose from a set of readymade inquiries for their students, modifying them as they need, or create their own inquiries using the *nQuire* authoring tools. Teachers can monitor their students' progress through inquiries, and give them access to new parts of inquiries.

Besides creation of Innovative learning technologies, web permits educational institutions to share their teaching expertise and learning resources globally. Various initiatives for online laboratories e.g. *WebLab-Deusto* (www.weblab.deusto.es/web), *iLab* Shared Architecture (http://icampus.mit.edu/projects/iLabs.shtml), *LabShare* (www.labshare.edu.au/home), *VISIR* [30], *OCELOT* (http://ocelot.ow2.org), *LiLa* (www.lila-project.org/) have emerged to provide sharing of virtual and remote laboratories among different universities. *WebLab-Deusto* is a research group of the University of Deusto which provides different solutions to different scenarios related to remote experimentation. A solution named *WebLab-Deusto* which is an open-source distributed remote lab used by students at the University of Deusto for their practice works in different engineering-related subjects. It makes possible to offer real experiments such as *FPGA*, CPLD, *PIC* microcontrollers, etc. to a certain group of users through any computer network, such as Internet. The experience of using the experiments remotely is exactly the same as using them in a traditional laboratory. Another solution named *WebLab-Box* is a micro server based solution for deploying standalone remote laboratories. *iCampus* is a research collaboration between Microsoft Research and MIT whose goal is to create and demonstrate technologies with the potential for revolutionary change throughout the university curriculum. *iCampus* has initiated diverse range of projects for engineering education through Web enabled collaborations and interactions. *OCELOT* (Open Collaborative Environment for the Leverage of Online instrumentation) is a complete solution framework for projects of remote and collaborative online remote instrumentation. It can be used from PCs, tablets, smart phones, etc. *LiLa* an acronym for the "Library of Labs", is an initiative of eight universities and three enterprises, for the mutual exchange of and access to virtual laboratories (simulation environments) and remote experiments (real laboratories which are remotely controlled via the Internet). *LiLa* builds a portal which grants the access to virtual labs and remote experiments. It includes services like scheduling system, connection to library resources, tutoring system, and 3D-environment for online collaboration.

With an aim to enhance the quality of engineering education in the India by providing free online courseware, National Program on Technology Enhanced Learning (*NPTEL*) (http://nptel.iitm.ac.in/) has been initiated by leading national engineering institutions of India. Currently, *NPTEL* provides e-learning through web and video courses in engineering, science and humanities. As on January, 2014, more than 250 online courses have been made available for different branches of engineering. Various initiatives such as *Khan Academy* (http: //www.khanacademy. org), *Coursera* (https://www.coursera.org/) and *EdX* (http://www.edxonline.org) for creating free global platforms to develop and deploy web enabled learning resources are running successfully. In *Khan Academy* students can make use of extensive library of content, including interactive challenges, assessments, and videos from any computer with access to the web. Coaches, parents, and teachers have unprecedented visibility into what their students are learning and doing on the Khan Academy. *Coursera* is an education company that partners with the many universities and organizations to offer free online courses. It offers courses in a wide range of topics including humanities, medicine, biology, social sciences, mathematics, business, and computer science. *EdX* offers interactive online classes and MOOCs from MIT, Harvard, Berkeley, UT and many other universities. The topics include biology, business, chemistry, computer science, economics, finance, electronics, engineering, food and nutrition, history, humanities, law, literature, math, medicine, music, philosophy, physics, science, statistics and more. Some *edX* courses now offer ID verified Certificates of Achievement which is a new way to demonstrate achievement. According to Manchester Institute of Technology, a co-initiator of *edX* 10,000 students have passed a midterm examination to an online course named 'Introduction to Circuits and Electronics" for which 120,000 signups were made in March 2012.

Besides efforts at institutional, national and international levels, individuals are very active in developing learning objects for engineering education. Ebner et al [31] used web based course management system in structure concreate and found that it gave students deep insignt into more complex structures of civil engineering. Haep et al [32] who used ICT for student assessment found that ICTs can facilitate the best aspects of assessment through web-based tests for practice and self-assessment, assessment of group work. Ribeiro et al [33] performed student evaluation of a problem-based learning (PBL) implementation in the postgraduate engineering curriculum using a qualitative and collaborative design. It was concluded that this approach was very satisfactory as it promoted the acquisition of knowledge and developed skills and attitudes, such as teamwork and communication skills and respect for divergent ideas. Cagiltay [34] studied the relationship between engineering students' learning styles and their performance. It was found that assimilators and convergers performed better than the divergers and accommodators and the performance difference between assimilators and divergers is statistically significant. It was also found that the learning style theory is a potential tool for guiding the design and improvement of courses and helping students to improve their individual performance. Smaill [35] used a web-based tool for skills practice and summative assessment in electrical engineering that delivered individualized tasks, marks student responses, supplies prompt feedback, and logs student activity. It was reported that the software helped instructors to manage workloads in spite of rising class sizes and that student learning had been enhanced rather than compromised. The students found the software easy to use and were of the opinion that it helped them improve their skills and understanding. Wen et al [36] developed an online group-based cantilever beam pilot application using low lag audio and interactive three-dimensional models learning environment in solid mechanics course. Using this system learners are capable to manipulate three-dimensional models, change the view point and apply forces in various locations using a browser. Ray et al [37] developed a Virtual Proteomics Lab that demonstrates different proteomics techniques, including basic and advanced gel and MS-based protein separation and identification techniques, bioinformatics tools and molecular docking methods, and their applications in different biological samples. Zhai et al [38] designed electrical online laboratory that enables autonomous, interactive and collaborative learning of electrical engineering experiments.

▪ Challenges for using Web in Engineering Education

Critical success factors are a set of parameters that must be ensured by an organization to be successful. CSF when applied to educational institutions in e-learning context help these institutions to enact e-learning policy and manage efficient implementation of e-learning. CSFs of e-learning have been studied and proposed from different perspectives by several researchers including Henry [39], Gasco et al [40], Selim [41], Zhang et al [42], and Mahdizadeh et al [43]. These CSFs include parameters for all core components of e-learning. Since the integration of ICT in education passes through various stages, the degree of importance of individual factor for an institution at a particular stage shall vary. The most important CSFs for an institution which intends to implement of e-learning in education consolidated from these studies are: a) Institutional Level: e-learning policy, leadership and technical staff, control mechanism, curriculum structure, and training, b) Technology Level: ICT infrastructure and standards, resources, and Internet access, c) Teacher Level: workload, motivation, aptitude, ICT competence, teaching style, d) Learner Level: motivation, participation, collaboration, and ICT competence, and d) Content Level: quality, scale, breadth, flexibility and accessibility. A recent study by Bhuasiri et al [44] to find CSF with respect to the developing countries has identified and prioritized the CSFs of e-learning system adoption in developing countries. The study was based on the opinion sought from faculty and ICT experts and revealed 20 factors from 6 dimensions that influence the success of e-learning implementation in developing countries. The identified dimensions are: learners' characteristics, instructors' characteristics, institution and service quality, infrastructure and system quality, course and information quality and extrinsic motivation. A cross-disciplinary survey conducted in studies [45] and [46] have found that the factor most likely to predict e-learning use was its perceived usefulness and perceived effectiveness. They however, concluded that since integration of technology is complex and influenced by issues other than those that had not yet been recognized and therefore, called for further study to understand other influencing factors.

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With varying degrees of integration, higher education institutions including engineering institutions throughout the world have successfully implemented e-learning in their educational process, however, due to some barriers others are facing difficulty to adapt e-learning. Challenges that impede the adoption of e-learning have been studied by several researchers who identified a number of barriers with varying degree of severity. A study by Mehra et al [47] found that majority of the teachers find technology tools and techniques more complex, feel intimidated, fear to lose the personal touch with students and are of the opinion that e-learning requires high administrative support. Challenges of poor and undeveloped existing infrastructure and a lack of skilled, qualified and ICT-savvy teachers present a great challenge to the current educational reform process [48]. Lack of adequate technology, improper curriculum design, resistance to change, and lack of managerial support are key barriers to e-learning [49]. Further, challenges due to culture and language [50], attitude, awareness, and motivation [51], social, cultural and economic issues [52], English language competency [53], lack of awareness [54], student resistance [55], privacy and security [56], and environmental factors [57] have also been reported. Research work conducted by Sife et at [58] suggests that flourishing of e-learning in developing countries can hamper on account of weaknesses in one or more of the following: systemic approach to ICT implementation, awareness and attitude towards ICTs, administrative and technical support, transforming higher education, staff development, lack of ownership, and inadequate funds. Implementation of e-learning in developing countries face challenges on account of lack of monitoring and evaluation such as a) absence of evaluation framework, b) limited local capacity for evaluation, c) limited funding and resource, d) Lack of demand and ownership, and e) confusing updating with upgrading [59]. The study further raised issues of content copyright and technological challenges in realization of 3D multi-user virtual learning environments.

A study conducted by Benchicou et al [60] has consolidates various barriers to e-learning as identified in studies [61], [62] and [63] in seven major categories namely: a) personal or dispositional; b) learning style; c) instructional; d) situational; e) organizational, f) content suitability; and g) technological barriers. These researchers have found that barriers to e-learning are heterogeneous and of a multi-dimensional nature. Also situational and organizational barriers are the most dominant while personal barriers can be the least common. Further, four key factors namely: a) organization b) self-efficiency, c) computer competence, and, d) computer training were found to be significant predictors of e-learning barriers. Furthermore, factors such as age, gender, ethnicity, marital status, level of education, prior experiences with computers and e-learning, computer ownership, location of study were found to be influential variables on e-learning barriers. Engineering education being based on science and mathematics makes it a significantly different from other disciplines. These subjects are traditionally difficult to teach online because of the need for laboratories and equation manipulation. Although advances in technology over years permits complex structures and objects to be represented by computers but it requires greater technical skill. Therefore, developing e-learning structures for engineering education may pose unique challenges as compared to other fields if the instructional material is not adequately designed to facilitate learning at all levels as it has to deal with multiple levels of intelligence. Further, the absence of the social context is one of the key challenges facing the development of remote laboratories, and the move from group work to individual work has significant consequences for the nature of the learning [64]. Challenges in simulation requirements [65], problems to connect the real to the virtual world [66], challenges in remote laboratories [67], and issues with virtual and collaborative laboratories [68] have also been reported in studies focused towards e-learning in engineering education.

A list of the critical success factors arranged in six dimensions namely: learner, teacher, course, institution, technology and environment for considerations while implementing ICT and e-learning in engineering education is given in figure 2. Factors under *Learner* dimension are indicative about the competence and comfort of learners in using technology but also how does the learner perceive its usefulness in learning. The learners may often have to put in extra efforts to learn use of ICT and other Web tools for improving their learning abilities. The factors under *Teacher* dimension besides indicating teacher's ability to use the technology for teaching and learning also indicate their perceived usefulness and motivation to learn technology and adapt modern pedagogy in their practice. This may put teachers into pressure of learning modern techniques and tools in a time bound manner for which teachers' readiness and willingness are also included in this dimension. The third dimension, *Course* includes factors that besides other indicate its scale, quality, flexibility and methodology to be adopted for learning. The well design course has methodology that allows modern engineering paradigm, is flexible and up to date. The factors under *Institution* dimension are most critical as all other factors are controlled by institutional policy about ICT and Web integration in education. These factors motivate and regulate all stakeholders. Service quality and

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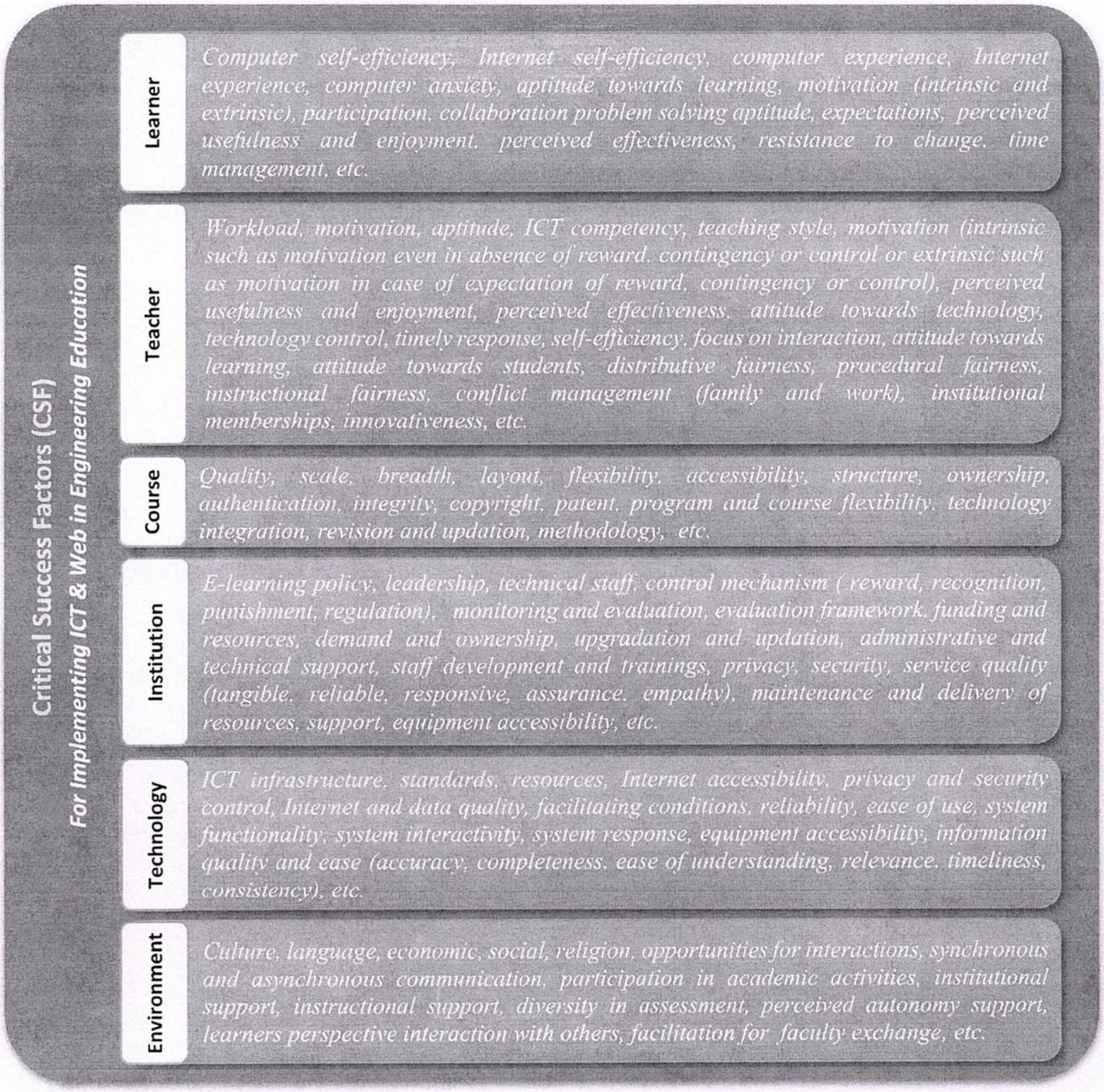
guarantee, equipment access, and guidelines/policy and framework are the most critical factors under this dimension. The *Technology* dimension includes factors that determine the quality of service and information that is available and provided by the institution to its stakeholders. The services and information must be reliable, easy to use, up to date, consistent, and must be provided timely to learners, teachers and administrators. The *Environment* dimension includes factors that are both internal such as technological setup, academic environment, facilitation, etc. and external to the institution such as socio-cultural, linguistic, etc. A negative influence on some key factors such as religion, social, etc. in this dimension may hamper the successful integration of ICT and Web based learning tools in education.



Critical Success Factors (CSF)

For Implementing ICT & Web in Engineering Education

Learner	*Computer self-efficiency, Internet self-efficiency, computer experience, Internet experience, computer anxiety, aptitude towards learning, motivation (intrinsic and extrinsic), participation, collaboration problem solving aptitude, expectations, perceived usefulness and enjoyment. perceived effectiveness, resistance to change. time management, etc.*
Teacher	*Workload, motivation, aptitude, ICT competency, teaching style, motivation (intrinsic such as motivation even in absence of reward. contingency or control or extrinsic such as motivation in case of expectation of reward, contingency or control), perceived usefulness and enjoyment, perceived effectiveness. attitude towards technology, technology control, timely response, self-efficiency, focus on interaction, attitude towards learning, attitude towards students, distributive fairness, procedural fairness, instructional fairness. conflict management (family and work), institutional memberships, innovativeness, etc.*
Course	*Quality, scale, breadth, layout, flexibility, accessibility, structure, ownership, authentication, integrity, copyright, patent, program and course flexibility, technology integration, revision and updation, methodology, etc.*
Institution	*E-learning policy, leadership, technical staff, control mechanism (reward, recognition, punishment, regulation), monitoring and evaluation, evaluation framework, funding and resources, demand and ownership, upgradation and updation, administrative and technical support, staff development and trainings, privacy, security, service quality (tangible. reliable, responsive, assurance. empathy), maintenance and delivery of resources, support, equipment accessibility, etc.*
Technology	*ICT infrastructure, standards, resources, Internet accessibility, privacy and security control, Internet and data quality, facilitating conditions, reliability, ease of use, system functionality, system interactivity, system response, equipment accessibility, information quality and ease (accuracy, completeness. ease of understanding, relevance. timeliness, consistency), etc.*
Environment	*Culture, language, economic, social, religion, opportunities for interactions, synchronous and asynchronous communication, participation in academic activities, institutional support, instructional support, diversity in assessment, perceived autonomy support, learners perspective interaction with others, facilitation for faculty exchange, etc.*

Figure 2. Critical Success Factors for implementing ICT & e-Learning in Engineering Education

▪ Fostering Web use in Engineering Education

The characteristics of e-learning (web based learning) as summarized in [69] are: a) it is web based, b) information available as networked courses, c) worldwide distribution and sharing, d) variety of study environments, v) flexibility of study, and, e) virtual study environment. Research work of Benchicou et al

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[60] has summarized the benefits of e-learning as follows: a) wide availability and accessibility, b) convenience, c) improved retention, d) instant feedback, e) accommodation of different learning styles and multimedia formats, f) hands-on training, g) collaboration, h) standardized course delivery, i) information resource, j) learner control and ownership, k) lower costs and international visibility. ICT and e-learning can effectively be used in engineering education whether offered through traditional or emerging approaches. Thousands of initiatives at personal, institutional, national or international levels have been carried out successfully to use ICT and e-learning in engineering education. Researcher works [70] and [71] have demonstrated that the required competencies for engineers as identified by ABET are enhanced by e-learning. Research study [72] focused to find the effect of teaching and learning through technology based studied more than twenty thousand research articles and concluded that the teaching has moderate and positive impact on cognitive student outcome. The four basic components of engineering curriculum namely theory courses, practical courses, seminar on contemporary topic and project work are benefited by the application of relevant ICT and Web tools. With varying degree of adaptability are being used in engineering institutions throughout the globe. The integration of ICT and Web in education does not occur instantaneously but instead passes through several stages from emerging stage through applying and infusing stages to the transforming stage. A recent research [73] conducted by the present author to examine the adoption of ICT and e-Learning in engineering education has classified teachers practices of ICT and Web in two categories namely Computer Based Training and Web Based Training. Figure 3 shows computer based training practices grouped into six groups along with individual component and few relevant tools for each group.

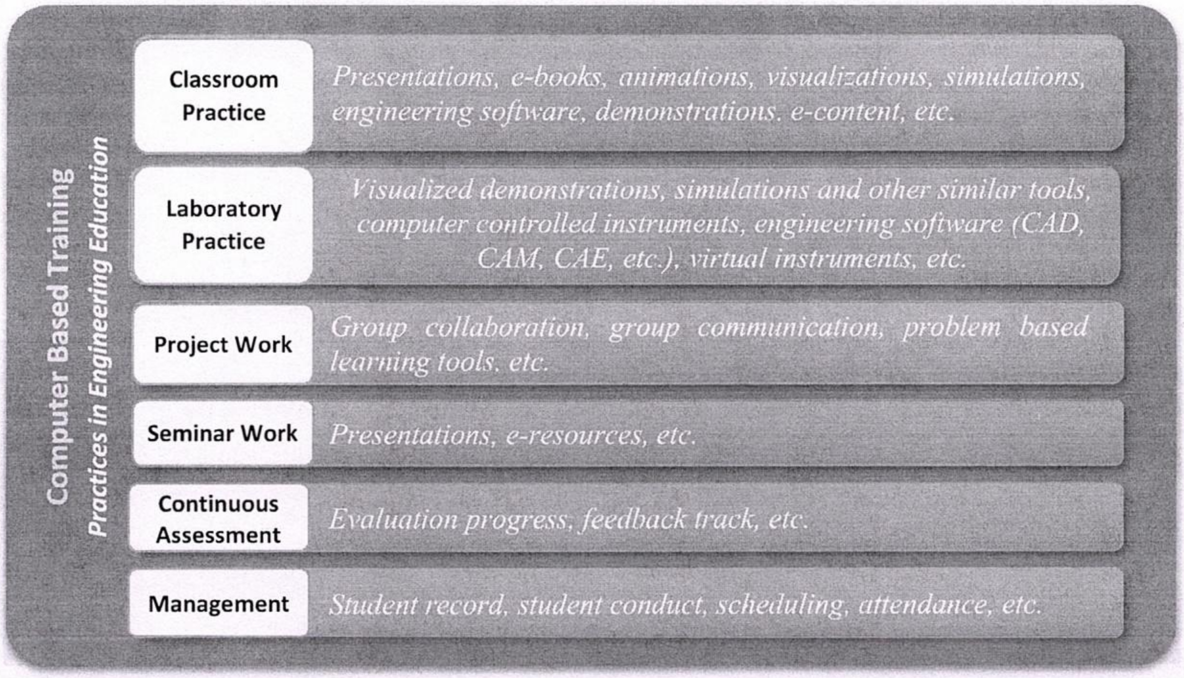
Computer Based Training
Practices in Engineering Education
Classroom Practice
Presentations, e-books, animations, visualizations, simulations, engineering software, demonstrations. e-content, etc.
Laboratory Practice
Visualized demonstrations, simulations and other similar tools, computer controlled instruments, engineering software (CAD, CAM, CAE, etc.), virtual instruments, etc.
Project Work
Group collaboration, group communication, problem based learning tools, etc.
Seminar Work
Presentations, e-resources, etc.
Continuous Assessment
Evaluation progress, feedback track, etc.
Management
Student record, student conduct, scheduling, attendance, etc.

Figure 3. Computer Based Training Practices in Engineering Education

Basic implementation of ICT in engineering education involves use of ICT for delivery of classroom lectures, demonstration and conduct of laboratory experiments, course and class management and administration. Classroom teaching is assisted by presentations that contains sufficient material, circuit diagrams, network diagrams, process diagrams and flowcharts. Softcopies of the books prescribed in the syllabi may be used while delivering the lectures. While explaining a circuit or program simulation software and compilers may be used in classrooms for better understanding of the lessons. Animations and visualizations can used to demonstrate the working of a component, functioning of a circuit or process. ICT equipment like visualizers, or digital still and video cameras can be interfaced to projectors in absence of visualizers to demonstrate experiments in laboratories to cover entire class in one go and thus save time which otherwise may require repetition for each group of students of a particular class. Simulation software, engineering design and evaluation tools, mind-mapping tools e.g. *MatLab*, *Mathematica*, *MathCad*, *Octave*, *OrCAD*, *SPICE*, *AutoCAD*, *Solid Works*, *Inspiration*, *MindManager*, etc. can be used in networked

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computing laboratory to demonstrate and carryout experiments which otherwise could have not been carried out in hardware laboratories due to non-availability of relevant or sufficient instruments or component(s) or due to time constraints. There are numerous such computer based tools both closed and open source that support engineering laboratories for each branch of engineering. Various experiments in engineering laboratories employ direct or indirect use of computers as many laboratory equipment are nowadays operated via some computer based interface.

Figure 4 shows teachers Web based training practices grouped into six groups along with individual component and few relevant tools for each group.

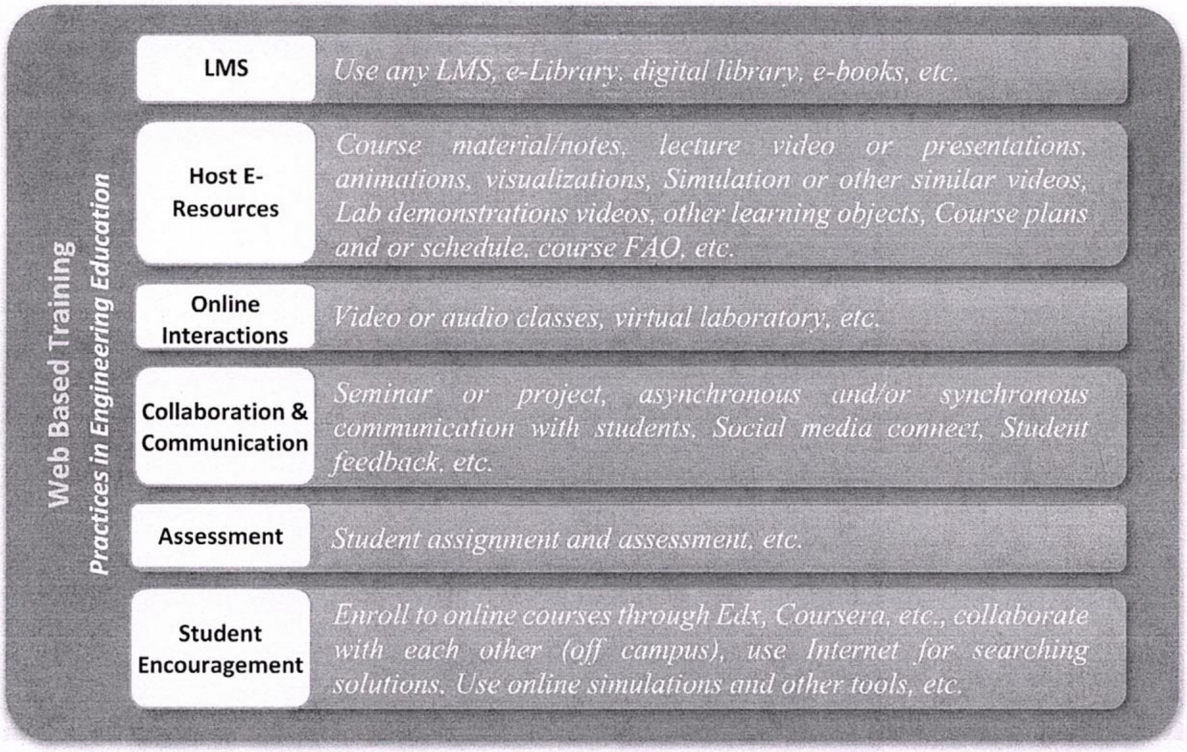
Web Based Training
Practices in Engineering Education
LMS
Use any LMS, e-Library, digital library, e-books, etc.
Host E-Resources
Course material/notes, lecture video or presentations, animations, visualizations, Simulation or other similar videos, Lab demonstrations videos, other learning objects, Course plans and or schedule, course FAQ, etc.
Online Interactions
Video or audio classes, virtual laboratory, etc.
Collaboration & Communication
Seminar or project, asynchronous and/or synchronous communication with students, Social media connect, Student feedback, etc.
Assessment
Student assignment and assessment, etc.
Student Encouragement
Enroll to online courses through Edx, Coursera, etc., collaborate with each other (off campus), use Internet for searching solutions, Use online simulations and other tools, etc.

Figure 4. Web Based Training Practices in Engineering Education

Web and e-Learning can further argument engineering education by use of e-resources, blended learning, lecture management systems, and other communication and collaboration tools. A typical lecture management system has facilities for content delivery, e-mail, tasks/exercises, forums, mailing lists, exams, self-assessment, surveys, group work, chat, calendar, *FAQs*, wikis, blogs, glossaries, videoconference, notebook, whiteboard, learning paths, student portfolio, podcast, student tracking, and vodcast. Other web tools like *SkyDrive*, *MS Office 365* for education, *Google Docs*, etc. can be used to work in collaboration on seminar papers, project reports, experimental write-ups, etc. In absence of lecture management system *Team viewer*, *MS Lync* or other similar tools may be used to deliver short online lectures, simulations, etc. Such tools often have an online white board for narrations during the delivery. E-mail is used as a communication tool to take up student's queries during vocations and schedule online instructions and presentations. Online tools and Social Networking websites such as *Google Talk, Skype*, etc. can be used for AV and text Instructions, sharing relevant news and notices, etc. Relevant news, articles, and information about subject of interest and related disciplines can be shared on the social networking websites. Several studies such as [74] have reported positive impact of the use of these tools on the learning outcome in some courses of electronics engineering.

▪ Conclusion

Traditional engineering education is markedly different from present model both in content and method. This change has been necessitated by the fact that the traditional engineering education model is inadequate for preparing students to address complex issues of the twenty-first century society. The focus of

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attention has taken a shift from early positivism to present constructivism - from teacher centric approach to learner centric approach. This paradigm shift has also impacted engineering pedagogy and has harbingered change in curriculum structure, course design, delivery of lessons and student assessment. Diverse collection of ICT and Web tools all over the world are enhancing engineering education to allow learner-centric engineering pedagogy with a high degree of communication, interaction, collaboration and structured content. Web has made different forms of e-learning such as e-resources, online courses, blended learning, and communities of practices possible through abundant Web tools for dissemination of content and services for asynchronous, synchronous and real-time communication. Various initiatives at international, national, consortium, institution and personal levels are offering Web based educational services such as learning objects, courseware, experimentations in remote laboratories, virtual learning environments, etc. to benefit engineering students and teachers. However, challenges for successfully using Web in engineering education such as lack of skilled manpower, lack of material resources, unwillingness and un-readiness for change from tradition to evolution impede some institutions to take full advantages of Web despite its recognized usefulness and need.

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SNo = 2

Multiple E-mail Address Certificate

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Abstract — **Digital signature certificates are digitally signed identity certificates issued by trusted Certification Authorities (CA's) to individuals, devices, applications, or services. E-mail Certificates (EC's) are issued primarily for the purpose of signing and encrypting e-mail messages. E-mail clients use sender's E-mail Certificate (Private Key) for signing and recipient's E-mail Certificate (Public Key) for encrypting an e-mail message. This paper proposes inclusion of multiple e-mail addresses in E-mail Certificates and puts forward modified procedure to allow e-mail clients to use a single E-mail Certificate of an individual for different e-mail addresses to sign and encrypt e-mail messages. Further, it discusses generation of multiple e-mail address certificates and demonstrates their working using an e-mail client developed for the said purpose.**

Keywords – Digital Signature; E-mail Certificate; Encryption; Public Key Cryptography; Digital ID; Digital Signature Certificate

I. INTRODUCTION

Secure Multi-purpose Internet Mail Extensions (S/MIME) [1] [2] is a prominent security protocols that provides end-to-end encryption by using asymmetric key cryptography. It adds cryptographic security services to e-mails through MIME encapsulation of digitally signed and encrypted objects. Every participant has a key pair; private key is kept secret and public key is made available to everyone. E-mails encrypted using someone's private key can only be decrypted using his public key and vice versa. Encryption is used for both digitally signing and encrypting contents of the message. S/MIME uses ITU-T X.509 [3] digital signature certificates to provide privacy, authentication, message integrity and non-repudiation [4] [5]. The current version 3.2 of S/MIME (RFC 5750 [6] and RFC 5751 [7]) has increased the required key sizes, made the Advanced Encryption Standard (AES-CBC) [8] the required content encryption algorithm, and made SHA-256 [9] the required digest algorithm.

A. Data Encryption and Decryption

Public Key Cryptography [10] also called Asymmetric Key Cryptography is based on a public/private key pair. The keys are mathematically related so that the data encrypted with one of the keys is decryptable with the other key. This characteristics is used to implement data encryption and digital signature. Private key is never distributed and is kept secret while as public key is distributed freely and widely. In its simplest form, the sender encrypts plaintext to cipher text using the public key of the intended recipient and the recipient using his private key decrypts ciphertext into plaintext. The cipher text can only be transformed to plain text by using the private key that corresponds to the public key used for encrypting it and therefore, sender has assurance that only the recipient will be able to read the message. This scheme ensures privacy of message but does not assure authentication, integrity and non-repudiation. However, the sender has to be certain that he possesses the correct public key of the intended recipient and that the public key is valid. This uncertanity can be resolved through digital signature certificates, explained later in this paper.

B. Digital Signature and Verification

In addition to encryption, a digital signature of the message can be created and send along with the message by the sender. A digital signature is a value produced as a result of cryptographic transformation on data by the message sender to bind message data to the sender's identity. When properly implemented, it provides a mechanism to verify origin authentication, data integrity and signatory non-repudiation.

In this case, the sender's private key is used to create the digital signature of the message and the corresponding public key is used by the recipient to verify the signature. The sender uses a one way function called as hash function [11] to compute a small and fixed length message digest also called finger print or hash or message abstract and then encrypts it using his private key to produce message signature. Signing message digest instead of entire message ensures faster signing at no security risk because message digest is small in comparison to the message itself and plain message cannot be reconstructed from the signature. The message, computed message signature and the public key of the sender are packed together for transmission. The recipient uses the same hashing function to compute the message digest of the received plain message after separating it from the public key of the sender and message signature. Using the public key of the sender, the received message signature is decrypted to produce the message digest. The received message digest and the computed message digest are compared with each other to verify sender authentication, data integrity and signatory non-repudiation. A small change in the plain message produces a considerable change in its digest and thus invalidates the signature and therefore, changes can be easily detected by the recipient. However, the recipient has to ensure that the publlic key received with the message is of the claimed sender.

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The remaining paper is organized as follows: section II presents brief review of digital signature certificates. Section III describes e-mail certificates, their structure, uses and limitations. In section IV, proposed multiple e-mail address certificates are discussed. Section V presents the results of experiments conducted for generation of keys and multiple e-mail address certificates. Section V also discusses development of a compitiable e-mail client and its use for sigining and encrypting e-mail messages using multiple e-mail address certificates followed by conclusion.

II. DIGITAL SIGNATURE CERTIFICATES

The simple implementations of encryption and digital signature are not applicable in situations wherein the number of communicating parties are very large e.g. e-mail system, because it is very difficult to bind public keys with individuals or systems without uncertaintity. Further, creation, distribution, and management of keys and interoperability is difficult to achieve. Digital Signature Certificates (hereafter referred as certificates only) a key component of public key infrastructure addresses this problem. The ITU-T X.509 is the most prominent certification method currently employed. A certificate is a signed (encrypted) data structure that binds a public key to a particular distinguished name (person, computer, code, service, etc.) in the X.500 [12] tradition, or to an alternative name such as a DNS-entry or an e-mail address. Before issuing a certificate, the Certification Authority hashes the contents, signs (encrypts) the hash by using its own private key, and includes the encrypted hash in the issued certificate. The corresponding public key of the CA is distributed in the form of a self signed CA certificate. X.509 certificates are generally obtained from CA for a subject by submitting a certificate signing request which contains the subject's name, the public key, and the algorithm that is used.

When CA is used to issue X.509 certificates, the encryption and signature procedures are modified. The sender and receiver both obtain their certificates from some trusted CA, keep private key secret and publish their certificate (public key) widely and openly. Further, both sender and receiver have to agree on some CA or have to trust each others CA. The plain message is hashed to produce a message digest which is encrypted by the private key of the sender extracted from his private key store to compute message signature. The certificate of the intended recipient is verified to confirm his identity and validity of the certificate. Since the size of the message to be encrypted can be large and asymmetric key encryption/decryption algorithms are slower than their symmetric key counterparts, therefore, a symmetric key is calculated from the plain message, message signature and the recipients certificate using any algorithm. The plain message, message signature and the certificate of the sender are packed together and encrypted using the previously generated symmetric key. The symmetric key is protected by encrypting it using the public key of the intended recipient extracted from his certificate. The encrypted and signed message is packed with the encrypted symmetric key for transmission. The recipient unpacks the packet into individual components and decrypts the encrypted symmetric key using his private key. The encrypted and signed message is decrypted using the symmetric key and unpacked to produce plain message, the message signature and the certificate of the sender. The certificate is verified and public key contained in it is used to decrypt the signature into message digest. The plain message is hashed to compute the message digest. The two message digests are compared to verify message integrity. With a certificate instead of a public-key, a recipient can verify the identity of senders, validity of certificate and validate signature of CA on the certificate to verify its integrity.

III. E-MAIL CERTIFICATES

An E-mail Certificate (EC) is a digital signature certificate that does not necessarily facilitate authentication of the identity of an individual but certainly authenticates an e-mail address. The subject field of such a certificate contains an e-mail address or includes e-mail address in subject or subject alternative name fields. It is issued primarily for the purpose of signing and encrypting e-mail messages. The CA binds only an e-mail address or an e-mail address and personal/company information with the public key contained in the certificate. Once a request is made to the CA for issuance of an EC for a particular e-mail address, the CA validated the address by sending a validation e-mail to that address. Once the address is verified, an X.509 e-mail certificate along with its private key in PKCS #12 defined archive file format (usually *.pfx*) is send through a mail as an attachment or a link is provided to download the same. The private key is protected by the specified password in the received file which can be export to X.509 e-mail certificate. In some cases the certificate can also be obtained on some secure device. The EC (public key) is distributed widely and openly so that recipients of signed e-mails can verify the originator's e-mail address. This can be helpful to check spoofing and attain non-repudiation of the originator. When both sender and recipient have obtained EC's either from same CA or from different CA but trust respective CA's, e-mails can also be send in encrypted form. This ensures privacy of conversation and integrity of message. E-mail certificates are available free of cost or for some minimum charges from reputed corporates like Ascertia (www.ascertia.com/), Globsign (www.globalsign.com/), Entrust (www.entrust. com), Comodo (www.comodo.com/), etc. who issue one EC for one e-mail address.

A. *Structure of E-mail Certificates*

E-mail certificate is an X.509 digital signature certificate that enable mail agents to use it for signing and encrypting e-mail messages. Any digital signature certificate can be used as an e-mail certificate by mail clients provided that it meets certain criteria e.g. binds a valid e-mail address in subject field or subject alternative name field with the public key included in the certificate and contains appropriate usage information in key usage or extended key usage extensions. Since an e-mail certificate is essentially an X.509 digital signature certificate, therefore, its structure is a sequence of three fields namely TBS certificate (*TBSCertificate*),

SNO=2(b)

algorithm identifier (*signatureAlgorithm*) and digital signature (*signatureValue*). S/MIME clients validate and process certificate as described in RFC 5280. The RFC 5750 focuses on e-mail addresses, and user agents' certificate processing, therefore, certain considerations and criteria as discussed in this document have to be meet for a digital signature certificate to be correctly used as an e-mail certificate by user mail agents. Some of these criterions include the following:

a. Both CA Certificates e.g. Cross Certificates, Self-Signed Certificates and Self-Issued Certificates and end-entity certificates can be used as e-mail certificates.
b. Though, e-mail address should be in the subject alternative field and not in the subject distinguished name, yet receiving agents must recognize e-mail addresses in distinguished name filed. The address must be encoded in IA5String format with upper bound of 255 characters. Simultaneous inclusion of e-mail address attribute in the subject distinguished name to support legacy implementations is deprecated but permitted.
c. Mail agents must also recognize certificates with no e-mail address by some alternate methods like address book lookup.
d. A minimum required set of certificate extensions having greatest value in S/MIME are basic constraints, key usage, authority key identifier, subject key identifier, and subject alternative name.
e. Basic constraints identify whether the subject of the certificate is a CA and the maximum depth of valid certification paths that include this certificate. In all CA certificates that contain public keys used to validate digital signatures on certificates must contain this extension and must be marked as critical. No end-entity certificates should contain this extension.
f. The key usage extension defines the purpose (e.g. encipherment, signature, certificate signing) of the key contained in the certificate. It serves to limit the technical purposes for which the public key listed in a valid certificate may be used. An e-mail certificate generally has digitalSignature, keyEncipherment bits set to true and the key usage extension is marked as critical. S/MIME receiving agents must not accept signature of a message, if it was verified using a certificate that contains the key usage extension without either the digitalSignature or nonReputudation bit set.
g. The subject alternative name extension is used in S/MIME as the preferred means to convey the e-mail addresses which must be in rfc822Name form. If the only subject identity included in the certificate is an alternative name form (e.g., an electronic mail address), then the subject distinguished name must be empty (an empty sequence), and the subject alternative name extension must be present.
h. The set of technical purposes for the certificate are the intersection of the uses indicated in the key usage and extended key usage extensions. E.g. if the certificate contains a key usage extension indicating digital signature and an extended key usage extension that includes the email protection OID, then the certificate may be used for signing but not encrypting S/MIME messages. Similarly, if the certificate contains a key usage extension indicating digital signature but no extended key usage extension, then the certificate may also be used to sign but not to encrypt S/MIME messages. If the extended key usage extension is present in the certificate, then interpersonal message S/MIME receiving agents must check that it contains either the emailProtection or the anyExtendedKeyUsage OID.
i. E-mail certificates are often procured online and some companies also offer such certificates free of cost for limited time. The structure of these certificates vary from one another. In some certificates the e-mail address appears in the subject field while as in other it appears in subject alternative name field and for some in both of these fields. Some certificates besides including e-mail address also include name and a text describing that the person is not identified. The key usage included in such certificates is at least digital signature, and key encipherment.

B. Signing and Encrypting using E-mail Certificates

Mail agents supporting S/MIME are user software that: a) create S/MIME CMS objects, MIME body parts that contain CMS objects or both (Sending Agents), and, b) interpret and process S/MIME CMS objects, MIME body parts that contain CMS objects, or both. S/MIME message creation involves MIME processing followed by signing and/or encrypting the message. A signed messages may either follow multipart/signed (also called a clear-signed message) or application/pkcs7-mime structure. The MIME processing output is passed to the CMS signed-data process, then wrap the result in a CMS content-info structure, and finally insert it in the appropriate MIME entity. In case of encryption, after MIME processing of the message, the output is passed to the CMS enveloped-data process, then the result in wrapped in a CMS content-info structure, and finally inserted into an application/pkcs7-mime MIME entity. For the case where the message is first signed and then encrypted, the output of the signed message becomes the input to the encrypted message process.

C. Limitations of E-mail Certificates

In today's world, e-mail has become very common and individuals are having multiple e-mail accounts on different mail servers. E-mail certificates currently issued by certification authorities contain one e-mail address in either subject field or subject alternative name filed, besides there may or may not be personal information in these fields. Therefore, exactly one e-mail address is bound to the public key of the certificate. E-mail clients use an e-mail certificate that contains "From" address in its subject field or subject alternative name field to sign an e-mail messages. Further, they use an e-mail certificate for encryption that contains "To" address in subject or subject alternative name field to encrypt an e-mail message. Before signing and encrypting an e-mail message with keys contained in selected certificates, the e-mail client confirm the validity of various fields of the certificate including e-mail address associated

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with it. Since only one e-mail address is associated with each certificate, therefore, an individual possessing multiple e-mail addresses has to obtain multiple certificates; one for each e-mail address and use corresponding certificate for sending signed e-mail messages and also must use different encryption certificates to send encrypted e-mail messages to same individual on different e-mail accounts. This process is cumbersome because it involves management of multiple certificates by both sender and recipient. Further, it is also expensive because certificates have to be purchased and renewed frequently. E-mail client applications support configuration for connecting to multiple mailboxes of an individual on same or different servers, however, do not support any method for using a single certificate with more than one e-mail address of an individual.

IV. MULTIPLE E-MAIL ADDRESS CERTIFICATES

A multiple e-mail address certificate is an X.509 certificate that can bind a public key to a particular distinguished name or to an alternative name which includes more than one e-mail address. The e-mail addresses may be in the subject field or in the subject alternative name field or in both fields of the certificate. Further, since key usage and extended key usage extensions limit the technical purposes for which a public key listed in a valid certificate may be used, therefore, the intersection of uses indicated in these two extensions must permit the certificate to sign and encrypt. Such a certificate shall permit an individual to use it for signing and encryption with more than one e-mail address.

The RFC 5280 does not recommend to include e-mail address in the subject distinguished name field. Yet, it suggests that receiving agents do recognize e-mail addresses in subject distinguished name field. It also does permit simultaneous inclusion of the e-mail address attribute in the subject distinguished name to support legacy implementations. Therefore, including more than one e-mail address in the subject distinguished name (e.g. E: sgrmtb@gmail.com, sgrmtb@mail.com or E: sgrmtb@gmail.com E: sgrmtb@mail.com) would not be desiriable as per RFC 5280 recommendations but as per the same recommendations would still work. It is worth to state that the personal e-mail certificates currently issued oline by various companies contain subject distinguished name as the e-mail address which is also against the RFC 5280 recommendations. These certificates work correctly with e-mail clients including MS Outlook and Mozilla Thunderbird.

The RFC 5280 does not put restrictions on the number of e-mail addresses a certificate can include in its subject alternative name field. However, when the subject alternative name extension contains an e-mail address, the address must be stored in the rfc822Name which is defined as type IA5String with support for internationalized e-mail addresses described in RFC 6818 [13]. Starting version 3, S/MIME allows a sender to match the name in the certificate can let an originator to use more than one mailbox if implemented. Therefore, including more than one e-mail address in the subject alternative name field (e.g. RFC822 Name= sgrmtb@gmail.com, RFC822 Name=sgrmtb@mail.com) would in no way be against the recommendations of RFC 5280 or RFC 5750. However, before issuing this type of certificate all e-mail address requested for inclusion in the certificate have to be verified for ownership. This can be achieved by sending a verification e-mail to all requested addresses.

To work with multiple e-mail address certificates, the sending and receiving mail agents have to modify the certificate handling procedures to match From/To addresses with all e-mail addresses listed in the subject or subject alternative name fields of the selected certificates. They have to permit signing an e-mail message with the private key listed in the selected signing certificate, if the mail "From" address is present at any place in either subject or subject alternative name fields. Likewise, they must permit encrypting an e-mail message with the public key listed in the selected encryption certificate, if the "To" address is present at any place in either subject or subject alternative name fields. Similar modifications need to be incorporated in the procedures adopted by receiving agents to decrypt and verify the signature of the receive e-mail message. To achieve this, the signing and encryption processing steps that match "To/From" address with the first e-mail address included in the certificate have to be modified so that the "To/From" address is compared with all e-mail address included in the certificate to find a match.

Inclusion of multiple e-mail address in e-mail certificates will make them visible collectively and therefore, may not be desired in situations where users send e-mail from some e-mail address and prefer to keep secret their other e-mail addresses.

V. EXPERIMENTS AND RESULTS

This section discusses generation of multiple e-mail address certificates and their usage for encryption and signing of e-mail messages. It demonstrates the working of these certificates through experiments carried out using an e-mail client developed by the current authors for handling multiple address e-mail certificates.

A. Generation of Keys and Certificates

Various programs have been developed to assist generation of digital signature certificates. These include OpenSSL (http://www.openssl.org/), GNU Privacy Assistant (http://www.gnupg.org/), and X Certificate and Key Management (http://xca.hohnstaedt.de/ and xca.sourceforge.net/). For its easy operability and graphical user design, the authors used X Certificate and Key Management program for the generation of e-mail certificates with desired properties. Using X Certificate and Key Management program following CA and E-mail certificates were generated:

a. A self-signed Root Certificate (CA) named M. Tariq Banday for signing end-entity certificates.
b. End-entity E-mail Certificate for user *Taheem Banday* with subject field containing his e-mail addresses on all e-mail servers *(gmail.com, mail.com, inbox.com, etc.)* with no additional e-mail addresses in subject alternative name field.

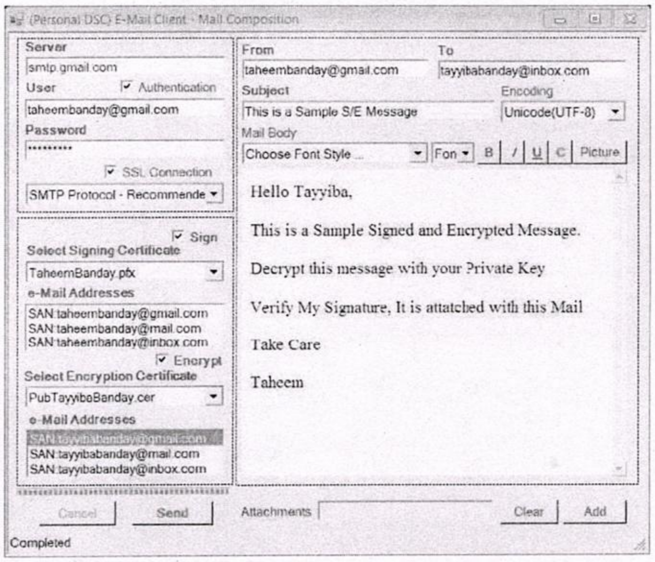
SNO=2 (d)

c. End-entity E-mail Certificate for user *Tayyiba Banday* with subject field containing her e-mail addresses on all e-mail servers *(gmail.com, mail.com, inbox.com, etc.)* with no additional e-mail accounts in subject alternative name field.
d. Further, end-entity E-mail Certificates wherein all e-mail addresses were placed in Subject Alternative Name field and no e-mail address was place in Subject field and e-mail certificates wherein some e-mail addresses were placed in subject field and others in subject alternative name field were generated for both users.
e. The certificates generated above were exported to *.pfx* with private key and *.cer* file formats and stored in proper folders accessible to the e-mail client program. The certificates were named as *taheembanday.pfx*, *tayyibabanday.pfx*, *taheembanday.cer* and *tayyibabanday.cer*.

To verify the functionality of the developed client with commercial certificates currently available, e-mail certificates including personal e-mail certificates were also obtained for the test users from commercial companies. The experiments did not involve system certificate store as the developed client loads the certificates directly from the designated folders.

B. Development of E-mail Client Program

An e-mail client program with both mail submission and retrieval interfaces supporting digital signing and encryption of e-mail messages was developed during the current study. The development was carried out using Visual Studio.Net (2012) and has utilized encryption and decryption libraries of Microsoft and other third parties.



Server: smtp.gmail.com
User: taheembanday@gmail.com ☑ Authentication
Password: *********
☑ SSL Connection
SMTP Protocol - Recommende
☑ Sign
Select Signing Certificate: TaheemBanday.pfx
e-Mail Addresses:
SAN:taheembanday@gmail.com
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SAN:tayyibabanday@gmail.com
SAN:tayyibabanday@mail.com
SAN:tayyibabanday@inbox.com
From: taheembanday@gmail.com
To: tayyibabanday@inbox.com
Subject: This is a Sample S/E Message
Encoding: Unicode(UTF-8)
Mail Body:

Hello Tayyiba,

This is a Sample Signed and Encrypted Message.

Decrypt this message with your Private Key

Verify My Signature, It is attatched with this Mail

Take Care

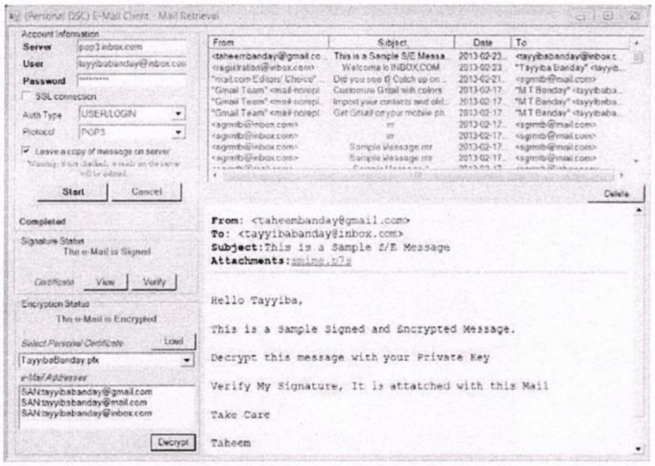
Taheem

Attachments:
Completed

Figure 1: **Mail Submission Client Interface for Multiple Address E-Mail Certificates**

The mail submission interface shown in figure 1 permits users to load signing and encryption certificates having multiple e-mail addresses in subject and subject alternative name fields. E-mail addresses found in the subject and subject alternative name fields of selected signing and encryption certificates are shown to the user in a transparent way permitting them to select proper certificates. The e-mail client permits signing of e-mail messages send from any e-mail address in subject field or subject alternative name field with private key contained in the single signing certificate. Further, e-mails send to any e-mail address present in the selected encryption certificate can be encrypted using public key contained in the encryption certificate (certificate containing public key of the intended recipient).

The mail retrieval interface shown in figure 2 permits users to retrieve mail from mailboxes using POP3 and IMAP protocols, store them in the local computer and read them. It can extract certificates from signed e-mails, view and verify their integrity and validity. It allows users to decrypt e-mails received in encrypted format. Private key contained in single certificate can be used to decrypt e-mail messages received in different e-mail accounts of a particular user.



Account Information
Server: pop3.inbox.com
User: tayyibabanday@inbox.com
Password: *********
☐ SSL connection
Auth Type: USER/LOGIN
Protocol: POP3
☑ Leave a copy of message on server

From	Subject	Date	To
<taheembanday@gmail.co...	This is a Sample S/E Messa...	2013-02-23...	<tayyibabanday@inbox.c...
<registration@inbox.com>	Welcome to INBOX.COM	2013-02-23	"Tayyiba Banday" <tayyib...
"mail.com Editors' Choice" ...	Did you see it? Catch up on ...	2013-02-21...	<sgmtb@mail.com>
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Completed
Signature Status: The e-Mail is Signed
Certificate
Encryption Status: The e-Mail is Encrypted
Select Personal Certificate: TayyibaBanday.pfx
e-Mail Addresses:
SAN:tayyibabanday@gmail.com
SAN:tayyibabanday@mail.com
SAN:tayyibabanday@inbox.com

```
From: <taheembanday@gmail.com>
To: <tayyibabanday@inbox.com>
Subject:This is a Sample S/E Message
Attachments:smime.p7s

Hello Tayyiba,

This is a Sample Signed and Encrypted Message.

Decrypt this message with your Private Key

Verify My Signature, It is attatched with this Mail

Take Care

Taheem
```

Figure 2: **Mail Retrieval Client Interface for Multiple Address E-Mail Certificates**

Initial experiments with the proposed PECs were carried out with e-mail accounts on author's personal domain names. Later, test e-mail accounts on different commercial e-mail servers (including gmail.com, inbox.com and mail.com) were created. Signed, encrypted, and both signed and encrypted e-mails were submitted/retrieved from/to these e-mail accounts through the developed e-mail client.

C. Mail Submission and Retrieval

Using the developed e-mail client program (submission interface) e-mails were submitted from all e-mail accounts (on gmail.com, mail.com, inbox.com, etc.) of user *Taheem Banday* to all e-mail accounts (on gmail.com, mail.com, inbox.com, etc.) of user *Tayyiba Banday* and vice versa. The submitted e-mails were: i) unsigned and unencrypted, ii) signed only, iii) encrypted only, and iv) both signed and encrypted. All signed e-mails that were submitted from

SNo=2 (e)

Taheem Banday's e-mail accounts used *taheembanday.pfx* certificate file for signing. All signed e-mails that were submitted from *Tayyiba Banday's* e-mail accounts used *tayyibabanday.pfx* certificate file for signing. The certificate file *taheembanday.cer* was used for encryption for sending encrypted e-mails to all e-mail accounts *of Taheem Banday.* The certificate file *tayyibabanday.cer* was used for encryption for sending encrypted e-mails to all e-mail accounts *of Tayyiba Banday.*

Using the developed E-mail client program (retrieval interface), all classes of e-mails of users *Tayyiba Banday* and *Taheem Banday* on all e-mail servers (on gmail.com, mail.com, inbox.com, etc.) were successfully retrieved from the respective mail boxes of the two users. Signed e-mails retrieved from different e-mail accounts of a particular user (*Tayyiba Banday* and *Taheem Banday)* contained same certificate (public key) of the sender and their signatures were successfully verified and validated. The included certificate was also viewed successfully and its import to system certificate store was also successful. The body of the encrypted e-mails was successfully decrypted by using the certificate containing private key of particular user. All encrypted e-mails received by user *Tayyiba Banday* in her mail boxes on different mail servers were decrypted by her single certificate file. The e-mails that were both signed and encrypted were also retrieved successfully. The signature was verified and validated successfully and body was correctly decrypted with single certificate of particular recipient.

Mail submission and retrieval experiments were repeated with other types of e-mail certificates wherein all e-mail addresses were placed in subject alternative name field or some in subject and others in subject alternative name fields. The public and private keys in the certificates correctly signed and encrypted e-mails. Further, signed and encrypted e-mails using commercial and personal e-mail certificates procured from commercial companies were also successfully submitted and retrieved using the developed client. Thus proving that the client can handle both single e-mail address and multiple e-mail address certificates. Further, cross examination of the developed client with MS Outlook and Mozilla Thunderbird was also successful.

CONCLUSION

Secure Multipurpose Internet Mail Extensions (S/MIME) uses ITU-T X.509 digital signature certificates to attain privacy of conversation, authentication of sender, integrity of message and non-repudiation of sender. Such a certificate is called e-mail certificate. It includes a valid e-mail address in subject field or subject alternative name field and appropriate usage information in key usage and extended key usage extensions. Currently, e-mail certificates are issued per e-mail address, therefore, an individual having more than one e-mail address must have multiple e-mail certificates, one for each e-mail address. E-mail client do not support use of a single certificate with more than one e-mail address. The RFC 5280 standard allows a certificate to include more than one e-mail address. Including multiple e-mail addresses in certificates will permit a single certificate to be used with multiple e-mail addresses for signing and encrypting e-mail messages. This will not only make the management of certificates simple for a user having multiple e-mail accounts but would also be economical. The generation of multiple e-mail certificates using an open source tool and working of the scheme through a mail client developed in MS Visual Studio have validated the working of the proposed scheme. This effort can be further augmented by developing multiple e-mail address certificate handling Add-on's for existing mail clients such as Microsoft Outlook and Mozilla Thunderbird. Further, studies may be undertaken to address privacy concerns of users due to collective visibility of e-mail addresses through a joint e-mail certificate.

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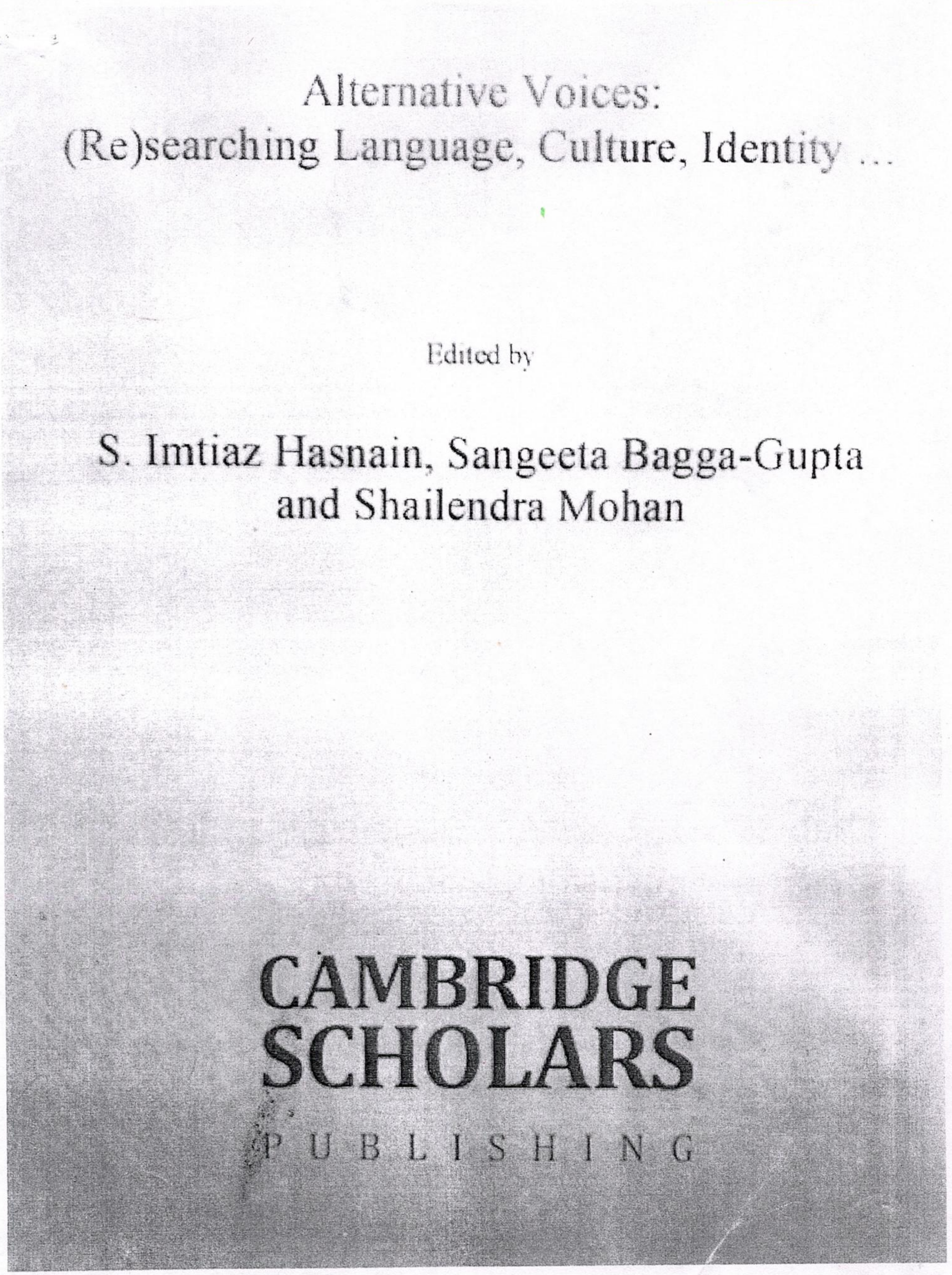

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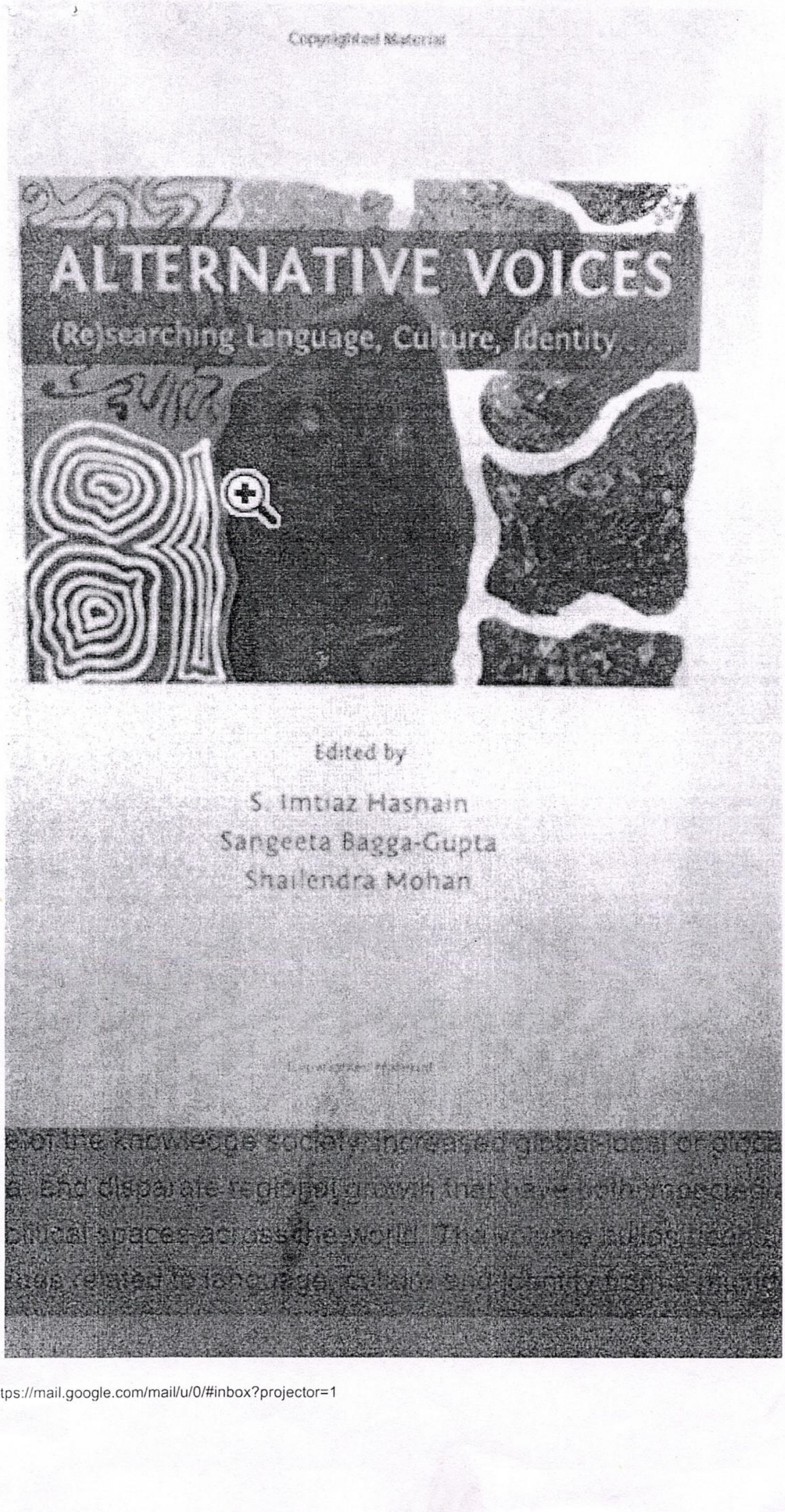

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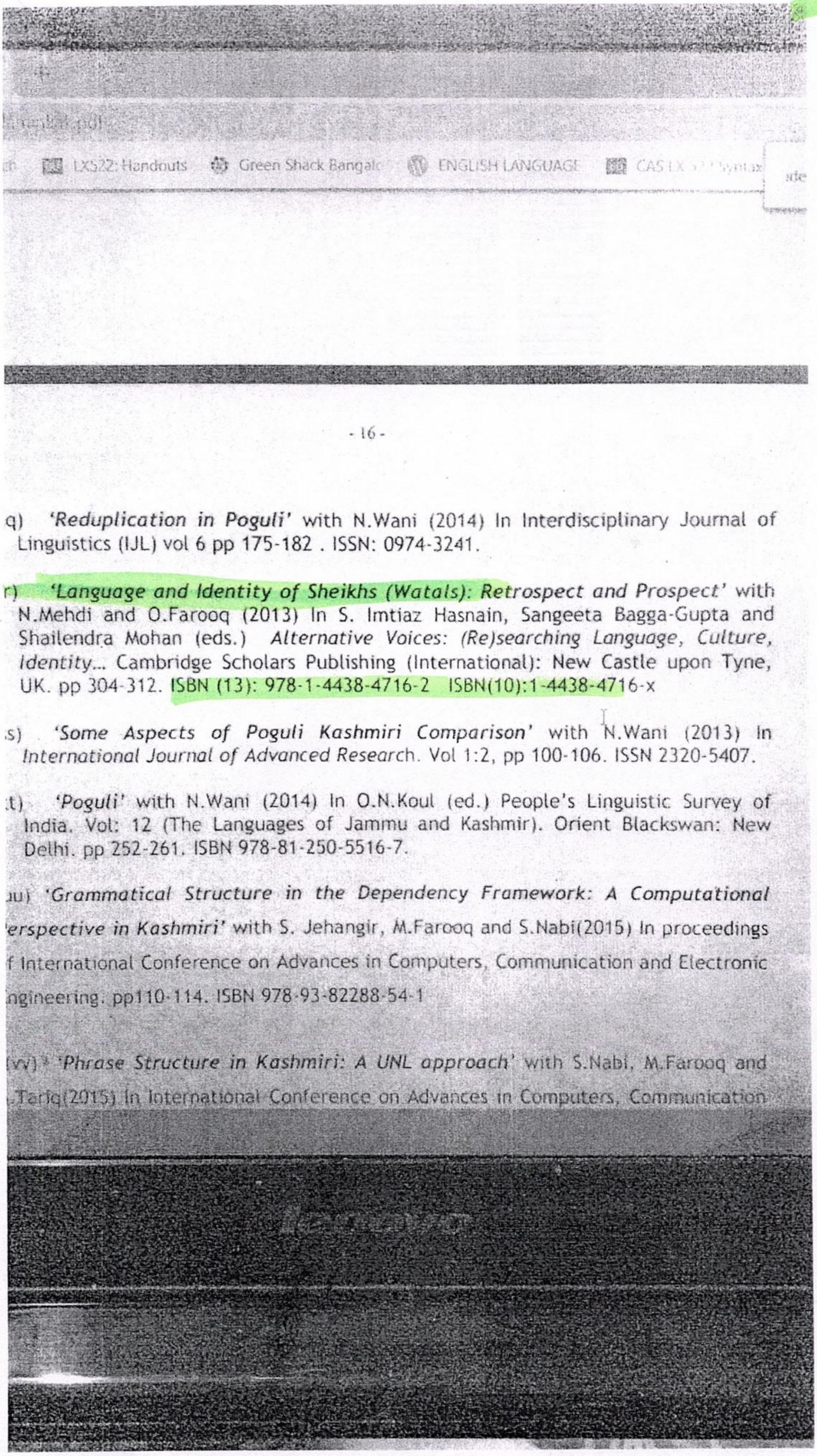
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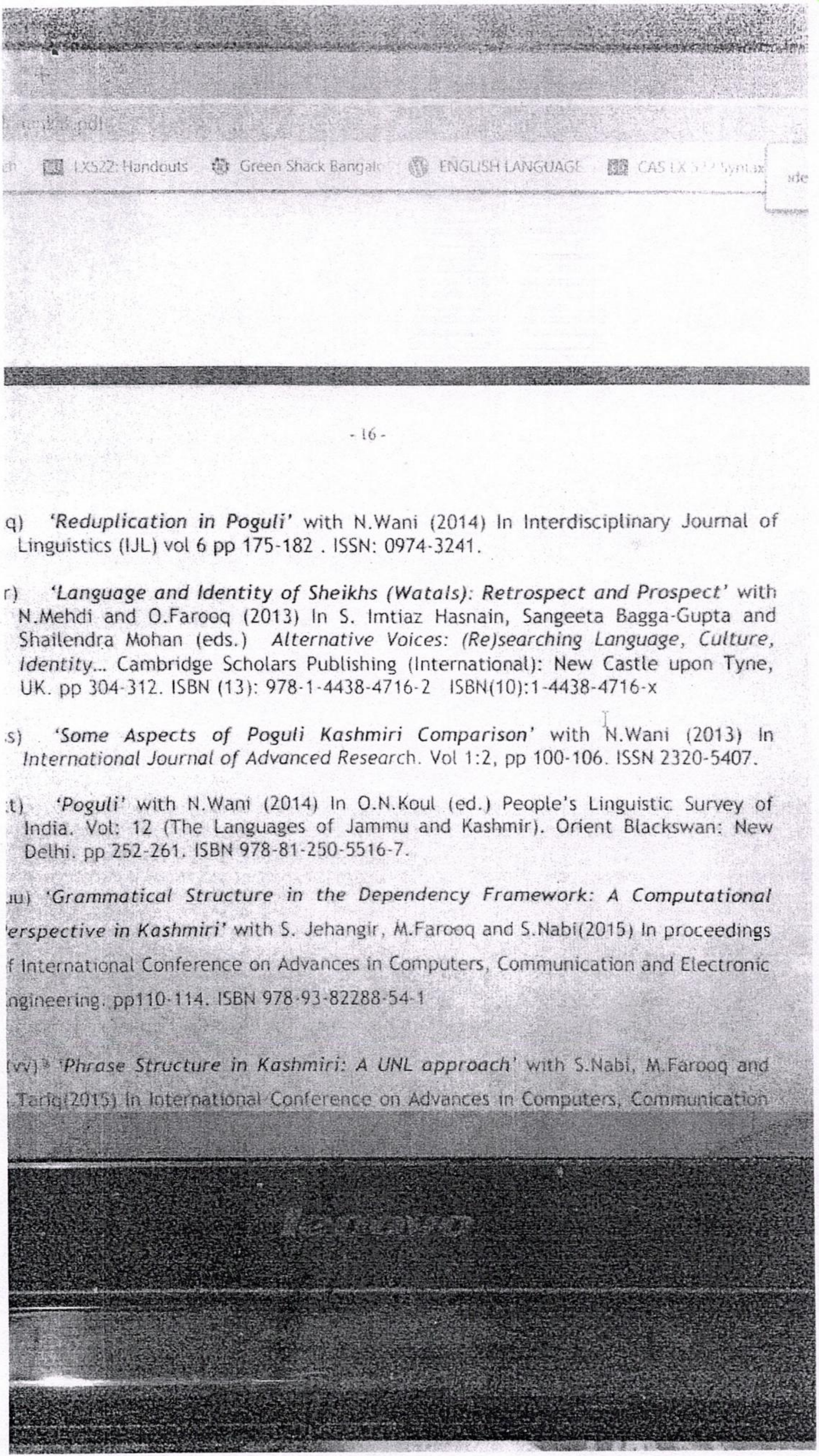
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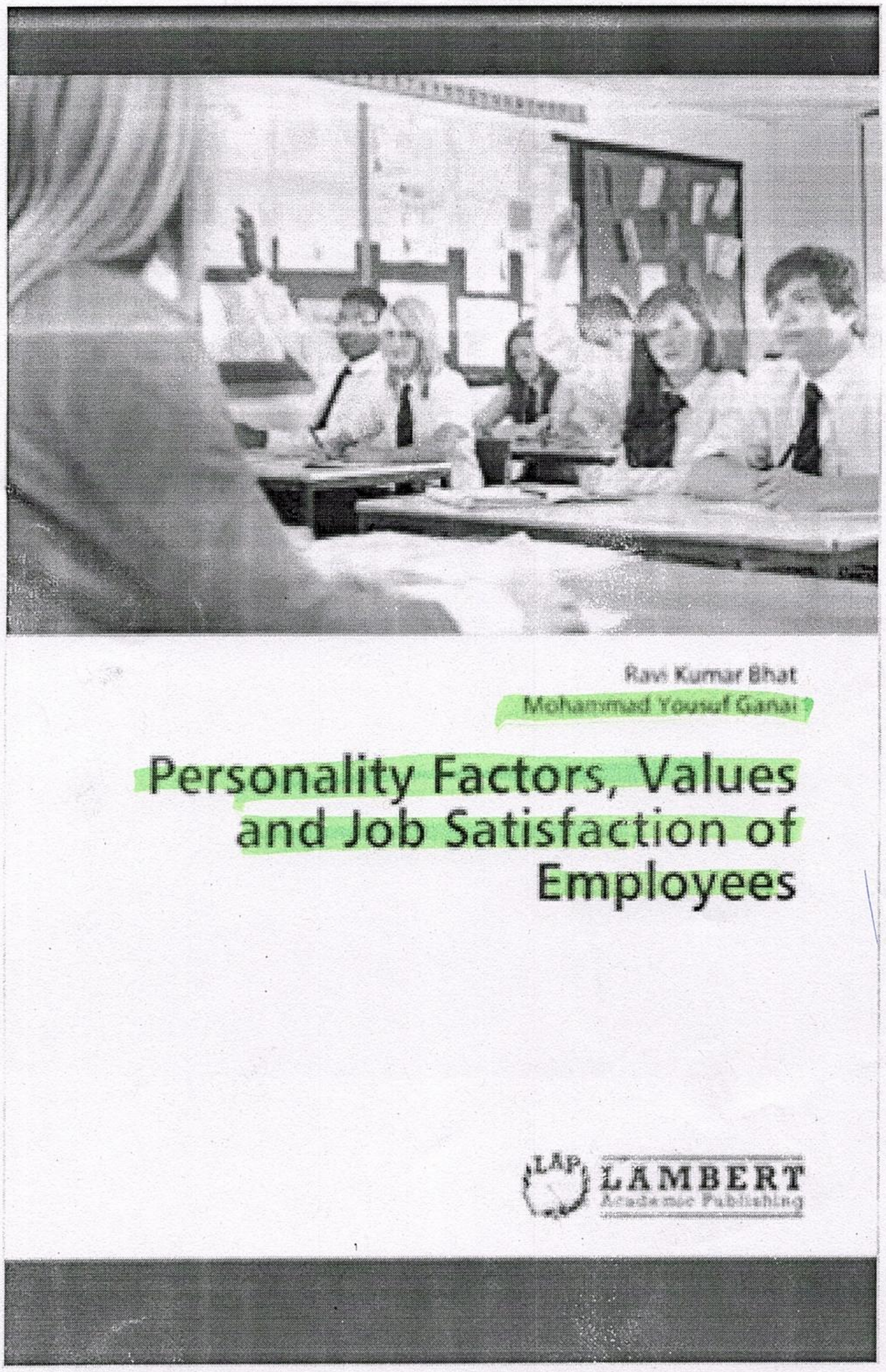

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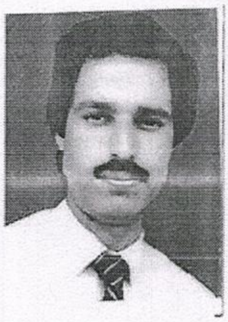

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Product details

- **Paperback:** 252 pages
- **Publisher:** LAP LAMBERT Academic Publishing (February 5, 2013)
- **Language:** English
- **ISBN-10:** 9783659336935
- **ISBN-13:** 978-3659336935
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ISBN: 978-81-921335-0-9

First Edition: 2013
Price: ₹ 1800
$ 85

Printed at Mehak Printing Press, New Delhi, India.

SNO = 05 (b)

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Editor's View

Nature has bestowed different regions with various resources which differ in occurrence, magnitude and quality. With growing pressure on resources, the concept of locational benefit has intensified the resource sharing competition, often leading to conflicts. The imbalanced resource structure making the world highly inter-dependent, prompted for universal integration and forced humans to foster regional cooperations. So the future stability and sustainable development seems to depend mainly upon how economies, societies and technologies respond to globalization and to what extent the regional sub-systems will merge in world system. Here it is pertinent to note that although the globalization contributes to international integration and homogenization but it also enhances diversity by providing space for the propagation of new ideas about regional identities – a dichotomy within the emerging developmental model. Hence for ushering in global peace, security and development, pooling significant physical and non-material resources, minimizing the globalization – regionalism nexus as well as a fair treatment to the residue emanating from global development process, should go side by side.

In view of the heterogeneity of two major blocks of Eurasia, we can strike a balance in terms of all principal developmental components for dwarfing the implications of locational benefit issue by encouraging

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the concept of specialized economies and societies, taking the benefit of prominent physical resources of Asia and non-physical resources of Europe. Apparently, it looks plausible but on the ground it demands a thorough investigation of ground realities and the possible options, taking all the stakeholders on board. Furthermore, as a result of global economic competition, the likelihood of some changes mainly owing to some shock therapy measures that are considered to have impacted negatively on the welfare system of some areas, also require to be taken care of. This whole complicated situation demands the true spirit of globalization and its proper dissectional study for careful application.

The Eurasian response to globalization alongwith the growing regional significance in terms of geo-political and economic endowment, has drawn international attention which prompted the stakeholders to engage themselves in this macro region. The aftershocks of Soviet demise as well as few other sub-regional developments, have led to a number of problems. The economies and societies of this dual-continent have got some problems in legacy while others are the product of change. Due to the paradigm shift from command system to open economy especially in erstwhile Soviet Union, and the post-2nd World War issues in other parts of Eurasia, the region has impulsed some vulnerabilities. The challenges vary among the states in their toddling stage of independent nationhood and the politically matured countries. Obviously, their negotiating mode with the global economy also differ, some remaining at a rudimentary level while others have reached almost upto the optimum threshold.

The politics of resources, relations and routes is giving rise to a contradictory model in the region. Exploitation of raw-hydrocarbons from Central Asian states as well as their energy-rich but water-poor and water-surplus but energy-deficient dilemma, is a serious concern. Energy politics in the Caspian region, its legal status alongwith riparian rights issue need urgent attention. Misuse of water resources, non-payment tariff issues and failure of arbitrations have disturbed not only the Central Asian landscape but other catchments have also suffered huge losses. The cross-cultural conflicts, ethnic clashes, diaspora puzzles, gender bias and other demographic features have engulfed the region. Terrorism, a great threat to humanity, has sounded alarm, rolled back foreign investments wherein FDI has shown a disturbing fluctuation. The international rivalry over pipelines and the issues like Black Sea – Mediterranean Sea rifts have closed some plausible route options. The environmental degradation, particularly, in Aral Sea and some other enclosed basins, is alarming which has created an environmental catastrophe, endangering flora and fauna. The bottlenecks in reviving some potential Silk Route branches, is a big jolt to borderless world concept and creates doubt about "4-D interface" i.e. North-South-West-East inter linkages. The benefits of knowledge society within some parts of South and South-east Eurasia needs a horizontal – vertical sprawl for changing the mindset of masses – the real mobilizers of change, in faovur of *"what suits them"* and against *"what hurts them"*. Also, the policies of bilateral / multilateral ties in some affected regions be re-visited for strengthening mutual trust and relations. The other area of concern pertains to status, rights and duties of some NGOs, especially in extended Central Asia.

In order to discuss some of the mentioned problems for professional treatment, our Centre organized an International Conference on *"Globailzation and Eurasia: Changes and Challenges"*. This mega event which was held on October 18-21, 2011 at the Kashmir University campus, was attended by a galaxy of scholars comprising Subject Experts, Area Analysts, Diplomats, Policy Planners etc. almost from all over the world. After threadbare analyses, the papers presented in the seminar were updated in light of the feedback received and finally screened for the *proceedings*. I am fully confident that the views expressed by the learned contributors will help subsequent scholars and inspire all stakeholders to further investigate and analyze various facets for balanced sustainable development of the region.

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Editor

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S/MIME with Multiple E-mail Address Certificates: A Usability Study

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Abstract—**Multiple e-mail address certificates have been proposed very recently, therefore, neither certification authorities currently issue such a certificate nor does any mail client permit its use for signing or encrypting e-mail messages. Further, no study has been made to evaluate their effectiveness for practical use. This paper studies the usability of multiple e-mail address certificates in secure messaging. It discusses S/MIME, its usefulness in e-mail security, current adoption by users, advantages, and disadvantages. It illustrates procedures in vogue for singing, encrypting, and both signing and encrypting e-mail messages using e-mail address certificates. It further reports the results of study carried out to evaluate user efficiency in sending/receiving S/MIME mail with and without the use of multiple e-mail address certificates.**

Keywords – Digital Signature; Secure Messaging; DSC; Personal E-mail Certificates; PEC; Encryption; Public Key Cryptography; Digital ID

I. INTRODUCTION

To ensure secure messaging, many security protocols are deployed, however, among them Secure Multi-purpose Internet Mail Extensions (S/MIME) is the most adopted protocol. S/MIME adds several security features to the insecure SMTP but it suffers from some disadvantages as well. These include: a) privacy concerns of mail senders as recipients of signed messages can pass a digitally signed message to others [1], b) non-repudiation in situations of lost keys [2], c) no control for phishing and spamming because S/MIME cannot prevent spamming and phishing tricks [2], d) unsigned message headers [3], and, e) requirement for a compatible mail client [3]. S/MIME is based on Public Key Infrastructure (PKI) and therefore inherits its demerits such as issue of key distribution, its renewal and management [2][4] and communication with unknown communicators [5]. The deployment of S/MIME compatible mail clients is ubiquitous; however, their adoption is not adequate. This may be due to one or more of the following reasons: a) S/MIME depends on X.509 certificates, which are required to be frequently procured/renewed, b) the management of the certificates and the certificate store is tedious for general users, c) users are unaware of the potential advantages of using S/MIME for securing against vulnerable attacks, d) there are additional costs associated with the purchase of certificates. For improving user adoption of S/MIME, e-mail users may be motivated for its use by making them aware of its benefits in securing the system against vulunurable attacks. In addition, minimizing the procedures for certificate management, easy and flexible methods for signing and encryption, and reducing the costs associated with the purchase of certificates may help in motivating the users to adopt S/MIME.

The remaining paper is organized as follows: Section 2 discusses secure messaging through cryptographic add-on mail protocols. Section 3 discusses e-mail certificates and illustrates procedures to sign and encrypt e-mail messages using personal e-mail certificates. In section 4, current adoption and usability of S/MIME is discussed. Section 5 reports the results of studies carried out to evaluate the efficiency of multiple address e-mail certificates in improving the adoption of S/MIME.

II. SECURE MESSAGING

Secure messaging must guarantee: a) privacy; assuring confidentiality of e-mail, b) sender authentication; assuring authentication of senders identity, c) message integrity; assuring security against e-mail forgery, d) sender non-repudiation; assuring non-denial by sender, and e) envelope consistency; assuring uniformity of both header and body from source to the destination [6]. Secure e-mail messaging is not ensured by extensively used e-mail protocols such as SMTP or ESMTP. Due to open message format (text or MIME) used in SMTP, e-mail is unprotected during transmission or at mailboxes and if accessed by unintended recipients, it can be read thus compromising privacy. Identity of the sender cannot be ascertained as it is possible to lie about true identity or even spoof e-mail address. Unauthorized users can modify an e-mail message in transit or at mailboxes and thus can be forged. Sender can deny having send an e-mail message and consistency of mail envelop can be compromised as mail transfer agents could add or make changes to mail body and envelope.

Several e-mail security protocols that work on top of SMTP and anti-spam filters of diverse types have been developed to ensure secure messaging and prevent mail forgery [7] [8]. E-mail security protocols include protocols that: a) secure communication channel between sender and receiver using encryption, b) validate senders' domain using IP address validation or digital signatures, or c) secure the e-mail message route using some symmetric or asymmetric cryptographic scheme.

Secure Socket Layer (SSL) [9] encrypts channel between sender and receiver during SMTP transactions. Similar encryption is also attained through Transport Layer Security

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The work carried out in this paper has been supported by University Grants Commission (UGC) of India.

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(TLS) [10] known as secure simple mail transfer protocol. They attain privacy and are transparent to end users but do not secure e-mail at endpoints or at intermediate mail transfer agents.

A Prominent digital signature based domain validation protocol is Domain Keys Identified Mail (DKIM) protocol [11]. DKIM, a domain level cryptographic protocol for mail signing. DKIM though adds authentication, authorization and integrity to SMTP thereby controlling spoofing but does not encrypt e-mail messages. Therefore, it cannnot protect mail from in-transit changes to its body or header at gateways. It can only validate the sending domain.

Prominent e-mail security protocols such as S/MIME [12] [13], Privacy-Enhanced Mail (PEM) [14], Pretty Good Privacy (PGP) [15] [16], and GNU Privacy Guard (GPG) [17] encrypt e-mail from source to destination through symmetric or asymmetric cryptography. PEM lacks flexibility because a single Certificate Authority (CA) is to be trusted by system[18]. PGP and GPG require more sporadic adoption. S/MIME is based on asymmetric key cryptography wherein digitally signed and encrypted MIME objects are encapsulated with the mail.

Every participant has a private and a public key. The private key is not shared and public key is made avaliable to everyone. Either key can be used to encrypt the mail which can only be decrypted by the corrosponding key. Encryption is used for both digitally signing and encryption of the contents of the message. S/MIME uses ITU-T X.509 digital signature certificates to ensure privacy, authentication, message integrity and non-repudiation [19] [30]. Version 2 of S/MIME was published as a two-part RFC i.e RFC 2311-S/MIME which is about message specification and RFC 2312-S/MIME which deals with Certificate Handling. RFC 2315- PKCS #7: Cryptographic Message Syntax Version 1.5 was also published as informational RFC which was updated by RFC 2630 to eliminate the dependency on RSA key transport algorithm in enveloped-data content types. RSA was made optional for both digital signatures and encryption, and Digital Signature Algorithm (DSA) [20] and Diffie-Hellman (DH) [21] were made the required algorithms for digital signature and encryption, respectively in version 3 of S/MIME (RFC 2632 and RFC 2633). The required digest algorithm was also changed from MD5 (RFC 1321) to SHA-1 [22]. Another upgrade to S/MIME was Version 3.1 with the publications of RFC 3850 and RFC 3851 and RFC 3852. The Cryptographic Message Syntax was augmented to RFC 3369 and new RFCs for Cryptographic Message Syntax (CMS) Algorithms and Compressed Data Content Type for Cryptographic Message Syntax were published. Password-based encryption, separate algorithm and protocol requirements and augumentation of key-management techniques are described in RFC 3370. The RFC 3274 describes compressed data. The current version of S/MIME i.e. verison 3.2 as described in RFC 5750 and RFC 5751 has increased the key sizes, made Advanced Encryption Standard (AES-CBC) [23] the mandatory content encryption algorithm, and made SHA-256 [24] the mandatory digest algorithm. RFC 5652, the Cryptographic Message Syntax standard has been published as Internet standard.

III. E-MAIL CERTIFICATES

A. *Personal E-mail Certificates*

An E-mail Certificate (EC) is a digital signature certificates that is used for the purpose of signing and encrypting e-mail messages and authenticates an e-mail address. A Personal E-mail Certificate (PEC) is an E-mail Certificate that authenticates an e-mail address of an individual. This certificate contains an e-mail address in subject field or subject alternate field. An EC can authenticate identity of an individual but PEC cannot. PECs are issued by certification authorities (CA) such as Ascertia, GlobalSign, Entrust, VeriSign, and Comodo after verifying e-mail address of an individual through return e-mail or on some secure device with its private key in PKCS#12 defined archive file format such as .pfx. Some of them offer PEC free of cost for limited period. The structure and format of these certificates may vary across CAs, however, the key usage included in these certificates is at least "Digital Signature" and "Key Encipherment". ECs and PECs are X.509 digital signature certificates that enable S/MIME mail agents such as Mozilla Thunderbird, Microsoft Outlook, Apple Mail, Outlook Express, and Entourage to sign, or encrypt, or sign and encrypt e-mail messages. They currently use SHA 256 algorithm for computing message digest an either 4096 bits RSA or 3072 bits DSA algorithms for computing digital signature. There is a high interdependency of key usage and extended key usage extensions in certificates for the purpose of S/MIME. The certificate may be used for signing in case digital signature is indicated by key usage extension and email protection OID is included in extended key usage extension. Signing may be permitted but the certificate may put restriction on encrypting S/MIME messages in case the extended key usage extension is present in it. Interpersonal message S/MIME receiving agents must check *emailProtection* or the *anyExtendedKeyUsage* OID in case the extended key usage extension is present in the certificate. The explicit presence of only extended key usage extension or other OIDs as well may be required for S/MIME uses other than interpersonal messaging. In an e-mail certificate *digitalSignature*, and *keyEncipherment* bits are set and the key usage extension is marked as critical. In case the certificate contains key usage extension but either the *digitalSignature* or the *nonReputudation* bit is not set, S/MIME receiving agents do not accept signature of a message.

B. *Secure Messaging with Personal E-mail Certificates*

Mail agents supporting S/MIME are user software that: a) create S/MIME CMS objects, MIME body parts that contain CMS objects or both (Sending Agents), and, b) interpret and process S/MIME CMS objects, MIME body parts that contain CMS objects, or both. The Cryptographic Message Syntax (CMS) RFC 5652 defines syntax used to digitally sign, digest, authenticate, or encrypt arbitrary message content. S/MIME message creation involves MIME processing followed by signing and/or encrypting the message. A signed messages may either follow multipart/signed (also called a clear-signed message) or application/pkcs7-mime structure. The difference between the two structures is that in the multipart/signed format, the message's contents are not included in the signed data because they are the first part of the multipart message and the detached signature being the second part. The

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multipart/signed structure is preferred because it permits recipients read the message contents even if they cannot verify signatures. Regardless of the type of the structure used, the MIME processing output is passed to the CMS signed-data process, then wrap the result in a CMS content-info structure, and finally insert in the appropriate MIME entity. In case of encryption, after MIME processing of the message, the output is passed to the CMS enveloped-data process, then wrap the result in a CMS content-info structure, and finally insert that into an application/pkcs7-mime MIME entity. For the case where the message is first signed and then encrypted, the output of the signed message becomes the input to the encrypted message process.

The process of a) signing and encrypting and b) signature verifying and decrypting an e-mail message is illustrated through figure 1.

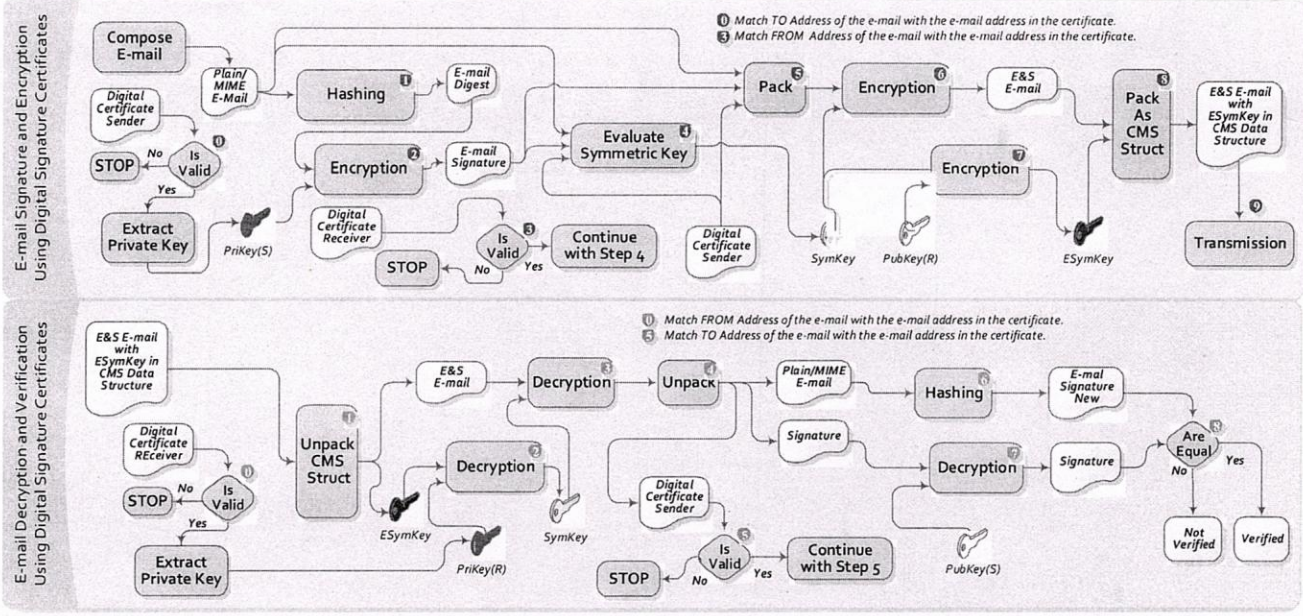
E-mail Signature and Encryption Using Digital Signature Certificates
⓪ Match TO Address of the e-mail with the e-mail address in the certificate.
③ Match FROM Address of the e-mail with the e-mail address in the certificate.
Compose E-mail
Plain/ MIME E-Mail
Hashing ①
E-mail Digest
Digital Certificate Sender
⓪
STOP
No
Is Valid
Yes
Encryption ②
E-mail Signature
Evaluate Symmetric Key ④
Extract Private Key
PriKey(S)
Digital Certificate Receiver
Is Valid ③
Continue with Step 4
STOP
No
Yes
Digital Certificate Sender
Pack ⑤
Encryption ⑥
E&S E-mail
Pack As CMS Struct ⑧
E&S E-mail with ESymKey in CMS Data Structure
Encryption ⑦
SymKey
PubKey(R)
ESymKey
⑨
Transmission
E-mail Decryption and Verification Using Digital Signature Certificates
⓪ Match FROM Address of the e-mail with the e-mail address in the certificate.
⑤ Match TO Address of the e-mail with the e-mail address in the certificate.
E&S E-mail with ESymKey in CMS Data Structure
Unpack CMS Struct ①
E&S E-mail
Decryption ③
Unpack ④
Plain/MIME E-mail
Hashing ⑥
E-mal Signature New
Digital Certificate REceiver
⓪
STOP
No
Is Valid
Yes
Extract Private Key
Decryption ②
ESymKey
PriKey(R)
SymKey
Signature
Digital Certificate Sender
Is Valid ⑤
STOP
No
Yes
Continue with Step 5
Decryption ⑦
Signature
PubKey(S)
Are Equal ⑧
No
Yes
Not Verified
Verified

Fig. 1. Process of a) E-mail signature and encryption and b) E-mail signature verification and decryption

The steps that a sending mail client undergoes to send a signed and encrypted e-mail message are listed below:

a) Compose e-mail message (fill headers and constitute body) and perform MIME processing,

b) Fetch the certificate selected for signing (containing private key) from the certificate store,

c) Check the validity of the certificate, if valid then proceed to next step, otherwise, exit the process and report "cannot sign with selected certificate".

d) Match the **From** address of the message with first e-mail address in the certificate subject, if present. Ignore other e-mail addresses, if present. If match is successful then proceed to step **f** otherwise go to next step.

e) Match the **From** address of the message with first e-mail address in the certificate subject alternative name field, if present. Ignore other e-mail address, if present. If match is successful, then proceed to step **f**, otherwise exit the process and report "cannot sign with selected certificate".

f) Check extensions especially basic constraints, key usage, authority key identifier, subject key identifier to determining trust level and permissibility to sign, if trusted and signing is permissible then proceed to next step, otherwise, exit the process and report "cannot sign with selected certificate".

g) Use allowed hashing function to compute message digest.

h) Extract the private key from the selected certificate.

i) By employing some permissible algorithm, encrypt the digest using private key to compute message signature.

j) Calculate a session key also called symmetric key using some algorithm on e-mail message, message signature, and the public key of the sender.

k) By employing, some permissible algorithm encrypt the e-mail message, message signature and the X.509 certificate (public key) using the session key producing signed and encrypted message.

l) Fetch the certificate selected for encryption (containing public key of recipient) from the certificate store, or address book.

m) Check the validity of the certificate, if valid then proceed to next step, otherwise, exit the process and report "cannot encrypt with selected certificate".

n) Match the **To** address of the message with first e-mail address in the certificate subject, if present. Ignore other e-mail addresses, if present. If match is successful

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then proceed to step **q** otherwise go to next step.

o) Match the **To** address of the message with first e-mail address in the certificate subject alternative name field, if present. Ignore other e-mail address, if present. If match is successful, then proceed to next step, otherwise exit the process and report "cannot encrypt with selected certificate".

p) Check extensions especially basic constraints, key usage, authority key identifier, subject key identifier to determining trust level and permissibility to encrypt, if trusted and encryption is permissible then proceed to next step, otherwise, exit the process and report "cannot encrypt with selected certificate".

q) Extract the public key of the recipient from his X.509 certificate.

r) By employing some permissible algorithm, encrypt the session key using public key of the recipient.

s) Constitute a CMS content-info structure from signed and encrypted message produced in step **k,** encrypted session key, and other objects.

The steps that a sending mail client undergoes to verify signature and decrypt an e-mail message are listed below:

a) Receive a CMS content-info structure containing encrypted and signed message along with encrypted session key, and other objects.

b) Fetch the certificate selected for decryption (containing private key of recipient) from the certificate store or address book.

c) Check the validity of the certificate, if valid then proceed to next step, otherwise, exit the process and report "cannot decrypt with selected certificate".

d) Match the **To** address of the message with first e-mail address in the certificate subject, if present. Ignore other e-mail addresses, if present. If match is successful then proceed to step **f** otherwise go to next step.

e) Match the **To** address of the message with first e-mail address in the certificate subject alternative name field, if present. Ignore other e-mail address, if present. If match is successful, then proceed to step **f**, otherwise exit the process and report "cannot decrypt with selected certificate".

f) Check extensions especially basic constraints, key usage, authority key identifier, subject key identifier to determining trust level and permissibility to decrypt, if trusted and decryption is permissible then proceed to next step, otherwise, exit the process and report "cannot decrypt with selected certificate".

g) By employing same algorithm used for encrypting session key, decrypt the session key using private key of the recipient.

h) By employing same algorithm used for encrypting MIME message, message signature and X.509 certificate of the sender, decrypt them using session key.

i) Render the decrypted message.

j) Extract the X.509 certificate of the sender received with the mail.

k) Check the validity of X.509 certificate of the sender. If valid, proceed to next step otherwise report "cannot verify the message signature".

l) Match the **From** address of the message with first e-mail address in the certificate subject, if present. Ignore other e-mail addresses, if present. If match is successful then proceed to step **n** otherwise go to next step.

m) Match the **From** address of the message with first e-mail address in the certificate subject alternative name field, if present. Ignore other e-mail address, if present. If match is successful, then proceed to next step, otherwise exit the process and report "cannot verify the message signature".

n) Check extensions especially basic constraints, key usage, authority key identifier, subject key identifier to determining trust level and permissibility to sign, if trusted and signing is permissible then proceed to next step, otherwise, exit the process and report "cannot verify the message signature"

o) Use same hashing function as used at the time of sending, compute message digest (new) from the message received.

p) By employing same algorithm as used for calculating message signature, decrypt the received message signature using the public key of the sender to find the original message digest.

q) Compare the two digest, if equal then report, "signature verified" otherwise report "signature not verified".

C. Multiple E-mail Address Certificates

An e-mail certificate or personal e-mail certificate permits its use with single e-mail address. To make an e-mail certificate useful for signing and encryption from more than one e-mail account of an individual, multiple e-mail address certificates have been proposed [25]. A multiple e-mail address certificate binds more than one e-mail address with an individual. For such a certificate, multiple e-mail addresses are contained either in subject field or subject alternate name files or in both. Inclusion of more than one e-mail address in the e-mail certificate does not disturb the existing X.509 certificate structure, because RFC 5280 does not restrict the number of e-mail addresses that may be included in the subject alternate name field of the certificate to one. Such a certificate is useful to individuals and businesses that possess more than one e-mail addresses to send or receive e-mail messages. It is required that the CA issuing a multiple address e-mail certificates to individuals verifies all mail accounts of the individual to be bind in the certificate. Using a single e-mail address certificate for the purpose of S/MIME will reduce costs incurred on to purchase multiple certificates. It will also simplify certificate management. However, current mail clients do not support

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such certificates and could expose privacy as all e-mail accounts of an individual can be seen through certificates.

IV. USABILITY OF SECURE MESSAGING

E-mail security can be achieved by using digital signature certificates as they ensure confidentiality, integrity, authentication, and non-repudiation of e-mail messages but their usability, at least for ordinary users is being contended and subject to research. The users have to purchase a certificate for each of his/her e-mail address, properly configure e-mail clients, browsers, etc. maintain and manage certificate store on computers, learn procedures to verify sender's certificate and certificates of issuing authorities associated with it, transport certificates between computers, etc. Awareness to the usability problem of encryption with PGP 5 was raised through a user study [26] that examined usability of PGP 5 in e-mail encryption through one and a half hour test of twelve participants. Only three participants were able to send signed and encrypted messages and three others send confidential information without encryption. The study found significant problems with PGP 5 user interface and management of keys. The usability of PGP 9 and S/MIME in Outlook Express 6.0 was investigated by a follow up pilot study [27]. The study found that, though PGP 9 improved in automatic encryption but problems in the processes of signing e-mail messages and verification of signatures continued. A study [28] to examine Key Continuity Management (KCM) by automatically extracting sender's key from incoming e-mail message found that though users understood the advantages of secure messaging using keys but most of them could not realize it practically, committed mistakes and send e-mails unprotected. The users expected e-mail programs to ensure encryption and help users not commit mistakes. Need for automatic security mechanism for e-mail messages and security information about the outgoing message has been advocated in a study [29] conducted to examine security of e-mail with social networking. S/MIME is not transparent to users, the message is not available for virus scanners and e-mail service providers, and mobility is limited.

V. USABILITY STUDY

The present study is concerned with evaluation of user efficiency in terms of response time and errors committed in sending/receiving S/MIME mail messages. The response time is total time taken by the user to send signed or encrypted or signed and encrypted e-mail message correctly to intended recipient excluding time to compose the message or to correctly decrypt or verify signature or decrypt and verify e-mail message received from an unknown recipient. Response time and errors committed have been recorded for following three cases:

i) S/MIME is not used for sending/receiving messages,

ii) S/MIME is used for sending/receiving messages to/from users who have more than one e-mail addresses but have unique certificate for each address, and,

iii) S/MIME is used for sending/receiving messages to/from users who have multiple e-mail addresses contained in single certificate (Multiple e-mail address certificate).

A. Methodology

Three e-mail accounts for each user were created on three different mail servers. Three single e-mail address certificates containing respective e-mail address of the user in the Subject Alternate Name field were created for each users. In addition, a multiple e-mail address certificates containing all e-mail address of a user in the Subject Alternate Name field were created for each user. Certificate containing public key only of each users were made available to every users. The certificates were generated using X Certificate and Key Management (http://xca.hohnstaedt.de/) which offers easy operability and graphical user design. MS Outlook, Mozilla Thunderbird, and the custom mail client supporting multiple e-mail address certificates [25] were used to submit and receive e-mail messages.

Three rounds of usability study were conducted. In the first round, users submitted e-mails to every other user account through each mail clients and received the mails submitted by other users. In the second round, S/MIME e-mails messages (signed, encrypted and signed and encrypted) were submitted from each account to all other user accounts. In this round, single e-mail address certificate of each user for each account was used. In the third round, S/MIME e-mails were again submitted from each account to all other user accounts. This round used multiple e-mail address certificates of users. The time taken by each user to submit and receive messages and the number of mistakes committed by each were recorded for each stage of the study.

B. Results

Fifteen computer users well experienced with webmail system were selected for the usability study and trained in the use MS Outlook, Mozilla Thunderbird and the custom mail client supporting multiple e-mail address certificates. The users were trained in sending and receiving mail through POP3 and IMAP protocols. Users were asked to send simple e-mail messages to each user account and were asked to receive the messages send by other users. Next, the users were trained in the use of e-mail certificates (single address) for sending signed and encrypted messages.

The certificates containing the public keys of each users were made available to every users. The users were asked to send signed only, encrypted only and signed and encrypted e-mail from their account to all other user accounts. The time taken by each users to send signed only, encrypted only and signed and encrypted e-mails were recorded for each user. Further, mistakes committed by users in sending signed and/or encrypted e-mails were also recorded for each users. The receiving behavior of users to verify signatures and decrypt e-mail with correct certificate was also recorded for each user. The users were then trained to send S/MIME mail using multiple address e-mail certificates. The users were again asked to send signed only, encrypted only and signed and encrypted e-mail from their account to all other 14 user accounts. Again, mail sending and receiving practice of all users was recorded. The results of the study are recorded in table 1.

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TABLE 1. E-MAIL SENDING AND RECEIVING PRACTICE WITH SINGLE AND MULTIPLE E-MAIL ADDRESS CERTIFICATES

Mail Sending and Receiving Practice	**Response Time and Mistakes Committed by Users**														
	MS Outlook				**Mozilla Thunderbird**				**Custom Mail Client**						
										SEAC			**MEAC**		
Participants: 15 **Messages send and received in each case: 126**	**Without S/MIME**	**Signed Only**	**Encrypted Only**	**Signed and Encrypted**	**Without S/MIME**	**Signed Only**	**Encrypted Only**	**Signed and Encrypted**	**Without S/MIME**	**Signed Only**	**Encrypted Only**	**Signed and Encrypted**	**Signed Only**	**Encrypted Only**	**Signed and Encrypted**
E-mail Sending Practice															
Average Response Time (Minutes)	0.50	2.58	2.82	2.88	0.57	2.48	2.80	2.90	0.55	3.00	3.00	3.50	1.80	2.20	2.50
Percentage Mistakes Committed	0.15	20.00	26.00	27.50	0.20	21.00	22.00	29.50	0.25	22.00	28.00	32.00	8.00	10.00	11.00
E-mail Receiving Practice															
Average Response Time (Minutes)	0.35	1.49	1.50	2.42	0.51	2.13	2.22	2.57	0.50	2.00	2.00	2.50	1.00	1.50	2.00
Percentage Mistakes Committed	0.05	17.00	21.00	25.0	0.055	17.00	21.00	25.0	0.065	17.00	21.00	25.00	6.00	9.00	11.00

It was found that users took slightly more time in sending mail to proper recipient than viewing received mail on all mail clients. The average response time to send and view received mail was slightly less in MS Outlook. Users committed fewer errors in viewing mail than sending it. The comparison of mail sending and receiving practice without the use of S/MIME across mail clients is shown in figure 2.

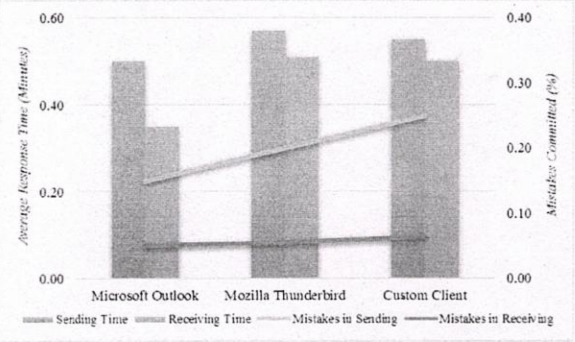

Fig. 2. E-mail sending and receiving practice without using S/MIME

Sending signed/encrypted S/MIME mail to recipients with correct certificate took users more time than for sending it without S/MIME. The average time to send signed mail, encrypted mail and signed and encrypted mail remained in the range of 2.58 to 2.90 minutes across different clients. There was not much difference recorded across different clients. Sending users took more time to choose proper certificates of receiving users who had multiple e-mail addresses. Users took more time to both encrypt and sign e-mail messages. Average time taken to verify signature, decrypt the message or both, took slightly less time than the time taken for sending. It has been found that users committed many errors (20% to 29.50%) while sending signed/encrypted e-mail messages to recipients who had more than one e-mail address. Average time taken by users to decrypt and verify sender's signature remained in the range of 1.49 to 2.57 minutes for mails send by users having multiple mail certificates. Error rate for correctly decrypting and verifying signature of e-mail messages also remained high (17% to 25%). The comparison of S/MIME mail sending and receiving practice-employing use of certificates (both single address and multiple address) across mail clients is shown in figure 3.

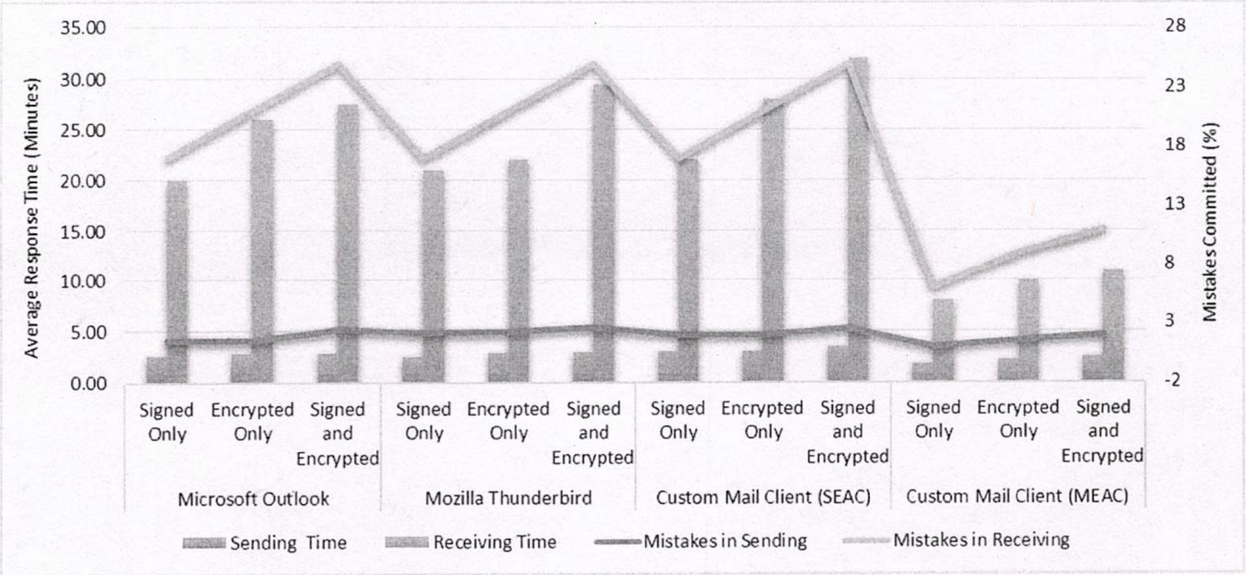

Fig. 3. E-mail sending and receiving practice using S/MIME *(with single and multiple e-mail address certificates)*

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Response time to correctly send and view received S/MIME mail either encrypted or signed or both encrypted and signed was greatly reduced by the use of multiple address e-mail certificates. Users took less time to select certificate for encryption/signing and decryption/signature verification. The average response time remained 1.8 to 2.5 minutes, which is far less in comparison to time taken when single e-mail address certificates were used. In addition, users committed far less errors while selecting correct certificates for signing/signature verification and encrypting/decrypting messages. The error rate decreased by more than 70% in all cases. Users were of considerate opinion that in general, selection of correct certificates for sending/viewing S/MIME mails was tedious and difficulty further increased for selecting proper certificate for users who had multiple e-mail addresses.

CONCLUSION

The use of digital signature certificates issued by certification authorities for signing and encrypting e-mail messages permit secure messaging, however, their usability due to the tedious procedures involved in it is often contended. A single e-mail certificate can be used with single e-mail address, therefore, for multiple e-mail addresses a user must procure and use different certificates, which is not only tedious but also expensive, as the user needs to buy multiple certificates and manage the certificate store. By including multiple e-mail addresses in a single e-mail certificate without violating the existing standards, a user can enjoy the benefits of secure messaging for all of his e-mail accounts without additional costs and extra management of certificates. The usability of secure messaging can be considerably improved if e-mail clients support e-mail certificates containing multiple e-mail addresses, however, inclusion of multiple e-mail address in e-mail certificates will make them visible collectively and therefore, may not be desired in situations where users send e-mail from some e-mail address and prefer to keep secret their other e-mail addresses. Based on the recorded practices it was found that the use of the multiple e-mail address certificates not only improve response time in sending and receiving signed and/or encrypted e-mails but also minimize the chances of mistakes committed by users in selecting proper certificates for signing, signature verification, encryption, and decryption.

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SNo = 07

Central Asia and its Neighbours

Prospects of India's Cooperation

Editors
Rashpal Malhotra
Sucha Singh Gill
Davinder K. Madaan

SNo=07(a)

ISBN 978-81-85835-691

CRRiD

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Published by:
Centre for Research in Rural and Industrial Development
Sector 19-A, Madhya Marg, Chandigarh — 160019 (India)

Views expressed are author's own. Maps used are not to scale and do not represent territorial jurisdiction of Countries.

ISBN: 978-81-85835-69-1

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May 2014
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Price: ₹ 500/- US$ 15

Printed by:
Ace Graphics
SCO 2443-44, Sec. 22-C, Chandigarh
Ph. : 09316113170, 09814134137
e-mail: jit_taran@yahoo.com

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Chapter 24

Radicalism: An Impediment to Islamic Revivalism in Central Asia

G. N. Khaki

In the intellectual landscape of Islam, because of its intrinsic nature of change and adaptation an organic and holistic approach developed in which religion intimately intervened with politics, law and society. As such a fresh, comparative and interpretative application of *Shariah* to any given situation had to be considered in the changing situations and circumstances. Throughout Muslim history moments have arisen periodically that seek to transform both the nature of Islamic belief and the political and social lives of their adherents. Thus, almost all reformist thinkers of the Muslim world realised that a complete reform in the socio-political and religious outlook of Islam can help it exist and maintain its civilisational glory and cultural integrity. Consequently, a host of reformist movements emerged in the Muslim world in the coming decades. *Butrusal-Bustami* of Lebanon (1819-1831), *Jamal-ud-din* Afghani of Afghanistan(1839-1897), *Muhammad 'Abduhu of* Egypt (1849-1905), *Sad Zaghlul, Muhammad Rashid Rida* (1865-1935) in Iran, *Khayral-din* (1822-1890) in Tunisia; *NamikKemal* (1840-1888) and *Zia Gokalp* (1876-1924) in Turkey; *Abdul Rahman al-Kawakibi* (1854-1902) in Syria; *Ismail Bey Gasprinski* (1851-1914), *Abdul rouf Fitrat* (1886-1938), and *Musa Jar-ul-Allah* (1875-1949) in Central Asia and Eastern Europe are a few prominent representatives of this reformist discourse. As a consequence of this Muslim intelligentsia throughout the world began actively advocating reforms in educational, political, cultural and social aspects to make Islam more relevant to the demands of contemporary society and receptive to the urges of the developing world. The Islamic radical groups in Central Asia however worked quite contrary to the objectives laid down in the manifesto of most of the reformist movements. In spite of making Islam more compatible to the requirements of 21st Century, these movements with their conservative and orthodox interpretations minimised the significance of Islam and added to the miseries and difficulties of their fellow citizens.

Historically, Central Asia has been part of one or the other major empires of the world without having its own political identity. The region has been in turmoil throughout its history. No other region perhaps has been through such conflicts and wars than Central Asia. Its history has been shaped by too many people that the inhabitants themselves found it

SNo = ⑦ (81)

difficult to remember. During its long march of historical development, the region has witnessed the rise and fall of many empires the—Samanids, the Ghaznavids, the Qarakhanids, the Saljuks, the Mongols, the Turks, the Shaybanis, and the Timurids, which left an indelible mark on the history, culture, tradition and the character of Central Asian Society (Shams-ud-din 2008). This historical process of cultural interaction and assimilation gave birth to such process of acculturation and enculturation that lies at the roots of the phenomenon of Islam. However, during the Muslim rule, there was very little scope for radicalism as Islam was at the very centre of the lives of Central Asian Muslims and was deemed as bedrock for the socio-religious stability. With the occupation of the region by the Russians, Czars, Bolsheviks and Soviets, Islamic culture with its value system was pushed back. Policies aimed at changing the Muslim character of the region were adopted for imperialistic designs. As a result of which Islam and Islamic practices in the region became a soft target. Soviets eliminated countless Muslim scholars and local leaders, destroyed Islamic texts and literature, closed tens and thousands of mosques and *madrasas* and converted them into shops, schools, warehouses and museums (Akiner 1994). Islamic properties were confiscated. Publishing of Islamic literature and its import from other Muslim countries was banned (Walker 2001). Severe restrictions were imposed on *Waqf* property destined to be used for sacred and learning purpose (Akiner 1994). Religions institutions in the form of *Maktabs* and *Madrasa* were closed. In 1943, the remaining Islamic institutions were brought under control of clerical administration of Muslims of Central Asia and Kazakhistan in Tashkent. Soviet media continued to disseminate the publication of anti-religious books and articles. In July 1948, *Sovetskaia Krygizia* (a publication) cautioned that the authority of Islamic residents was yet again extending on account of reduction in anti-religions campaigns and the extension of Islamic *Madrasas*. Muslims were prevented from worship and observance of their religions practices. (Benningsen and Wembush 1986) Those who opposed these attempts were ruthlessly suppressed. Given the Marxists-Leninist interpretation of religion, Soviet authorities had no alternative but to suppress it in all its manifestations and institution.

The anti-religious onslaught on Islam by the Soviet authorities, continuing from mid-1920's till the mid-1980's, failed to eradicate Islam from their hearts and minds. Notwithstanding the suppression, the economic subjugation of their lands and the colonial designs of societal and cultural transformation produced a sagacity of strong dislike among the Muslims of the region. This repressive approach led to the emergence and formation of numerous radical movements that created a national and political awareness among Muslims by uniting them against the colonial Czars. The movement known as *Jadidism* initiated by Ismail Gaspirali in 1883 united

SNo=07 (h)

Muslims against Czars under the banner of Turkism and Pan Islamism (Rashid 2002). The Jadidis successfully resisted the policy of Russification and deemed Central Asia as a whole entity. Soon after October 1917 revolution, the foundation for an anti-Islamic strategy was laid out as the Bolshevik government implemented a radical programme, separating religion from the state (Tazmini 2001). One of the most serious consequences of this campaign was the *Basmachi* Revolt that began in 1918. The first ever incident of terrorism in an organised form that took place in the former Soviet Union was the famous *Basmachi* Revolt. The Sufi orders with special reference to *Naqshbandis* along with their supporters in view of the repressive policies fought against these regimes in Central Asia with special reference to Afghanistan, Chechnya and Fergana Valley. The phenomenon of "unofficial Islam" that worked clandestinely also became the root of future radicalisation of Islam in Central Asia. Since 1930's the number of smaller but more radical movements were active in the Soviet Union. The Muslim brotherhood *(Ikhwanal-Muslimeen)* had succeeded in creating a number of secret cells in Dagestan in 1920s (Taheri 1987). The Wahhabi Movement had also established a presence especially in Turkmenistan in 1930s (Encyclopedia of Religion 1987).After Iran's Islamic revolution many more radical Islamic groups began to appear on the Soviet scene. Islamic "Samizdat" generally known as *Islamizdat* started from 1982 was part of the initiatives taken by these new groups of Muslim radicals. The group was committed to the eventual over throw of the Soviet system which they described in their literature as *Shaytani and Taghuti* (in revolt against God) (Mohanty 2006). The Islam and Democracy in Uzbekistan (IDU) a radical movement with Almaz Estekov with its chairman worked for the spiritual cleansing of people from immortality (Bohr 1989). The People's Front of Uzbekistan, a radical organisation operated in Uzbekistan with the sole aim of establishing an Islamic republic. Similarly the Islamic Democratic Party advocated the creation of a theocracy modelled after the Islamic Republic of Iran (*Los Angeles Times* 1990). In Kazakhstan, an Islamic party named "Alash" headed by Aron Atabek and Rashid Yutoshev pressed for the creation of an Islamic state in Kazakhstan (*The Current Digest of Soviet Press* 1992). Besides the leaders of some unknown groups like Ashghar Shah Jabrov, Abdul Rahim Karimov, Imad-ud-din Ahmadjanov, Syed Karim Khajov, Arsalan Salur Bayev, and Kelim Qurbanov also contributed in the radicalisation of the region (Mohanty 2006). A number of these Islamic parties, organisations and movements with a variety of ideological orientations confronted the colonial power which to a greater extent seems justified as the basic precepts of the religion were under siege; the reaction as such was spontaneous and natural.

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The unprecedented epoch-making event of the 20th century, culminating in the attainment of independence by five Central Asian Republics opened the doors of Islamic revivalism in Central Asia (Mandelbaum 1994). Central Asian Muslims who had been forced to renounce or hide their religion for 74 years, at least saw an opportunity to reconnect spiritually and culturally with their Islamic past (Rashid 2002). However, by promoting radicalism, majority of Muslim population of Central Asia seized this opportunity to rediscover their identity and heritage all of which they linked intimately with Islam. Instead of taking due advantage of the situation, they began to promote radicalism in a country where majority of the population had forgotten even their prayers and other rituals of Islam. The Post-Soviet movements with whatever manifesto failed to realise the value and merit of wisdom and fair dealings, which could have been instrumental in further strengthening the mutual bonds and the pace of revivalism, the manifestation of which is found in the considerable increase in the number of mosques[i] *(For Eastern Economic Review 1992)*, and making Hajj to Makkah, growing number of students in religious educational institutions (Benningsen 1989), celebration of Muslim festivals, remembrance of outstanding religious scholars of the region (Siddiqui 1997), legal dissemination of information popularising the values and standards of Islam through books (Anderson 1997), pamphlets, television and radio programmes (Rashid 2001), etc., expanding contact with Muslim countries of the world by joining the Economic Cooperation Organisation, the Organisation of Islamic Conference, and deputation of students to higher institutions of learning abroad (Mohanty 2006).

The collapse of the Soviet rule had in fact come both as a blessing and affliction for the Muslim majority states of the region. It created a religious, cultural and political vacuum, to be filled by some alternative substantive system. Islam was believed to be a potential alternative for (i) being at the very centre of the lives of Central Asian people and (ii) having a tradition of change and adaptation which the radical Islamic movements miserably failed to capitalise. Consequently, the otherwise unifying factor of Islam became a lethal weapon in the hands of extremists, a force for division, fragmentation and enormous bloodletting. One such incident which influenced the politics of the region tremendously for nearly five years was the Tajik Civil War. It was a militant and violent struggle that took the lives of 50,000 people. This bloody Civil War had the highest number of casualties proportionate to the population of any Civil War in the past 50 years. It was Central Asia's first experience of a political coup by a home-grown Islamist movement (Rashid 2002). All this transpired against the fundamentals of the religion. Being a complete civilisation, the classical history of Islam proved the Islamic Universality offering a living

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demonstration of the qualities of ethics, values, morals, compassion, mercy, tolerance and love, to which all human beings can relate. It, in unequivocal terms, rejects discrimination, racism and teaches men and women to disperse within the land and seek the bounty of God (Praja 2007). As against the general rules of the populace of a region, Islam does not force or advocate the implementation of Islamic laws. Although the radical groups in Central Asia are obsessed with implementing *Shariah,* they however did not see *Shariah* as a means to create a just society but simply as an alternative to regulate personal behaviour—a concept that distorts centuries of tradition, culture, history and even the religion of Islam itself. The hallmark of their manifesto is the rejection of all historical experience, scientific experiment and other forms of knowledge that Muslims (and other societies) have developed over the past 1400 years. The new Islamic order for these groups is reduced to a harsh, repressive panel code for their citizens that strip Islam of its values, humanism and spirituality (Rashid 2002). The new radical and fundamentalist movements have distorted Jihad's greater meaning of an inner struggle to be a devote Muslim. Nowhere in Islamic literature or traditions does *Jihad* sanction the killing of innocent non-Muslim men, women and children, or even fellow Muslims, on the basis of ethnicity, sect or belief. It is this perversion of *Jihad* as a justification to slaughter the innocent which in part defines the fundamentalism of most of today's extreme Islamic movements.

Islam throughout the course of history advocates pluralism at the most general level, that refers to a process of change which affects all regions of the world in a variety of sectors' including economic, science and technology (Nasr 2002). The claim that Islam cannot connect with the process of globalisation is devoid of merit and value. Its emphasis on the concepts of justice, peace, tranquillity, pluralism and co-existence, which in essence is the intrinsic nature of Islam and upon which a viable system of justice and equality can be disseminated in contemporary Central Asia, is an essential feature of Islamic perspective of globalisation (Yusuf 2013). The conquest of multiple territories, intermixing of races and synthesis of various cultures demonstrate the secular and pluralistic vision of Islam. The most significant example of pluralism and co-existence is reflected in the Charter of *Madina,* through which it established the security of the community, religious freedom, security of women, stable tribal relations, a tax system to support the community at a time of conflict, parameters for exogenous political alliance, a just social system to ensure protection of individuals and a judicial system to resolve disputes. The system as such advocates inclusive as against the exclusive tendencies. Contemporary Muslim majority nations of Central Asia can make a difference provided they adhere to the dictum of "inclusiveness", pluralism and coexistence

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which in turn will ensure a world of love and peace free of vices, hatred and prejudice. Such an approach on the part of Muslim States will ensure significant role of Islam in the Central Asian socio-political milieu.

Radicalism besides Central Asia destroyed the age old Afghan tolerance and consensus. After 1992, the brutal Civil War divided Islamic sects and ethnic groups in a way that was unimaginable to ordinary Afghans before. *Masudi's* massacre of Hazaras in Kabul in 1995, the Hazaras massacre of the Taliban in *Mazar-i-Sharif* in 1997 and the Taliban massacres of Hazaras and Uzbeks in 1998 has no precedence in Afghan history and has probably irreparably damaged the fabric of the country's national and religious soul (Rashid 2010). The Taliban's religious outlook denigrated Islam and the unity of the country, as minority groups along with some ethnic groups tried to flee the country en-masse. The destruction of Bamiyan idols in Afghanistan is an example of extremism engulfed with ignorance and orthodoxy which became the focal point of criticism throughout the globe. Islam advocates respect and protection of places of worship of other religions and does not permit their destruction. It has been rightly observed by scholars that "while the Taliban were ostensibly smashing idols, in reality they were demolishing Islam". History bears witness to the fact that a Muslim General during the reign of al-Mutasim AD 833-842 ordered an *Imam* and a *Muadhin* to be flogged for having destroyed a fire-temple in Sughd and building a mosque in its place (Arnold 2002). It is, therefore, believed that Taliban represented nobody but themselves and recognised no Islam except their own. Such an atmosphere has made it difficult for 20th century rulers to incorporate its religious leaders into a strong centralised state system. The obsession of radical Islam as a matter of fact is not the creation of institutions but the character and purity of its leaders, his virtues and qualifications and whether his personality can emulate the personality of the Prophet of Islam. Thus, these movements pre-suppose the Islamic virtues of individuals, even though such virtues can only be logically acquired if a society is already truly Islamic.

The emergence of numerous movements in post-independent Central Asia gave Islamic radicalism a new phase and a new identity at least for the next millennium by not recognising any political system except their own and rejecting all accommodation with Muslim moderates and the west (Rashid 2002). In order to carve out a place of influence for itself in the socio-political structure of the region, Central Asian Muslims need to further strengthen the process of Islamisation of the region, free of aggression and discrimination by adhering to the principle of pluralism and co-existence and to the dictum of Baha-ud-din Naqashbandi *Dastbakardilbayaar "hand to work and heart to God"*. As against radicalism, Sufism in the region was

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Although such a view invites all citizens of the region to a platform of mutual understanding, Muslims without passing on the buck certainly carry the heaviest responsibility since Islam has been consistently described as the epitome of radicalism and terrorism. Within hours of the planes hurtling into the World Trade Centre of New York and Pentagon on 9/11, American anguish was echoed throughout Europe. The fear and paranoia thus generated, have set Muslims at the back seat having badly affected the process of mutual accommodation between Muslims and European population and the integration of both Islam and Muslims into Europe's socio-cultural and political landscape (Praja 2007).

Against the basic precepts of religion, several pro-religious organisations in Central Asia began to mobilise public support by exploiting religious sentiments of the people inspite of the government suppression. Islamic Renaissance Party (IRP)[ii], Islamic Movement of Uzbekistan (IMU)[iii], Hizb-ut-Tahrir (HT)[iv] and Adolat are some of the prominent movements that flourished in Central Asia. All these parties by and large persuaded the people of Islamic faith to work for the creation of an Islamic Empire in the region. The policies enacted by these movements reflected negative repercussions and forced the present regimes to formulate policies and enforce strict rules against the growing tendency of radicalism which ultimately proved counterproductive to the process of peaceful expansion and propagation of Islam in the region. For example in Uzbekistan in a massive crackdown against the HT in May 1998, freedom of worship was restricted[v]. Police questioned all men with beards or more than one wife, fathers were jailed for the alleged crimes of their sons, all Muslim organisations and mosques were to be registered with the government, women were arrested for wearing the *Hijab*. The government as rightly said by Holly Carter, the director of Human Rights Watch for Central Asia, painted Muslims with the same brush — those who may have criminal intent and average Muslims who simply grow beard and go to the mosque", (Human Right Watch 2000). Considering Islam as a potential threat to its very existence, Uzbekistan's President Karimov, for example, views the Islamic religion as an 'ideological and political threat'. In denying Islam a political role, the Central Asian leaders did not merely apply the old Soviet model, but assumed criteria of a modern state, similar to Turkey, where Islamists may occasionally hold power but where the military sees itself as guardian of the secular tradition instituted by Ataturk. In response to a question on whether Uzbekistan corresponds to 'the standards of the

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Muslim world', Karimov said a categorical 'no'. President Nazarbayev also revealed his deep secular belief when he said: "Having been a Soviet people, we are atheists, but Kazaks with Muslim background. We do not allow religion to interfere with politics. And when working with Muslim states, we strictly define that there will be no religious interference in our country, and that goes even for literature, which is published in their countries". Consequently, after more than a decade, Islam has had no effective impact on the socio-political structure of the state. The leaders of Islamic movements have been concerned with their own power and popularity. In view of their manifesto and conservative interpretations, Islam seizes to be a vision of the future or blueprint for any action. The increase in Islamic movements has prompted the governments to pursue a series of policies directed against them.

Conclusion

The epoch making event of 20th century accelerated the natural historical process conducted to speed-up moves of society and state through the means of transport, communication and information, to reduction of room and time of sectioning people. In these conditions Central Asian civilisation exhibited anew quality and with new capabilities for onward march to progress and prosperity. In the process of the interaction between local and global Islam in Central Asia, most of the states are in a state of worry and anxiety about their policy on how to rule people belonging to the Islamic orders. Yet, it is not easy to view the Central Asian republics as part of the modern Islamic world. Islam has affected the society, but not influenced politics. To one degree or another, these countries remain concerned about preserving the secular governments and societies they inherited at independence, and resist attempts to be categorised as Islamic. This is partly because of the long isolation of Central Asia from the main centres and cultural processes of the Muslim world, and shortage of religious literature and restricted religious practice and the decline of the level of religious education. The ruling elite have given only lip service to traditional Islam as a factor of social conservatism. They have tried to retain the Soviet-era system of control over the official clergy, which has power over the great mosques in the region. In short, the Muslim Central Asian republics cannot stop the spread of impact and influence of the Muslim world at large because it is a real phenomenon which is imposing itself by the forces of political influence, economic pressure, media and information domination exerted by the new world order. In fact, interaction and inter connectedness is based on economic power, political stability, social justice and progress in all fields of life. These can be attained by implementation of necessary reforms, correction of the

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situation of Islam and establishment of the bases of joint Islamic action at all levels, in order to enhance cooperation among these Muslim countries towards a more promising perspective and prosperous future.

To carve out a place of influence for itself in the socio-political structure of the region, Central Asian Muslims instead of conservative interpretation need to further strengthen the process of Islamisation of the region, free of aggression and discrimination by adhering to the true philosophy of religion. Instead of radicalism, Sufism in the region has always been instrumental in the propagation of Islam so much so that the rulers of the Turkic dynasties would seek validation for their role from the leading Sufi saints. Such a view although invites all citizens of the region to a platform of mutual understanding, Muslims certainly carry the heaviest responsibility since Islam has been consistently described as the epitome of radicalism and terrorism. Central Asia can make a difference provided they adhere to peace, inclusiveness, pluralism and coexistence. Such an approach on the part of Muslims will ensure outstanding role of Islam in the process of globalisation.

The Islamic Movements by representing positively to the religious precepts have the potential to become torch bearers in this hemisphere by highlighting the urgent need for peaceful propagation of Islam, communal harmony dialogue among civilisations to prevent major conflicts and ensure intercultural and interreligious peace-building process, Kofi Annan, former Secretary General of the United Nations asserted once, that "all sensible people must wish to avoid such a clash". President Mohammad Khatami of Iran, made a memorable speech on the subject in the United Nations General Assembly. He said, 'The Islamic revolution of the Iranian people ... calls for a dialogue among civilisations and cultures instead of a clash between them'. At his suggestion, the Assembly has since decided to proclaim the year 2001 as the United Nations Year of Dialogue among Civilisations". To quote Hans Kung, 'there will be no peace among nations unless there is peace among religions and there will be no peace among religions unless there is authentic dialogue among religions'. The only way to create an atmosphere in which global peace, communal harmony and co-existence can be nurtured is to extend the unbiased umbrella of Islam which promotes these precepts irrespective of race, gender and creed.

Endnotes:

[i] This religious resurgence revealed the depth of the roots of Islam, which had flourished underground in defiance of the repressive Soviet state. As of 1994, an estimated 7,800 mosques and prior houses have been opened in Central Asia. Between 1989 and 1991, the Uzbek government returned a number of religious

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sites to the believers, including the Abu Isaal-Tirmidhi Mausoleum in the republic's south, the Kalon mosque, the Ata Walikhai mosque in Namangan, the Imam al-Bukhari Mausoleum in Bukhara, and the Jamia mosque in Kokand. (*For Eastern Economic Review,* 1992)

[ii] It emerged out of the inter-republican party of Islamic revival or Islamic Renaissance, Mohanty, Jatin Kumar. 2006: *Terrorism and Militancy in Central Asia,* Delhi: Kalpaz Publications, p.99, p.123.

[iii] JMU is deemed as the greatest threat to Central Asian stability. Formed in 1998 by extremist who were dissatisfied with the moderation of the Islamic Renaissance Party and determined to topple the government of Central Asian strongman Islam Karimov, the IMU launched Guerrilla attacks against the regimes from bases in Tajikistan and Afghanistan in 1999, 2000 and 2001. Under the military leadership of the charismatic Juma Namangani, the IMU has extended its Jihad to the whole of Central Asia.

[iv] HT, a widespread Islamic movement has taken root in Central Asia. It produces abundant literature about its goals, including a website. The party seeks to reunite the Central Asian republics and eventually the whole Muslim World by non-violent means with the eventual aim of establishing a Caliphate. However, like IMU it lacks complete social, economic or political plan for governing this Caliphate.

[v] Although every act of state repression has pushed these movements into taking more extreme positions, distorting their original message, it remains true that the Islamic ideologies of the IMU and the HT are based not on the indigenous Islam of Central Asia, the birth place of Sufism (the tolerant form of Islamic mysticism) and 19th century Jadidism (the modernist interpretation of Islam), but on imported ideologies. Their message of extremism originated with the Taliban in Afghanistan, the militant madrassa culture of Pakistan (where many IMU and HT adherents studied), and the extreme Wahhabi doctrine of Saudi Arabia. Contrary to the Central Asia's Islamic traditions and history, Jihad in its simplest form rather than Ijtihad (reinterpretation and consensus) has become the primary aim of these groups as they seek to mobilise popular support.

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جادونوا ٔ اقبال

(اقبال کی فارسی شاعری پر قومی سیمینار میں پڑھے گئے تحقیقی مقالات کا مجموعہ)

ترتیب وتہذیب

پروفیسر تسکینہ فاضل

اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی، کشمیر یونیورسٹی، حضرتبل سرینگر

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جادو نوائے اقبال

قبال کی فارسی شاعری پر قومی سمینار میں پڑھے گئے تحقیقی مقالات کا مجموعہ)

بگو اقبال را اے باغباں رخت از چمن بندد
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پروفیسر تسکینہ فاضل

ال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی، کشمیر یونیورسٹی، حضرتبل سرینگر

N: 978-93-82288-26-8

(جملہ حقوق بحق اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی محفوظ ہیں)

کتاب کا نام: جادو نوائے اقبال
سنہ اشاعت: ۲۰۱۴ء
ناشر: ڈائریکٹر اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی
مطبع: کاف پرنٹرس حبہ کدل سری نگر
تعداد اشاعت: پانچ سو
کمپیوٹر کمپوزنگ: خالد بختاور
قیمت: تین سو روپے

ملنے کا پتہ

اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی کشمیر یونیورسٹی۔ حضرت بل ۱۹۰۰۰۶
ای میل:۔ iqbalinstituteku@yahoo.in

فہرست

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خوبی کے ساتھ قدم آگے بڑھاتے رہے ہیں۔ اس ترجمے کے ذریعے ناز کولگامی نے دوہری خدمت انجام دی ہے۔ اول کشمیری زبان میں اقبال کے بلند خیالات سے کشمیری زبان کو مزید باثروت بنایا۔ دوم اہل کشمیر کو اقبال کے فلسفۂ خودی سے آگاہی بہم پہنچائی۔

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''گلشن راز جدید'' کا ایک تنقیدی مطالعہ

ڈاکٹر عابد گلزار

''گلشن راز'' اصل میں ایک منظوم فارسی تصنیف ہے جو ایران کے قصبہ تبریز کے قریب شبستر گاؤں میں رہنے والے ایک عالم و عارف محمود نے لکھی تھی۔ تصنیف کا محرک یہ بنا کر ہرات (موجودہ افغانستان کا صوبہ) کے ایک عالم و بزرگ میر حسین نے ۷۱۷ھ میں تبریز کے علماء کی طرف تصوف کے اسرار و رموز کے تناظر میں ۱۷ سوالات بھیجے' اسلئے کہ تبریز اُس وقت علم و عرفان کا گہوارہ تھا۔ علماء تبریز نے متفقہ طور پر ان سوالات کے جوابات لکھنے کی ذمہ داری محمود شبستری پر ڈال دی۔ اسطرح سے ''گلشن راز'' کے عنوان سے یہ تصنیف ان ۱۷ سوالات کے جواب میں معرضِ وجود میں آئی۔ آج مطبوعہ نسخوں میں صرف ۱۵ سوالات موجود ہیں۔

علامہ اقبال پہلے فلسفۂ وحدۃ الوجود کے شدید مخالفین میں سے تھے۔ اندلس کے بہت بڑے عارف و عالم شیخ محی الدین ابن عربی جو فلسفۂ وحدۃ الوجود کے عظیم داعی رہے انہوں نے باطنی تجربہ' داخلی کیفیات و مشاہدات کی تفصیل و توضیح علمی طور پر اپنی کُتب فصوص الحکم اور فتوحات مکّیہ میں کی ہے۔ علامہ اقبال نے جب پہلے ابن عربی کا باقاعدہ مطالعہ نہیں کیا تھا اور اُن کے فلسفہ کی باتیں ان لوگوں سے لی تھیں جو مغرب زدہ تھے' تو ان کا یہ خیال تھا کہ ابن عربی غیر مسلم وحدۃ الوجودیوں کی طرح شرک' الحاد اور رہبانیت سکھاتے ہیں لیکن بعد میں ابن عربی کے افکار کا باضابطہ مطالعہ کر کے پہلے خیالات سے تائب ہو کر اُن کے قائل ہو گئے اور پیر رومؔی (مولانا جلال الدین بلخی) کو اس حوالہ سے اپنا مرشد بنایا۔

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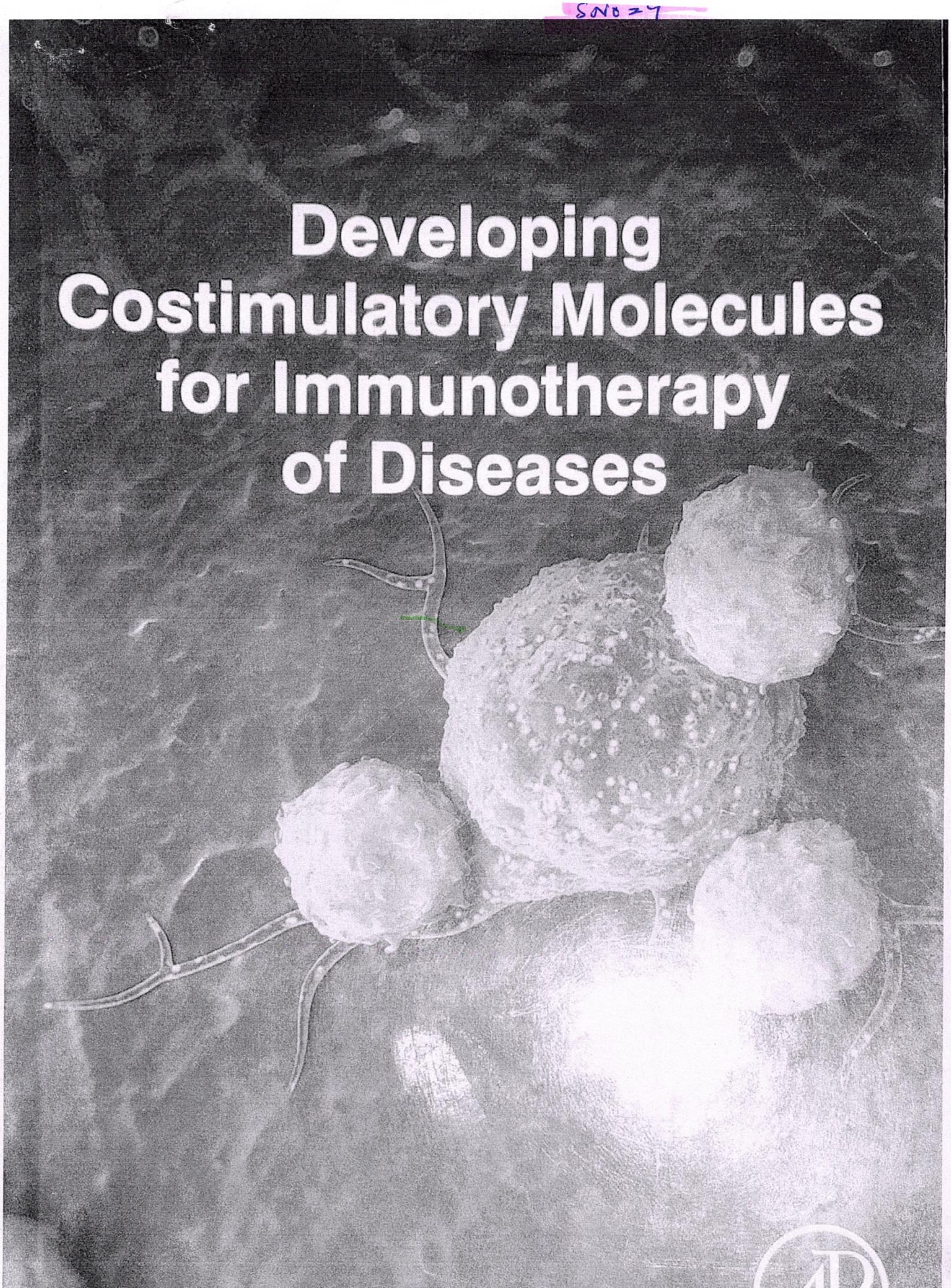

Developing Costimulatory Molecules for Immunotherapy of Diseases

Manzoor Ahmad Mir

SNO =9 .(9)

Developing Costimulatory Molecules for Immunotherapy of Diseases

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and

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SND9 (b)

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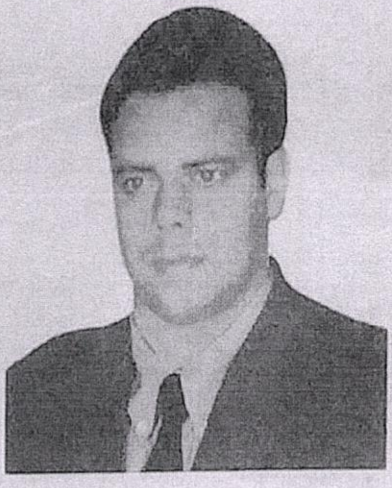

Dr. Manzoor completed his masters in life sciences with a gold medal and after qualifying with the prestigious JRF-NET-CSIR examination completed his PhD in immunopathology from IMTECH-JNU. His PhD work includes understanding the role of reverse costimulation in the survival of intracellular pathogens and cancer. His area of research includes costimulation biology and immunology of stroke. He is Assistant Professor at the Department of Bioresources, University of Kashmir, Srinagar, India, and presently working in the Stroke Research Chair on novel recombinational therapies for stroke as Research Scientist at the College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia. He has several international research papers, review articles, and books to his credit. He is a member of many scientific societies across the globe. He has many courses to his credit besides a doctorate degree in immunology which includes PGDHE and PGDEE. Dr. Manzoor has already authored many books on costimulation immunotherapy and stroke biology.

SNo > 7 (4

Developing Costimulatory Molecules for Immunotherapy of Diseases

Manzoor Ahmad Mir

Assistant Professor, Department of Bioresources, Faculty of Biological Sciences, University of Kashmir, Srinagar-190006, India

Developing Costimulatory Molecules for Immunotherapy of Diseases highlights the novel concept of reverse costimulation, which can be effectively exploited to develop immunotherapy using either humanized antibodies against CD80, CD86, and other costimulatory molecules or CD28 fusinogenic proteins for the treatment of diseases like allergies, asthma, rheumatoid arthritis, multiple sclerosis, lupus nephritis and severe psoriasis vulgaris, tuberculosis, typhoid, therapeutic transplantation, cancer, and inflammation.

Considering the importance of complex roles played by CD28 and B7 costimulatory families in regulating the immune system, novel approaches targeting these families will yield new therapies for the treatment of numerous diseases. To translate this field into the clinic, there is an urgent need to develop novel methods to target the currently-appreciated costimulatory pathway and deeply understand the pathophysiology of the diseases involving costimulatory molecules. Despite the complex roles and interactions within the CD28 and B7 costimulatory families, the novel approaches targeting these families will yield new therapies for the treatment of inflammation, autoimmunity, transplantation, cancer and other infectious diseases.

- Describes the breakthrough strategy of immunotherapy involving costimulatory molecules to treat various diseases, minimizing side effects inflicted by drug therapies
- Contains many flowcharts and diagrams highlighting costimulatory interactions
- Provides cutting edge knowledge on costimulation and immunotherapy with relation to different diseases and their treatment
- Includes coverage of therapeutic and preventative methods
- Brings the basic science and clinical perspectives together in a single volume, facilitating translational possibilities
- Helps to integrate the value of costimulation immunotherapy outside of a cancer setting

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An imprint of Elsevier
store.elsevier.com

ISBN 978-0-12-802585-7
9 780128 025857

S No —

جادو نوائے اقبال

(اقبال کی فارسی شاعری پر قومی سمینار میں پڑھے گئے تحقیقی مقالات کا مجموعہ)

ترتیب و تہذیب

پروفیسر تسکینہ فاضل

UNIVERSITY OF KASHMIR

اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی، کشمیر یونیورسٹی، حضرتبل سرینگر

ISBN: 978-93-82288-26-8

(جملہ حقوق بحق اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی محفوظ ہیں)

کتاب کا نام: جادو نواٴ اقبال
سنہ اشاعت: ۲۰۱۴ء
ناشر: ڈائریکٹر اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی
مطبع: کاف پرنٹرس حبہ کدل سری نگر
تعداد اشاعت: پانچ سو
کمپیوٹر کمپوزنگ: خالد بختاور
قیمت: تین سو روپے

ملنے کا پتہ

اقبال انسٹی ٹیوٹ آف کلچر اینڈ فلاسفی کشمیر یونیورسٹی۔ حضرت بل ۱۹۰۰۰۶
ای میل:۔ iqbalinstituteku@yahoo.in

SNo. = 1091

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خاکدانے با فروغ و بے فراغ
چہرۂ او از غلامی داغ داغ
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ایں جہاں شایانِ مہر و ماہ نیست

مجموعی طور پر زبورِ عجم اقبال کے عظیم تصورات کا ایک دلکش مرقع ہے اور ان کی فارسی زبان و ادب کے مزاج سے کامل واقفیت کا اعلیٰ ترین نمونہ ہے۔

[illegible]

اقبال کی فارسی مثنوی ''اسرارِ خودی'' کے تین ترجمے

پروفیسر تسلینہ فاضل

حکیم الاُمّت علامہ محمد اقبال ایک عظیم مفکر ہونے کے ساتھ ساتھ ایک ایسے الہام نوا شاعر ہیں جنھوں نے نہ صرف مسلمانوں بلکہ پورے بنی نوعِ انسان کو اپنے حیات بخش پیغام سے نوازا۔ اُن کے احساس کمتری کو دُور کر کے اُن میں خودی اور خودداری کا جذبہ بیدار کیا۔ عمل سے غافل قوم کو سعیٔ پیہم کا درس دیا۔ زندگی کے اُن اہم اور بنیادی حقایق کو شاعری کا موضوع بنایا جو قوموں اور جماعتوں کی سیرت و کردار کی تعمیر و تشکیل میں معاون ثابت ہو کر ہمرہانِ سُست عناصر کو منزلِ مقصود کی جانب تیز گام ہونا سکھاتی ہیں۔

خودی کا تصور اقبال کی فکر کا اساسی اور مرکزی تصوّر رہا ہے۔ اقبال نے اِس لفظ کو تکبّر، غرور اور نخوت کے منفی معنوں سے نجات دلا کر قران کے تناظر میں استعمال کیا۔ اقبال نے اِس اصطلاح کا سنگِ بنیاد قرآن حکیم کی سورۃ المائدہ کی آیت نمبر ۱۰۵ پر رکھا جس میں اہلِ ایمان پر خودی کی حفاظت فرض قرار دی گئی ہے۔ اقبال خودی سے عرفانِ نفس اور شعورِ ذات مراد لیتے ہیں۔ انسان کو اللہ تعالیٰ نے غیر معمولی استعداد سے نوازا ہے۔ اُس پر لازم ہے کہ وہ اپنی اس غیر معمولی استعداد کو اُجاگر کر کے مُثبت طور پر برُوے کار لائے۔ بہ الفاظِ دیگر خودی قانونِ الٰہی کی تابع رہے۔ اقبال خودی کی اصطلاح پر ابتداً سے تفکر و تدبر کرتے رہے ہیں، چنانچہ ۱۹۱۵ء میں اُن کی پہلی فارسی تصنیف اسرارِ خودی کے نام سے شایع ہو کر منظرِ عام پر آئی۔ یہ مثنوی اقبال نے دو سال میں مکمل کی۔ اِس مثنوی میں اقبال کے مجتہدانہ افکار کی کارفرمائی کے باعث اِس کی صوفیانہ حلقوں میں شدید مخالفت ہوئی۔ تاہم مرورِ ایام کے ساتھ ساتھ اِس کی اہمیت کو سمجھا جانے لگا، اور اس مثنوی کے یکے بعد دیگرے کئی زبانوں میں منظوم اور منثور ترجمے ہوئے۔ سب سے پہلے کیمبرج یونیورسٹی کے عربی کے پروفیسر اور مشہور مستشرق رینالڈ

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Verification using Multimodal Biometric Fusion

Saba Mushtaq*, Shoaib Amin Banday, Ajaz Hussain Mir

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Abstract

Verification using biometrics has offered a wide range of advantages over conventional possession and knowledge based methods. Almost all the biometric modalities have been tested by now but there are various factors that limit their accuracy. This paper presents a multimodal biometric system for verification. We have fused the matching scores for features extracted from iris and handwritten signatures. GLCM features for iris and GLRLM features for signatures have been used. The verification results so obtained are exceptionally good in comparison to both unimodal iris verification and handwritten signature verification systems.

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Keywords: Multimodal Biometrics; Iris Recognition; Handwritten Signature Verification; Texture Recognition.

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1. Introduction

A large variety of application requires confirming the identity of the individual before providing them access to the application. Some of these applications need to be highly secured from illegitimate access like bank transaction, security systems, surveillance databases, entrance to high security zone areas etc. Even a small amount of inaccuracy can compromise the access.

Biometrics has become a prominent and popular technique to provide personal verification. A biometric system simply matches a pre-stored sample of an individual with the current input sample and matches certain feature to ascertain the identity of the individual. A biometric system operates to either identify or verify an individual. In identification a comparison is made between the submitted sample and all N stored samples in the database (1: N) while as in verification in addition to a submitted sample some pin or password are also entered and a 1:1 comparison is made.

A single biometric system may fail to extract enough information for verifying an individual so multimodal biometric that is, biometrics that involve more than one biometric modality to obtain improved performance are used. The most important feature of multimodal systems is to collect information from multiple biometric modalities to reduce the error introduced in monomodal systems (Ross et al 2006). Multimodal systems make it difficult for an intruder to copy more than one biometric traits. The main aim of multimodal systems remains to fuse information obtained from biometric samples at different fusion levels (Rattani et al. 2006). This fusion can be performed at four different levels sensor level, feature level, matching level and decision level. The first two levels i.e. sensor and the feature level are referred to as a pre-mapping fusion while as if the matching is performed at matching score level and the decision level then it is referred to as a post-mapping fusion (Sanderson.C, K. K. Paliwal 2003). In this paper, we fuse the information at matching score level. We have made use of GLCM (Grey level co-occurrence matrix) to calculate features of right iris and GLRLM (Grey level rum length matrix) to calculate features of handwritten signature images. Iris recognition is the most promising for high security environments (J. Daugman 1993). Iris based biometric recognition systems have achieved a very high accuracy as high as 97% (C. Sanchez-Avila et al. 2001). A brief description of the two texture based techniques viz GLCM and GLRLM are given in next section.

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SNO= 11(b)

2. Generalized Description of Feature Extraction schemes

Texture is one of the important characteristics used in identifying an object in an image and to discriminate the images. The texture coarseness or fineness of an image can be interpreted as the distribution of the elements in the matrix (Harlic 1973). The gray tone spatial dependence was first used by (Julesz 1962) for texture classification.

2.1. GLCM

GLCM is a second order statistics method, which describes the spatial interrelationships of the gray tones in an image (R.W. Conners and C. A. Harlow, 1980). It contains elements that are counts of the number of pixel pairs, which are separated by certain distance and at some angular direction. Typically, GLCM is calculated in a small window, which scans the whole image. Bachoo and Tapamo (2005) have used GLCM for pattern analysis of iris however in this method the selection of window size remains a problem. In the proposed scheme we have normalize, the GLCM and assumed GLCM represent probabilities instead of counts. The co-occurrence matrix is constructed by the joint probability density function between the gray level tones, which gives the spatial relationship between any two points in the image. It is denoted by $P(i,j,d,\theta)$, where i and j give ith line and jth column of co-occurrence matrix respectively, d is the distance between any two points and θ is the direction. Normalization involves dividing by the total number of counted pixel pairs. There are eight texture features based on GLCM as studied by (Haralick 1973). The mathematical expressions for these features are given below:

$$\text{Entropy} = -\sum_i \sum_j p(i,j) \log (p(i,j)) \quad (1)$$

$$\text{Correlation} = \frac{\sum_i \sum_j (ij)p(i,j) - \mu_x\mu_y}{\sigma_x\sigma_y} \quad (2)$$

$$\text{Contrast} = \sum_{n=0}^{N_g-1} n^2 \left\{ \sum_{\substack{i=1 \\ |i-j|=n}}^{N_g} \sum_{j=1}^{N_g} p(i,j) \right\} \quad (3)$$

$$\text{Dissimilarity} = -\sum_{i=0}^{N_g-1} p_{x-y}(i) \log \{ p_{x-y}(i) \} \quad (4)$$

$$\text{Homogeneity} = -\sum_i \sum_j p(i,j) \log (p(i,j)) \quad (5)$$

$$\text{Angular Second Moment} = \sum_i \sum_j \{ p(i,j) \}^2 \quad (6)$$

$$\text{Mean} = i(\mu)i \quad (7)$$

$$\text{Variance} = (\sigma 2) \quad (8)$$

Here GLCM features are computed based on two parameters, which are the distance between the pixel pair 'd' and their angular relation θ. The angular relation is quantized at four angles i.e., 0^0, 45^0, 90^0 and 180^0.

2.2. GLRLM

The technique used to calculate features of handwritten signatures is GLRLM. The GLRLM is based on computing the number of gray-level runs of various lengths. A gray level run is a set of consecutive and collinear pixel points having the same gray level value. The length of the run is the number of pixel points in the run. The Gray Level Run Length matrix is constructed as follows:

$$R(\theta) = (g\ (i,j) \mid \theta),\ 0 \leq I \leq Ng,\ 0 \leq I \leq Rmax; \quad (9)$$

Where Ng is the maximum gray level and Rmax is the maximum length. Let p (i, j) be the number of times there is a run of length j having gray level i. There are five Run Length Matrix based features computed for 4 directions of run (0°, 45°, 90°, 135°). For each matrix in a particular direction following seven GLRLM features viz SRE, LRE, GLN, RLN, RP, LGLRE, HGLRE are obtained. These features were suggested by Gallow 1975

SNO = 11 (6)

Table 1 : GLRLM features

S.NO.	Features	Formulae
1	Short Run Emphasis(SRE)	$\frac{1}{n}\sum_{(i,j)}\frac{P(i,j)}{j^2}$
2	Long Run Emphasis(LRE)	$\frac{1}{n}\sum_{(i,j)}j^2\,p(i,j)$
3	Grey Level Non-uniformity(GLN)	$\frac{1}{n}\sum_{i}\left(\sum_{j}p(i,j)\right)^2$
4	Run Length Non-Uniformity	$\frac{1}{n}\sum_i(\sum_i p(i,j))^2$
5	Run Percentage(RP)	$\sum_{i,j}\frac{n}{p(i,j)\,j}$
6	Low Grey level Run Emphasis(LGLRE)	$\frac{1}{n}\sum_{i,j}\frac{p(i,j)}{i^2}$
7	High Grey Level Run Emphasis(HGLRE)	$\frac{1}{n}\sum_{i,j}i^2\,p(i,j)$

3. Proposed Scheme

This section presents the proposed scheme for verification using multimodal biometric fusion.

3.1. Database

We have used two databases one for signatures and one for iris images. For iris experiments are carried on CASIA-iris-V4 thousand database and for hand written signatures a signature database collected at NIT Srinagar is used.

3.2. Algorithm

The above discussed textural feature extraction method are used to extract features from right iris and hand written signatures. GLCM textural features are calculated using equations shown in section 2. The distance d between pixel pairs is first selected as 1 and gray level co-occurrence matrix features are calculated. The features are calculated at an angles of 00,450,900 and 1800. The experiment is continued with calculation of GLCM features for value of d=2 and 4. The features are again measured at the pre-defined angles of rotation over the whole iris image.

To make the GLCM invariant to the rotation of the images, GLCM obtained at d = 1,2 and 4 is averaged through four angular relations (00,450,900 and 1800). Once the textural features of image (iris) is calculated, the feature set is stored in the database as trainer. The test image (iris) is similarly processed to obtain a textural feature vector. This feature vector of the test image is processed by the matching unit of the multi unit biometric verification system and compared against the templates stored in the database. The matching unit because of taking Euclidean distance as the classifier outputs a matching score corresponding to each template in the database. The matching score is fed to the decision unit which because of some predefined threshold classifies test image as Genuine or Imposter based on the score obtained at the matching unit. Similarly, the signature image is pre- processed separately as shown in the figure 1. The GLRLM features are extracted for the signature image in the similar way followed by matching. In case Once the scores are obtained from both the matching units (i-e., from right iris and handwritten signatures), they are fused using SUM method of fusion.

SNO → 11(d)

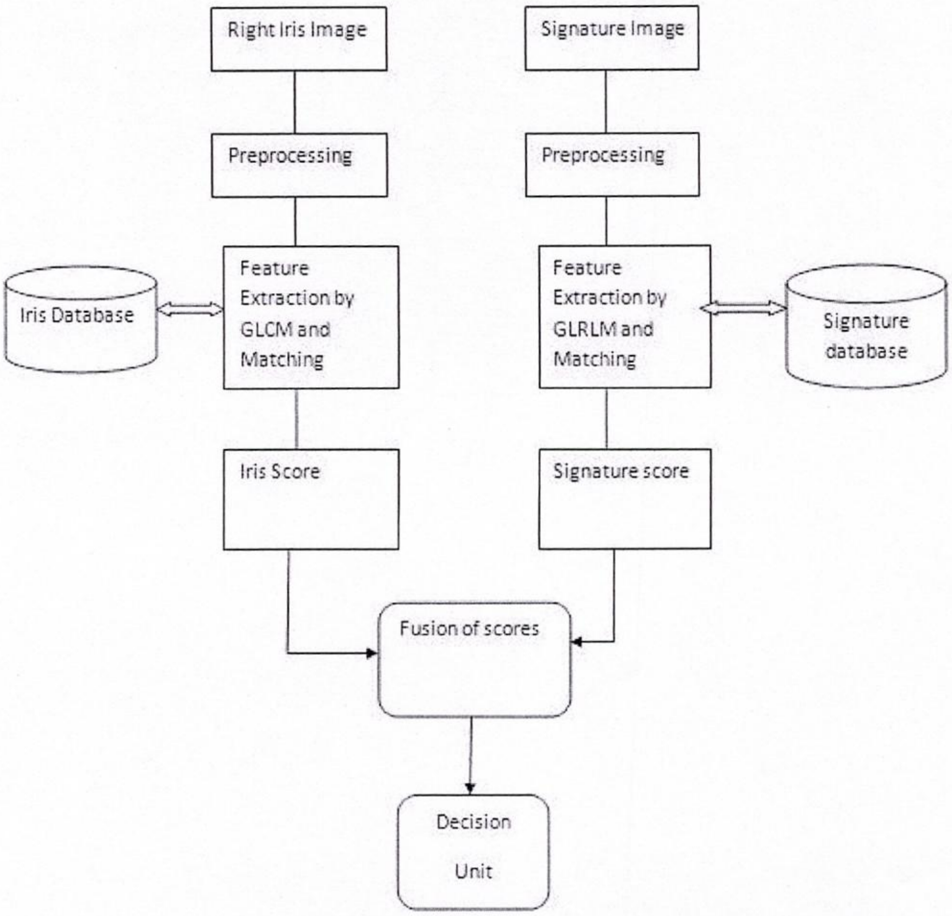
Right Iris Image
Signature Image
Preprocessing
Preprocessing
Iris Database
Feature Extraction by GLCM and Matching
Feature Extraction by GLRLM and Matching
Signature database
Iris Score
Signature score
Fusion of scores
Decision Unit

Fig 1: Block Diagram of proposed system

4. Experimental Results

We evaluated the proposed system on a data set of 525 signature images collected at NIT Srinagar and CASIA-iris-V4 thousand database. The training set contains 200 each, a signature and an iris image assumed to be belonging to same individual. The testing set is a set of 50 each, signatures and iris images for verification.

4.1 Training

For an individual one image for each trait i.e iris and signature is enrolled in the database for which features are extracted using GLCM and GLRLM respectively. Which are also used for score level fusion and saved in database for verification.

4.2 Testing

Pair of iris and signature are used for testing.. Fused feature vector is generated from the pair and is compared with the database score value.We have calculated FAR and Accuracy for the individual systems and then for the multimodal proposed system. The results thus obtained are given in table below. We also calculated the Genuine and imposter scores for the two systems that is for iris using GLCM and for Signatures using GLRLM and for the proposed system which are given below in fig2, fig 3 and fig4 respectively . It can be clearly seen that the overlap of genuine and imposter scores is more in unimodal systems and for every verification systems the aim is to reduce this overlap as much as possible. Lesser the overlap more accurate is the system.

SNO = 11(e)

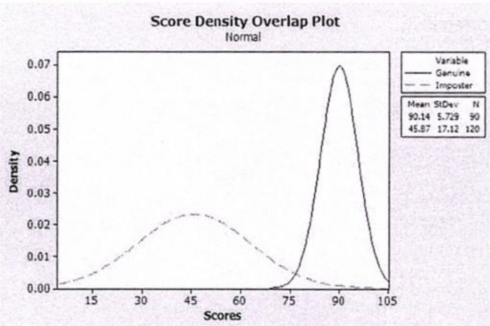

Fig 2 : Score distribution for iris using GLCM

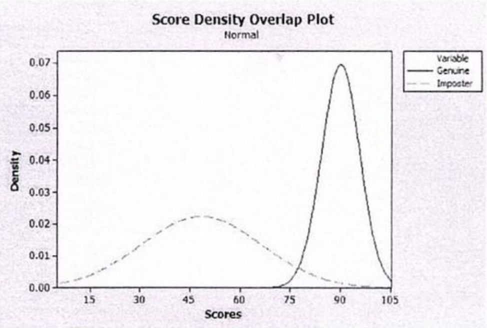

Fig 3 : Score distribution for Signature using GLRLM

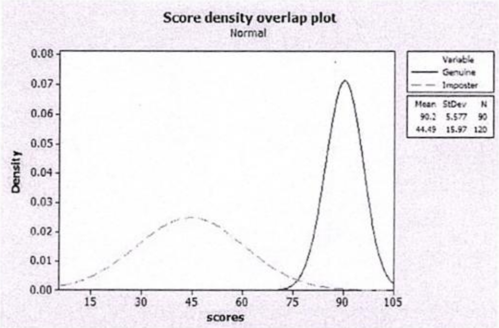

Fig 4 Score density for proposed system.

Table 2: Accuracy and FAR

S. No.	Modality	FAR	Accuracy
1	Signatures	13.33	85.15%
2	Iris	0.8	93.2%
3	Proposed Multimodal system	0.17	97.6%

5. Conclusion

The field of multimodal biometrics is a challenging and novel area of research aiming at reliable and accurate personal verification and identification. This paper presents a score level fusion technique for human verification. The proposed technique uses texture features viz GLCM and GLRLM for feature extraction. The features thus obtained are normalized. In addition, stored in database. Matching scores are calculated for iris and signatures separately, then fused using sum rule of fusion, and results are compared to unimodal systems based on accuracy and FAR. The experimental results establish the effectiveness of fusion of the individual matching scores and accuracy of 97.6% is obtained in comparision to individual signature and iris biometric systems that provide accuracy of 85.15% and 93.2 % respectively.

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University of Kashmir, Srinagar, India

FloSwitch Board Design using Multi FPGA

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Abstract

The Flosolver Lab was started in 1986 to "Build a parallel computer for fluid dynamics applications". Since then, different generations of parallel systems (Mk1 to Mk8) and inter-processor communication devices have been built. The communication between the processing elements is very important in parallel processing system. FloSwitch is the communication device, designed and developed indigenously to meet the requirements. The present high communication reconfigurable FloSwitch is Virtex 5 FPGA based to meet the application requirement. There is always scope of improvement of the communication devices. Here new design of FloSwitch is taken up to improve its communication speed, data handling of the parallel system (big data) with more reliable & efficient way and to cut down the no. of hops in the big system for the data transfer. To meet the requirement of the enhanced FloSwitch four FPGAs (Virtex-6) are used. The design will have the more processing elements (64) connected to the one device compared to the earlier device with 16 processing elements. This will bring down the number of hops between the processing elements. The DPM on board will be replaced by Block RAM resources of the four FPGAs , thereby leading to lower power consumption, data transfer rate increase and reduced size for a multicore chip.

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Keywords: FPGA; Block RAM; DPM; Xilinx; Floswitch.

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1. Introduction

Starting from the jolting bullock cart of yesteryears to supersonic planes of the 21st century the face of science and technology is not the same .Same is the case with parallel computing technology moving leaps and bounds in recent years. Data-Intensive Computing is an application which uses data in the parallel approach to process large volumes of data typically in terabytes, petabytes in size. High computational Background Study applications which spent most of their execution time to computational requirements will have small volumes of data. Whereas computing applications which require large volumes of data and spent most of their processing time to I/O and manipulation of data are known as high communication (Flosolver Team (a)). Earlier electronics designs were based more on the design concept & its feasibilities. Power requirement was as the part of the design. Current design trends are portable devices with high-performance and low power. Designing the low power boards to improve the performance is extremely challenging & demanding.

Communication protocol is a formal description of the digital message formats and the rules for exchanging those messages in or between computing systems. Protocols may include signaling, authentication and error detection and correction capabilities to reduce the size of digital designs (xilinx.com). The industry trend over the last few years has been to move towards the use of high speed serial protocols for data transmission. A digital serial signal uses fewer pins to transmit high-speed data by increasing the clock rate at which the signals are sent (Flosolver Unit (a)). Communication network is the most demanding area in the upcoming technology development. Every day the revolution is taking to its new height to meet the demand in the market. This project mainly deals with design of FloSwitch using four low power Virtex-6 FPGA's. ON board DPM's will be replaced with inbuilt BLOCK RAM of FPGA. Replacing on board DPM's with inbuilt RAM's of FPGA will use less power (Havinga, 2000). Communication speed will be increased as the internal RAM's access time is very less compare to the on board DPM's (Flosolver Unit

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E-mail address: hamdanimursal@gmail.com.

SNo=12(b)

(b)). In this design 64 optical links can be connected to the FloSwitch. As in the earlier Design only it supports to the 16 optical links. Here it will have support of four FloSwitch capabilities in one device. Intra cluster connectivity will can also be the optical link. This new concept aims to reduce the number of hops between the processing elements, so that processing speed increases. This may lead to reduce the area covered by four FloSwitches to just one since it generates the same number of optical links as by four FPGA's.

2. Block Diagram

2.1. Existing Design

The design of this proposed floswitch is based upon some limitations of the existing switch. So it is quite natural to first deal with the existing system and know wherein the changes are to computing intensive applications. Here the numbers, which force to think of, power consumption in the big systems. In the existing system of Flosolver MK-8(Flosolver Team(b)), FloSwitch is designed using Virtex 5 FPGA (XC5VLX110T, FF1759), DPM (IDT70v658S) and optical links.Flosolver Mk8 is mainly in the form of 128 clusters. Each Cluster is of 8-processor system consists of 4 dual processor server boards with PCI based add-on card(Flosolver Team(b)) which is connected to the FloSwitch through 64 bit parallel bus for intra-cluster communication

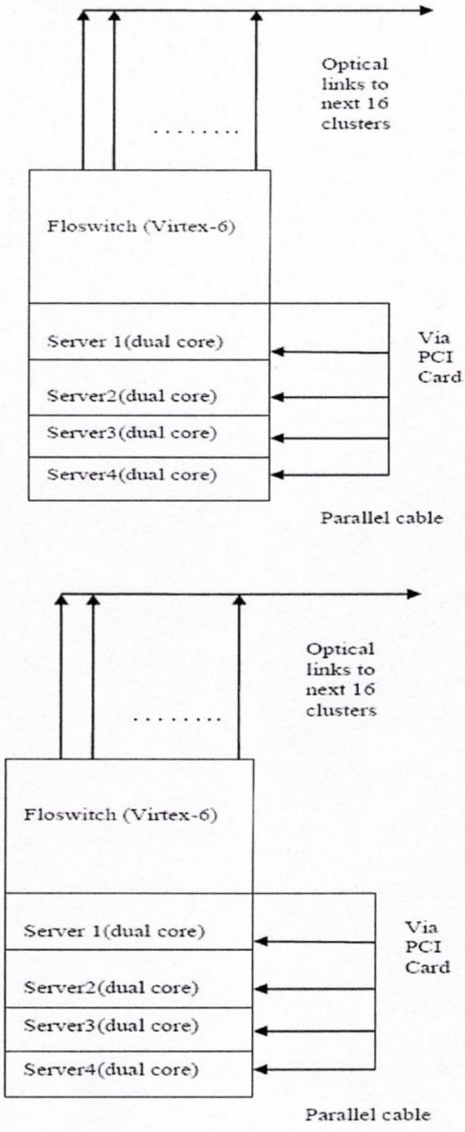
Optical links to next 16 clusters
....
Floswitch (Virtex-6)
Server 1(dual core)
Server2(dual core)
Server3(dual core)
Server4(dual core)
Via PCI Card
Parallel cable
Optical links to next 16 clusters
....
Floswitch (Virtex-6)
Server 1(dual core)
Server2(dual core)
Server3(dual core)
Server4(dual core)
Via PCI Card
Parallel cable

Fig. 1. Existing system interface

Such 128 clusters are linked via 16 Flo-optilinks (optical link) of FloSwitch for inter cluster communication (Flosolver Team (b)). So the FloSwitch is the prime communication device across the Mk8 super computer.

JNO=12(4

2.2. Proposed Design

While the multi FPGA chips are generally used for high intensive data handling calculations, will essentially enhance speed , reduce power as compared to earlier floswitches, and reduce the number of hops .This is achieved by employing Virtex 6 FPGAFPGA (XC6VLX550T, FF1759), using FPGA block memory instead of external DPM will reduce the data transfer rate, flexibility in the design and size of the board. Four FPGA's are arranged in a reconfigurable pattern in a manner that each FPGA can connect to every other FPGA via address, data bus and control signals.

3. Reconfigurable FloSwitch Expediency

The proposed design consists of four Virtex-6 FPGA's connected in a manner that each FPGA connects to every other FPGA via address (32bit) and data(64bit) bus in one to one. Here the design of the board is in such a way that all FPGA can read or write with other FPGA's in parallel. This lends the design of the FloSwitch flexiblele in terms of use of Virtex-6. Internal resources such as block RAM etc. are used for the memory to to all other connected FPGA's. In the existing design each cluster has one FloSwitch which has 4 parallel links for intra-cluster communication via PCI card interface and 16 optical links for inter-cluster communication.

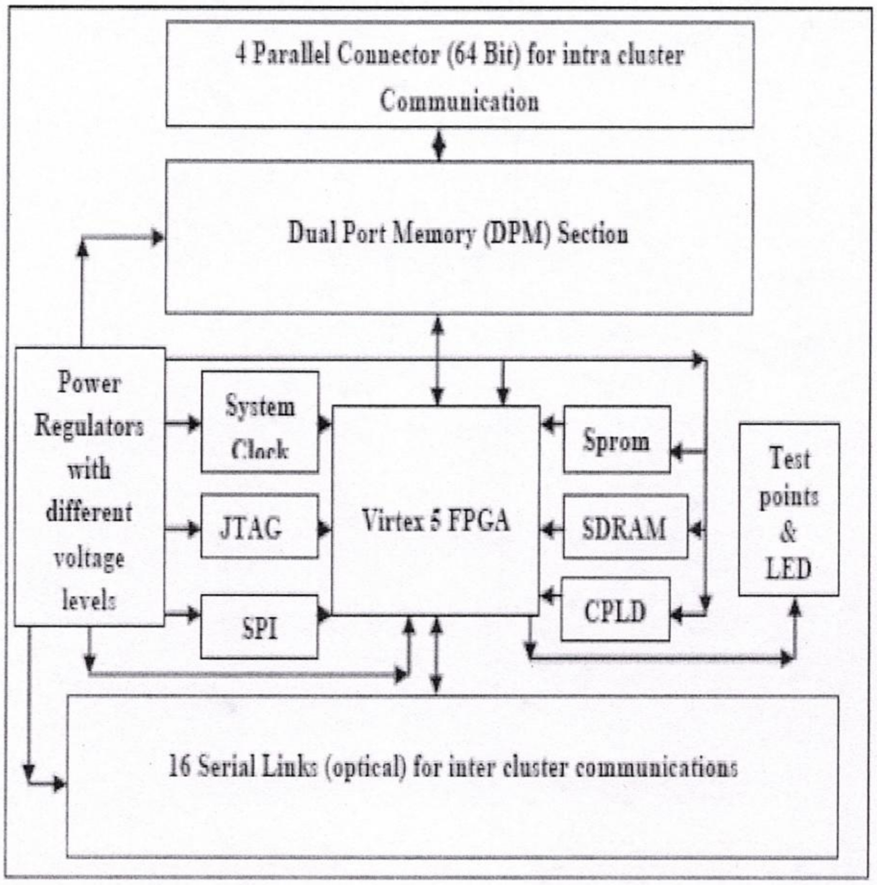
4 Parallel Connector (64 Bit) for intra cluster Communication
Dual Port Memory (DPM) Section
Power Regulators with different voltage levels
System Clock
JTAG
SPI
Virtex 5 FPGA
Sprom
SDRAM
CPLD
Test points & LED
16 Serial Links (optical) for inter cluster communications

Fig2. Existing Existing FloSwitch Design

Thus each cluster connects to next 16 clusters in the MK8 ,128 cluster supercomputer design .In the proposed design 80 optical links are available for both inter-cluster and intra-cluster communication. This entails that each cluster can connect to 80 processing elements (PE's), As a result more processing elements can have the communication using one FloSwitch, it is like a single cluster. This will eventually reduce the number of hops that information carrying from one server other server, thereby leads to an improvement in the communication system as a whole. As shown in Fig1 a single rack consists of four dual core servers (XEON processor). Intra-cluster communication is done in parallel, while serial optical links are used to connect to corresponding clusters.

The present system of FloSwitch can be upgraded with DPM's inside the FPGA [Virtex-6]. This will enhance the speed and reduce the area of the board while reducing the access time of the data from memory twice.This will be carried out while considering power reduction schemes.The power section will be addressed to improve further by bringing down the total power in the FloSwitch design. By using low power GTX optical transceivers, low voltage SRAM and PROM of the order of FPGA used considerable amount of power is reduced thereby enhancing the performance of the

SNO= 12(d)

system. Fig.1shown above explains how in the existing system intra-cluster and inter-cluster communication exists via parallel connectors (cables) and optical links respectively.

BLOCK DAIGRAM

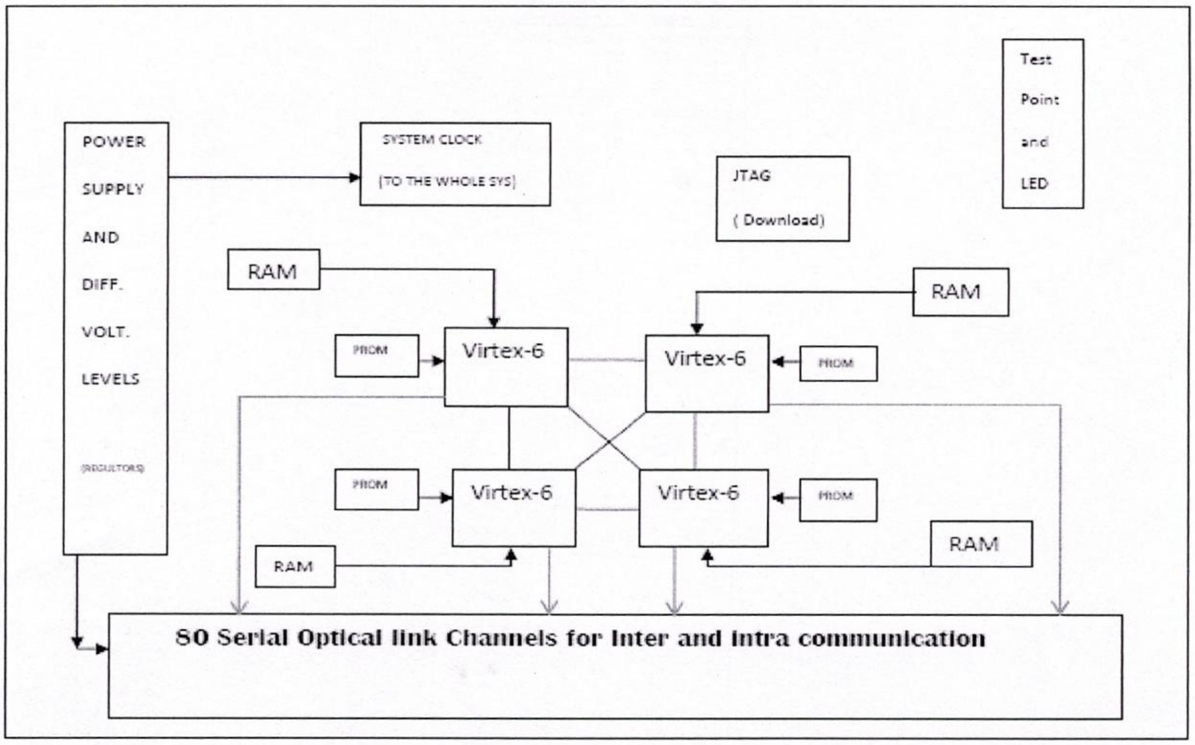

Fig. 3. Proposed FloSwitch Design.

4. Advantages over Existing Designs

While in the proposed design, the multicore FloSwitch can be connected in two configurations. First configuration proposes the use of FloSwitch as a centralized device with all the processing servers surrounding it. This means that all the eighty optical links coming out from the FPGAs will be used to connect to the servers directly. This will lead to great improvement in speed of the FloSwitch design as one to one communication between large number of servers will be possible , which was never possible in the earlier design. The second configuration as shown in fig4 entails the use of one FloSwitch in a manner that, it can firstly connect to sixteen other FloSwitches via optical links and also with sixty four servers directly. This is one of the option to show the inter cluster connectivity with one hop. For example Server 1 of first cluster to server 63 of the sixteenth cluster can be communicated in one hop. Here the total number of servers connected using sixteen Floswitches will be 1024. Total processing elements will be 2048. Earlier the sixteen FloSwitches can connect one to one was 64 server board as 128 processing elements. Therefore, over all there is a gain of 16 times more PE's can be connected.

4.1. Reduce the Number of Hops

In the parallel computing scheme, we define a hop as the communication from one PE to other PE. In computer networking, a hop represents one portion of the path between source and destination. When communicating over the Internet, for example, data passes through a number of intermediate devices (like routers) rather than flowing directly over a single wire. Each such device causes data to "hop" between one point-to-point network Connection and another. While in the case of parallel computers, each FloSwitch encountered leads to a hop and a delay since the proposed design aims to replace four switches by just one, it entails reduction in number of hops encountered also.

JNO= 12 (9

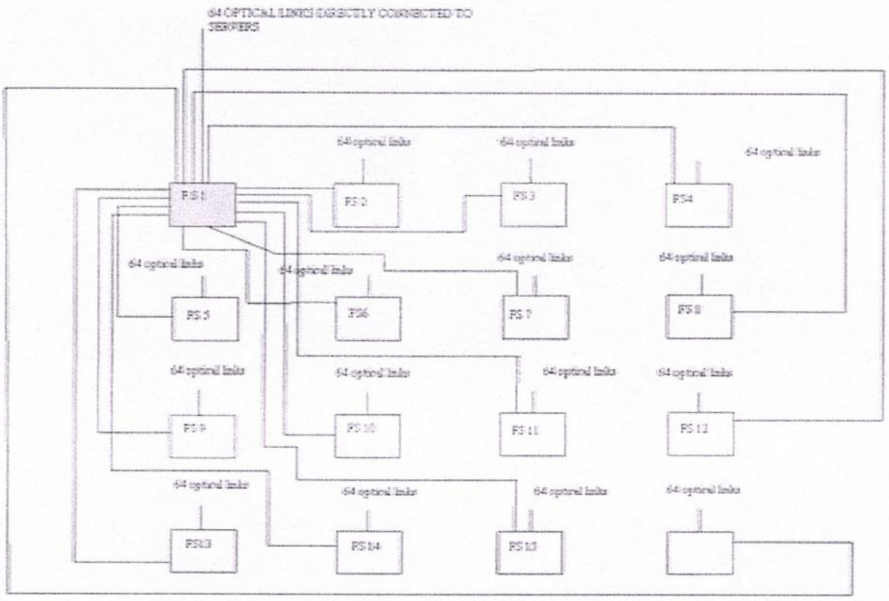
64 OPTICAL LINKS DIRECTLY CONNECTED TO SERVERS
FS 1
64 optical links
FS 2
64 optical links
FS 3
64 optical links
FS4
64 optical links
FS 5
64 optical links
FS6
64 optical links
FS 7
64 optical links
FS 8
64 optical links
FS 9
64 optical links
FS 10
64 optical links
FS 11
64 optical links
FS 12
64 optical links
FS13
64 optical links
FS 14
64 optical links
FS 15
64 optical links

Fig. 4. Proposed Floswitch interface with 64 servers' direct links and 16 other floswitches.

4.2. DPM removal and Block RAM:

In the existing design, one FloSwitch has 8 DPMs occupying a reasonable amount of space on the board. Four such switches carry 32 DPMs. The proposed design will use block RAM of the Virtex-6 FPGA instead, thereby reducing area of the board and also reducing the power consumed by the DPMs (Jagannatham, et al, 2013). Power consumed by one DPM is measured to be 1650 Mw. If we replace 32 DPMS, we are in fact saving 52.8 Watt of power consumption. This no. are useful as we grow system to a big parallel machine. Here the main advantage of the FloSwitch will be to have a one-type communication link as serial weather it is intra cluster or inter cluster communication

This design has been under taken to study the feasibility of the communication and the advantage over making a big system for big data and intense communication applications.

Table 1 Comparative analysis of Proposed and Existing Designs

COMPONENTS	EXISTING SYSTEM	PROPOSED SYSTEM
FPGA	12.217 W(Virtex-5) 12.17 × 4 = 48.6 W	13.645 W(Virtex-6) 13.645 ×4= 54.6 W
SDRAM	528 mW	63mW
FLASH MEMORY	49.5 mW (SPI)	54 mW (BPI)
SFP	990mW	792mW
TRANSCEIVERS	990 × 64= 64 W	792× 64= 50 W
CLOCKING CIRCUIT	115.5 mW	45 mW

5. Acknowledgement

I would like to thank the Flosolver Unit, NAL, who cooperated with me in this endeavour. Our vote of thanks would be incomplete without the mention of Mrs. Rajalakshmy Sivaramakrishnan, HOD Flosolver Unit, and NAL. In addition, the college authorities deserve a special mention for they believed that we could go through with the new design.

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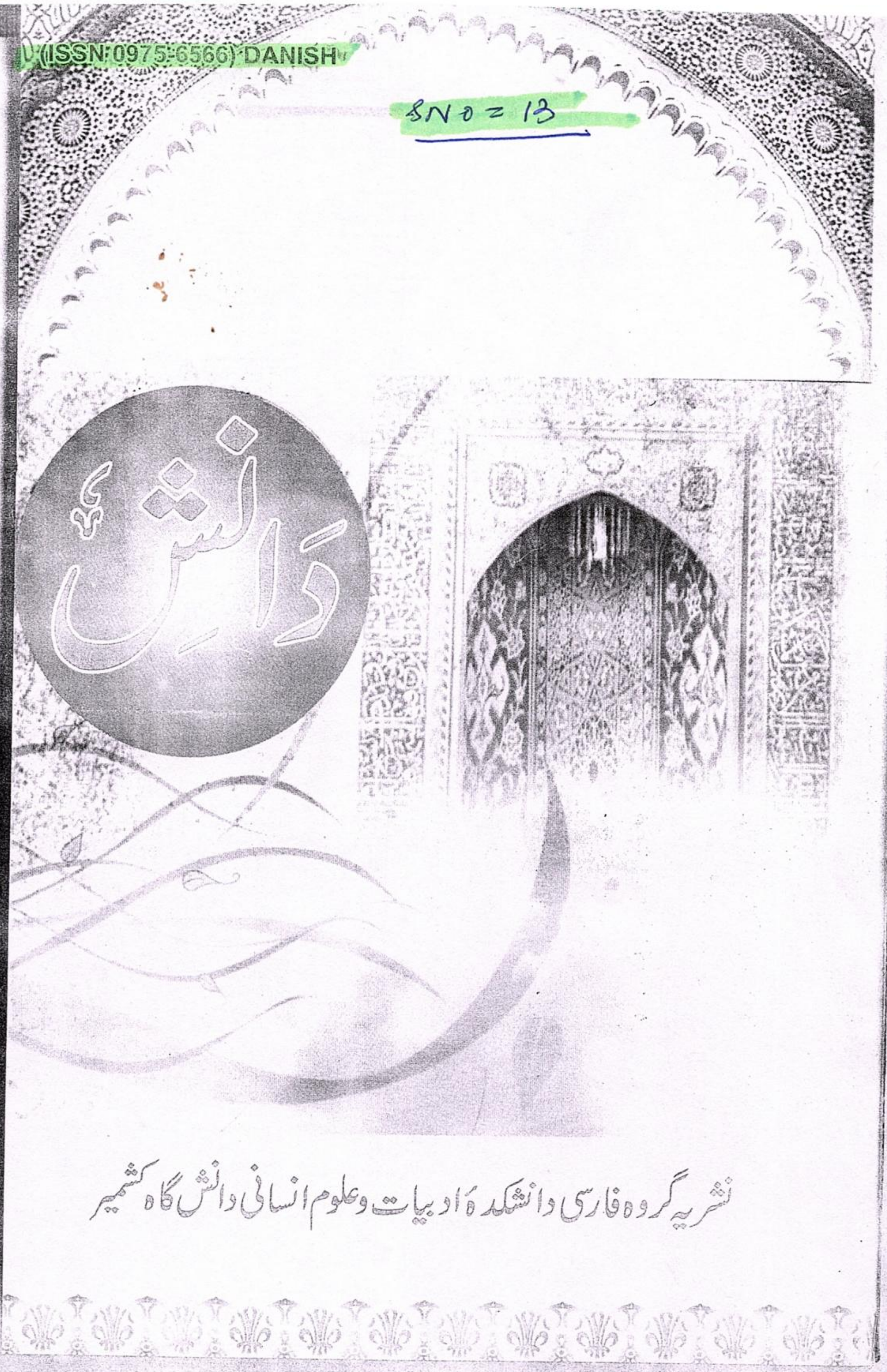

دانش

نشریه گروه فارسی دانشکدهٔ ادبیات و علوم انسانی دانش گاه کشمیر

SNO = 13 (a)

حافظ شاه نواز شاه

استادیار، گروه زبان ادبیّات فارسی، دانشگاه کشمیر

همسانی ها در اشعار حکیم ناصر خسرو و علّامه اقبال

آدمی قبل از آنکه بشناخت جهان پیرامون خود و نیک و بد آن بپردازد، باید خود را بشناسد و گنجینه های فطرت و نهاد خود را کشف نماید و آنها را به کمال برساند و امیال نفسانی و شهوانی خود را تعدیل کند. در این صورت است که به بزرگ ترین سعادت نایل می شود. امّا اگر غفلت بورزد و استعدادهای خود را نیابد و فقط نیازهای مادی و امیال نفسانی و حیوانی خود را برآورد، گرفتار خسران می گردد و از مرتبهٔ انسانیت به حیوانیت تنزّل می کند. دعوت به شناخت انسان از توصیه های مهم پیامبران الٰہی، عالمان اخلاق، عارفان و فیلسوفان اسلام است و انسان خود نیز اهمیت آن را احساس می کند. البتّہ، آدمی از جهات مختلف، موضوع شناخت و علوم گونا گون است. روان شناسی، جامعه شناسی، تاریخ، اخلاق، پزشکی، اندام شناسی، زیست شناسی و هر کدام، از نظرگاه خاصی انسان را مورد مطالعه قرار می دهند؛ امّا منظور از شناخت انسان در این مبحث، آن است که او دارای استعدادها و نیروهایی برای فهم خود و جهان و تکامل انسانی است. اگر انسان با تأمل و تفکّر، امکانات و استعدادهایی که برای رشد و تکامل در او آفریده شده است، بشناسد، بهتر می تواند سرمایه های وجودی خود را بکمال

برساند۔ قرآن انسان را به خودشناسی دعوت می کند۔

چون در قرآن آمده۔ ''فلینظر الانسان ممّ خلق (انسان باید بنگرد که از چه آفریده شده است)[1]

وهمان طور به جای دیگر آمده است که۔ ''اولا یذکر الانسان انّاخلقنٰه من قبل ولم یک شیئاً (آیا انسان به یاد نمی آورد که ما او را آفریدیم وحال آنکه چیزی نبوده است)[2]

در این راه، اوّلین راهنمای انسان قرآن وسنّت رسولؐ است و بعد از آن کسانی که راجع به این موضوع مهم از راه آثار خود افکار خودشان را مطرح کرده باشد۔ حکیم ناصر خسرو یکی از اوّلین فیلسوفان و شاعران قرن پنجم است که موضوع ''خودشناسی'' را به طور مفصّل در ابیاتِ خود ابراز کرده است چون حکیم حافظ قرآن بوده[3] بنابراین منزل مقصود انسان واحتیاجات روحانی و جسمانی را در نظر گرفته، واصول وقوانین خودشناسی از طریق راهنمای قرآن در ابیات خود بیان نموده و بعد از او یعنی نه قرن بعد دکتر علاّمه اقبال لاهوری در این موضوع کار مهمّی انجام داده است۔ ما می توانیم دربارۂ ادراک معنی وحقیقت خودی از فکر ایشان استفاده کنیم۔ همین طور دکتر علاّمه اقبال اصول وقوانین خودی را جا به جای در آثار خود برای انسان مطرح نموده است۔ با در نظر گرفتن آثار هر دو شاعر وفیلسوفان، به نظر می رسد که علاّمه اقبال تحت تأثیر افکار ناصر خسرو بوده است۔ علاّمه اقبال در جای گفته است که با حکیم ناصر خسرو در عالم روحانی ملاقات کرده است و در مورد این ملاقات خود در ''جاوید نامه'' اینطور می گوید: ''نمودار می شود روح ناصر خسرو علوی وغزلی مستانه سرا یید ه غائب می شود'' بعد از

SNo=13(b)

این تعدادی از اشعار ناصر خسرو را در جاوید نامه نقل کرده است که دربارۂ اهمیت قلم وتیغ است۔[4]

دست را چون مرکبِ تیغ وقلم کردی مدار هیچ غم گر مرکبِ تن لنگ باشد یا عرن
از سر شمشیر و از نوک قلم زاید هنر ای برادر همچو نور از نار و نار از نارون
بی هنر دان نزد بی دین هم قلم هم تیغ را چون نباشد دین نباشد کلک وآهن را ثمن
دین گرامی شد بدانا و بنادان خوار گشت پیش نادان دین چو پیش گاو باشد یاسمن
همچو کرباسی که از یک نیمه زو الیاس را کرته آید وز دگر نیمه یهودی را کفن[5]

علاّمه اقبال علاوه بر قرآن، از کتاب مثنوی معنوی از مولانا جلال الدین رومی استفاده نموده ومولانا رومی را بعنوان مربّی، مرشد واستاد عقیدت می ورزد علاّمه اقبال در یکی از سفرهای خود به افغانستان، به آرامگاه شاعر معروف حکیم سنائی غزنوی رفته، زیارتِ قبر ایشان کرد۔ چون علاّمه اقبال بعد از مولانا رومی، حکیم سنائی را بعنوان استاد معنوی خود ارادت می ورزد، بعد از زیارت قبر حکیم سنائی با چشمان اشک آلود بیتهای زیر را سرود۔ در ابیات زیر هویدا است که حکیم ناصر خسرو را نیز با مولانا رومی وحکیم سنائی یاد کرده است۔ از ابیات زیر واضح می گردد که علاّمه اقبال، ناصر خسرو را در جنبهٔ استادان وارادتمندان معنوی خود یاد می کند۔

عطا کن شور رومی، سوز خسرو عطا کن صدق و اخلاص سنائی
چنان با بندگی در ساختم من نه گیرم گر مرا بخشی خدائی[6]

محیطی که انسان در آن زندگی می کند بر فکرش اثر عمیق دارد، اگر چه این بزرگان در ادوار مختلف وکشورهای مختلف زندگی می کردند ولی دور ایشان اغلب یک جور بوده

3 No = 13(c)

است، وقتی که ناصر خسرو جوان شد، کشور ایران و بالخصوص خراسان زیر تسلط غیر بومیان یعنی غزنویان بوده و بعد از ایشان سلجوقیان بوده و مردم این کشور از حقوق سیاسی، اجتماعی، اقتصادی و مذهبی محروم بوده اند و همین طور شبه قارهٔ هند زیر تسلط انگلیسی ها بوده و مردم از حقوق سیاسی، اجتماعی و مذهبی محروم بودند، لذا هر دو شاعر حساس از انتشار و اوضاع کشورهای خود ناراحت بوده اند۔

حکیم ناصر خسرو در مورد اوضاوع ناراحت کننده کشور خود این طور اشاره می کند۔

خراسان جای دونان شد نه گنجد　　به یک خانه درون آزاده با دون
نداند حال و کار من جز آن کس　　که دو نانش کنند از خانه بیرون
همانا خشم ایزد بر خراسان　　بر این دو نان ببارید است گردون
که اوباشی همی بی خان و بی مان　　در او امروز خان گشتند و خاتون[7]

علامه اقبال می گوید۔

شرق و غرب آزاد و ما نخچیر غیر　　خشت ما سرمایهٔ تعمیر غیر
زندگانی بر مراد دیگران　　جاودان مرگ است نی خواب گران
هندیان با یک دیگر آویختند　　فتنه های کهنه باز انگیختند
تا فرنگی قومی از مغرب زمین　　ثالث آمد در نزاع کفر و دین[8]

چون هر دو شاعر از شورش و فتنهٔ سیاسی در کشورهای خودشان ناراحت بودند ولی می خواستند که مردمان با یک دیگر به طور برادرانه زندگی می کنند، لذا هر دو شاعر به توسط ابیات و آثار دیگر خودشان این اطلاع به مردمان می رسانند به طور مثال ابیات زیر را توجه کنید۔

بهین کاری که اندر زندگانیست　　نکوخواهی بکس راحت رسانید
تو گر توفیق داری هم بران باش　　نکوخواه و بکس راحت رسان باش
بلطف و مرحمت دلها نگهدار　　کس از دست و زبان میازار
بکار افتاده کار آموز میباش　　بهر دل سوخته دلسوز میباش
علاج دردمندان کن بهر درد　　که هر کس که جراحت کرد بدکرد
چو مرحم خسته را راحت رسان باش　　ببختی چارهٔ بیچارگان باش[9]
(ناصر خسرو)

علامه اقبال به فرزند خویش به نام جاوید این طور خطاب می کند۔

حرف بد را بر لب آوردن خطاست　　کافر و مؤمن همه خلق خدا است
آدمیت احترام آدمی　　باخبر شو از مقام آدمی
آدمی از ربط و ضبط تن به تن　　بر طریق دوستی گامی به زن
بندهٔ عشق از خدا گیرد طریق　　می شود بر کافر و مؤمن شفیق
کفر و دین را گیر در پهنای دل　　دل اگر بگریزد از دل، وای دل[10]

ایزد متعال در قرآن مقدس فرموده است "و فی الارض آیات للموقنین۰ و فی انفسهم افلا تبصرون۔ [11]و در زمین برای جویندگان علامت های وجود دارند و در اندرشان نیز علامت ها موجود است آیا شما نمی بینید؟!] با در نظر گرفتن این آیت مذبور، ما می توانیم حدس بزنیم که خودشناسی در قرآن چیست؟۔ ناصر خسرو و علامه اقبال هر دو از قرآن حکیم و علوم اسلامی مطالعهٔ عمیق دارند۔ ناصر خسرو چه در کتابهای منثور و اشعار خود "خودشناسی" را موضوع فلسفهٔ خود

بناساخته واقبال نیز ''خودی'' را موضوع فلسفهٔ خود ساخته است۔ ناصر ترقی روحانی و اخلاقی را کمال می گوید واقبال همان چیز را ''تکمیل خودی'' می گوید، مقصود و مفهوم هر دو شاعران یکی است وهر دو برای ترقی روحانی واخلاقی انسان چند وهله تجویز فرموده اند ، که تا انسان از خواب غفلت بیدار شود و مقام اصلی خود بدست بیاورد۔ لذا در نظر ایشان خودشناسی، مهم ترین بنیاد برای رشد و ترقی کردن ایمان است۔ وقتی که انسان خود را می شناسد، خدا را می شناسد چنانکه مشهور است که ''من عرف نفسهٗ فقد عرف ربّهٗ''

ناصر خسرو در مورد خودشناسی می گوید۔

بدان خود را که گر خود را بدانی   زخود هم نیک وهم بد را بدانی
شناسی وجود خویشتن شو   پس آنگه سرفراز انجمن شو
ندانی قدر خود زیرا چنینی   خدا بینی اگر خود را ببینی
ترا نه چرخ وهفت اختر غلام است   تو شاگردتنی حیفی تمام است [۱۲]

علاّمہ اقبال در بارهٔ خودی می گوید۔

برتر از گردون مقام آدم است   اصل تهذیب احترام آدم است [۱۳]
مقام تو برون از روزگار است   طلب کن آن یمین کو بی یسار است [۱۴]
بمقام خود رسیدن زندگی است   ذات را بی پرده دیدن زندگی است [۱۵]
اگر چشمی گشایی بر دل خویش   درون سینه بینی منزل خویش
سفر اندر حضر کردن چنین است   سفر از خود به خود کردن همین است
کمال زندگی دیدار ذات است   طریقش رستن از بند جهات است

SNo=13(d)

چنان باذات، حق خلوت گزینی   ترا او بیند و اورا تو بینی [۱۶]

اطاعت ایزد متعال و اطاعت رسولؐ برای مسلمانان لازم است، ایمان انسان به خدا و طاعتش اوّلین شرط مسلمانی است۔ ناصر خسرو وهم علاّمه ترقی روحانی واخلاقی انسان، ایمان را لازم می دانند و برای این خودشناسی وخودی را مهم ترین وسیله ای می شمارند۔

در بارهٔ اطاعت حکیم ناصر خسرو می گوید۔

به طاعت بست شاید روز وشب را   به طاعت بندمش سازان و پایان
به طاعت برد باید این جهان را   که گوید کاین جهان را برد نتوان
به فرمان های یزدان تا تو باشی   بیاید مر ترا گیتی به فرمان [۱۷]

ودر بارهٔ اطاعت وشفاعت رسول ﷺ ناصر خسرو می گوید۔

پشتم قوی به فضل خدای است وطاعتش   تا در رسم مگر به رسولؐ و شفاعتش
پیش خدای نیست شفیعم مگر رسولؐ   دارم شفیع پیش رسول آل عترتش
با آل اوروم سوی او نیست هیچ باک   برگیرم از منافق ناکس شناعتش
آن را که جود نام نهادش رسول حقؐ   امروز نیز اوست سوی خلق کنیتش [۱۸]

همین طور ایمان داشتن به روز آخرت و قیامت لازم است۔ لذا برای انسان لازم است که زادراه آماده کند، بهترین زادراه فکر سفر آخرت، علم با عمل وحکمت دین است۔

ناصر خسرو در بارهٔ روز قیامت همینطور می گوید۔

آن دان به یقین که هر چه کردستی   امروز به محشر آن فروخوانی

SNo=13(e)

زان روز کہ جز خدای سبحان را		برکس نرودز خلق سلطانی
زآن روز کہ ھول او بریزاند		نورازمہ و زآفتاب رخشانی ۱۹

بعد از آوردن ایمان بہ خدا و پیغمبرش و روز آخرت، لازم است کہ انسان ھمیشہ در سعی باشد کہ تعلق خود را با خالق کائینات بوسیلۂ عبادت قوی تر بکند و ہیچ وقت از خدا غافل نباشد۔ ناصر خسرو دربارۂ عبادت می گوید۔

دمی از حق مشو غافل در این راه		چو می دانی کہ آید مرگ ناگاه
از و خواه استعانت در ھمہ کار		کہ چون او کس نباشد مرترا یار
توکّل در ھمہ کاری برو کن		زغیر او بگردان رو در او کن
ثبات دولت و دین راستی دان		زکذب این ھر دو را کم کاستی دان ۲۰

منظور و مقصود از ایمان و عبادت عمل نیک است، اصلاً علامت ایمان عمل صالح است اگر ایمان قوی تر باشد پس انسان را برای اعمال صالح وادارمی سازد۔ ناصر خسرو می گوید۔

گیتی بہ مثل سرای کار است		تا روز قیام و نفخت صور
جز کار کنی بدین ازین جا		بیرون نشود عزیز و مستور
گر کار کنی عزیز باشی		فردا کہ دھند مزد مزدور ۲۱
شبان گشت موسی بکردار نیک		چنان چون شنیدی برین خفتہ رم
بہ فعل نیکو جملہ عاجز شدند		فرومایہ دیوان ز پر مایہ جم ۲۲

برای دانستن و فہمیدن مقصود ایمان، عبادت و عمل، علم و حکمت لازم است، بہ وسیلۂ این بہ مقصود اصلی یعنی بہ کمال انسانیت توان رسد! ناصر خسرو می گوید۔

ترا خدای ز بہر بقا پدید آورد		تراز خاک و ھوا و نبات و حیوان را
نگاه کن کہ بقارا چگونہ می کوشد		بخوردگی منگر دانۂ سپندان را
بقا بہ علم خدا و رسولؐ و قرآن است		سرای علم و کلید و در است قرآن را
اگر بہ علم و بقا ہیچ حاجت است ترا		بہ سوی در بشتاب و بہ جوی دربان را ۲۳

ھر دو شاعر دربارۂ علم و حکمت و عمل فکر یکجو ر دارند۔

تنھا نہ ای امروز چون نکوشی		کز علم و عمل برشوی بہ جوزا
گر تخم تو آب خرد بیابد		شاخ تو بر آرد سر از ثریّا ۲۴

علاّمہ اقبال می گوید:

گفت حکمت را خدا خیر کثیر		ھر کجا این خیر را بینی بگیر
علم و حرف و صوت را شہپر دھد		پاکی گوھر بہ ناگوھر دھد
علم را بر اوج افلاک است رہ		تاز چشم مہر برکندد نگہ ۲۵

فلسفۂ خودی علاّمہ اقبال کہ وی در مثنوی ''اسرار خودی'' و ''رموز بی خودی'' بیان نمودہ است ھمان خودشناسی ناصر خسرو است۔ علاّمہ اقبال دربارۂ فلسفۂ خودی می گوید۔

نقطۂ نوری کہ نام او خودی است		زیر خاک ما شرار زندگی است ۲۶

و در شعر اردوی می گوید:

خودی وہ بحر ہے جسکا کوئی کنارہ نہیں		تو آبجو اسے سمجھا اگر تو چارہ نہیں ۲۷

SNO = 13(F)

خودی کو کر بلند اتنا کہ ہر تقدیر سے پہلے　　خدا بندے سے خود پوچھے بتا تیری رضا کیا ہے

(کلیات اقبال) علاّمہ اقبال

(یعنی خودی خود را به آن قدر بالا رسانید که قبل ازهر تقدیری خدا از انسان پرسد، بگو رضایت چیست؟

مثل حکیم ناصر خسرو، علاّمه اقبال نیز برای تکمیل خودی چند مراحل تجویز می کند۔ به نظر علاّمه اقبال اطاعت، بنیان تکمیل خودی است، چون انسان به تکمیل خودی می رسد پس ازآن ازحالت جبر به اختیار می رسد۔ علاّمه می گوید:

در طاعت کوش ای غفلت شعار　　می شود از جبر پیدا اختیار
ناکس از فرمان پذیری کس شود　　آتش ار باشد ز طغیان خس شود
هر که تسخیر مه و پروین کند　　خویش را زنجیری آیین کند
باطن هر شی ز آیینی قوی　　تو چرا غافل ازین سامان روی
شکوه سنج سختی آیین مشو　　از حدود مصطفیؐ بیرون مرو ۲۸

ضبط نفس برای خودی وهم برای انسانیت خیلی مهم است۔ اطاعت خالق کائنات ،انسان را از بد کردن و اندیشیدن جلوگیری می کند، به وسیلهٔ ضبط نفس اماره، او می تواند که خودی خود را به تکمیل به رساند، علاّمه اقبال می گوید:

هر که بر خود نیست فرمانش روان　　می شود فرمان پذیر از دیگران
هر که حق باشد چو جان اندر تنش　　خم نگردد پیش باطل گردنش
خوف را در سینهٔ او راه نیست　　خاطر مرعوب غیرالله نیست
هر که در اقلیم لا آباد شد　　فارغ از بند زن و اولاد شد

می کند از ما سوی قطع نظر　　می نهد ساطور بر حلق پسر ۲۹

چون انسان پابند آیین می شود، برایش ضبط نفس کردن که مخزن بدی ها است آسان می گردد و سفر تکمیل خودی برایش آسان می گردد، حتیٰ که تا مقام انسانیت برسد و بنده اطاعت گذار می گردد و نیابت الٰهی نصیبش می شود!

علاّمه اقبال دربارهٔ نایب می گوید:

نایب حق در جهان بودن خوش است　　بر عناصر حکمران بودن خوش است
نایب حق همچو جان عالم است　　هستی او ظل اسم اعظم است
از عصا دست سفیدش محکم است　　قدرت کامل به علمش توأم است
خیز و قانون اخوت ساز ده　　جام صهبای محبت باز ده
باز در عالم بیار ایام صلح　　جنگجویان را بده پیغام صلح ۳۰

ناصر خسرو و علاّمه اقبال در افکار های زیادی متفق اند، من می خواهم بعضی از آنها به طور مثال به نویسم۔

این دو مرد بزرگ به احتیاج استاد روحانی قائل بودند۔ استادِ روحانی ناصر خسرو، المؤید فی الدین شیرازی بوده و استادِ روحانی اقبال مولانا جلال الدین رومی بوده است۔

ناصر خسرو دربارهٔ استادِ روحانی خود می گوید:

شب من روز رخشان کرد خواجه　　به برهان های چون خورشید رخشان
سوی من خوار شد مرگ طبیعی　　از آن پس کم چشانید آب حیوان
ز گوشهٔ منظر او بنگریدم　　به زیر خویش دیدم چرخ گردان

مرا نمود حاضر هر دو عالم   بیک جا در تنم پیدا و پنهان [۳۱]

علاّمه اقبال دربارهٔ استادِ روحانی خود می گوید: ؎

پیر رومی مرشد روشن ضمیر   کاروان عشق و مستی را امیر
منزلش برتر ز ماه و آفتاب   خیمه را از کهکشان ساز د طناب
نور قرآن درمیان سینه اش   جام جم شرمنده از آئینه اش
از نی آن نی نواز پاک زاد   باز شوری در نهاد من افتاد
گفت جانها محرم اسرار شد   خاور از خواب گران بیدار شد [۳۲]

ناصر خسرو و علاّمه اقبال روح انسان را نور خدا می شمارند و همان نور را اصل زندگی انسان بشمارند، باید که آن را به مقام بالا یعنی به مقام اصلی اش برساند: ؎

ناصر خسرو

بارانی تنت اگر گلیم آمد   مرجان ترا تن است بارانی
این جامه و جامه پوش خاک آمد   تو خاک نئی که نور یزدانی [۳۳]

علاّمه اقبال

جوهر نوریست اندر خاک تو   یک شعاعش جلوه ی ادراک تو
خوگر پیکار پی هم دیدمش   هم خودی هم زندگی نامیدمش [۳۴]

در نظر ناصر خسرو و علاّمه اقبال انسان بر مقام انسانیت به وسیلهٔ همان روح می رسد و اصل زندگی انسان روحش است لذا برای انسان لازم است که روح را در تنش رشد و ترقی بدهد و به مقام بالای خودش برساند که جای اصلی اوست۔

ناصر خسرو

نگاه کن که چه چیز است در تنت که تنت   بدوست زنده و ز و حسن و زیب و فر دارد
چه گوهر است که یک مشت خاک در تن ما   به فرّ و زینت از او گونه گون هنر دارد [۳۵]
گر طعام جسم نادان را همی خری به زر   مر طعام جان دانا را به جان باید خرید [۳۶]

علاّمه اقبال

با تو گویم رمز باریک ای پسر   تن همه خاک است و جان والا گهر
جسم را از بهر جان باید گداخت   پاک را از خاک می باید شناخت [۳۷]

طمع و حرص بدترین اخلاق آدمی است، این حرص است که انسان را هم در این دنیا ذلیل می کند و هم از عقبیٰ محروم می سازد۔

ناصر خسرو

دیو است حریص و کام او حرصش   بشناس به هوش دیو و کامش را
چون صورت و کار دیو را دیدی   بگذار طریقت نغامش را [۳۸]
اسپِ آزت سوی بدبختی برد   زین بخت بد فرونه زین عقال [۳۹]

علاّمه اقبال

محکم از حق شو سوی خود گام زن   لات و عزای هوس را سر شکن
از سوال آشفته اجزای خودی   بی تجلی نخل سینای خودی
وای بر منت پذیر خوان غیر   گردنش خم گشته ی احسان غیر [۴۰]

دربارهٔ تقلید این طور اظهار خیال می کنند:

JNO = 13(A)

ناصرخسرو

زیراکه علم دینی پنهان شد   چون کار دین وعلم به غوغا شد
مپذیر قول جاهل تقلیدی   گرچه به نام شهره ی دنیا شد
چون وچرا بجوی که برجاهل   گیتی چون حلقه تنگ ازینجا شد [۴۱]
تقلید نپذیرفتم و حجّت نهفتم   زیراکه نه شدحق به تقلید شهر [۴۲]

علاّمه اقبال

چاک کن پیراهن تقلیدرا   تابیاموزی ازوتوحیدرا [۴۳]

مذمّت پادشاه ظالم

ناصرخسرو

ای غرّه شده به پادشایی   بهتر بنگر که خود کجایی
تو سوی خرد ز بندگانی   زیراکه به زیر بندهایی
آنکس که ببند بسته باشد   هرگزکه دهدش پادشائی
زیراکه زخلق خواستن چیز   شاهی نبود بُوّد گدایی [۴۴]

علاّمه اقبال

گفت شیخ این زرحق سلطانی ماست   آنکه در پیرهن شاهی گداست
سطوتش اهل جهان رادشمن است   نوع انسان کاروان، اورهزن است [۴۵]

ایمان یک نعمت عالی ازطرف خداوندمتعال برای انسان است وقتی که ایمان بدرجهٔ کمال می رسدوانسان به عشق الهی مستغرق می شودوانسان خودراوهم همه کارهای

گوناگونی خودرابه خالق خویش می سپردتا که از شرّ نفس خویش (نفس امّاره) وهم از شیطان لعین آزاد بماند، لیکن با این همه شیطان انسان راتعقیب کند۔ لذا انسان را برای بدکردن خویش ضرری رسدوبرای آن ضررخدارا شکوه می کند۔ همین طورناصرخسرو وعلاّمه اقبال ازخالق ومالک خودشکوه کرده اندوجواب هم داده اند۔

شکوه وجواب شکوهٔ ناصرخسرو:

شکوه

توگرخلقت نمودی بهر طاعت   چرابایست شیطان آفریدن
سخن بسیار باشد جرأتم نیست   نفس از ترس نتوانم کشیدن
ولی بر عدل و بر احسان نه زیبد   به جای خویش غیری راگزیدن
به جانم رشتهٔ لهو و لعب را   توانم دادی از لذّت شنیدن
خدایا راست گویم فتنه از تست   ولی از ترس نتوانم جغیدن
به ما فرمان دهی اندر عبادت   به شیطان دررگ وجانها دویدن
به ما اصرار داری در ره راست   به اودر پیچ و تاب ره بریدن
به ذات بی زوالت دون عدل است   به روی دوست دشمن راکشیدن
تو کز درگاه خویشت باز راندی   چرا بایست بر ما ره بریدن
همین دستی به دامان تو دارم   مروّت نیست دامن پس کشیدن
زمانی نیز از من مستمع شو   ز نُقل دیگرم باید چشیدن
شبی در فکر خاطر خفته بودم   طلوع صبح صادق در دمیدن [۴۶]

جواب شکوه

صدای آمد از بالا به گوشم   نهادم گوش در راه شنیدن
رسید از عالم غیبم سروشی   که فارغ باش از گفت وشنیدن
به غفاریم چون اقرار کردی   مترس از ساغر پیشین کشیدن
ازین گفتار بخشیدم گناهت   چه حاجت از بدونیک شنیدن
به هر نوعی که کس مارا شناسد   بود مستوجب انعام دیدن
ندارد کس ازین در نا امیدی   به امّید خودش باید رسیدن [۴۷]

علاّ مه اقبال شکوه و جواب شکوه ی خودش را به زبان اردو نوشته است۔

JNo = 13(ن)

شکوه

تجھ کو معلوم ہے لیتا تھا کوئی نام تیرا
قوّت بازوے مسلم نے کیا کام تیرا
نقش توحید کا ھر دل پر بٹھایا ہم نے
زیرِ خنجر بھی یہ پیغام سنایا ہم نے
تو ہی کہہ دے کہ اکھاڑا در خیبر کس نے
شہر قیصر جو تھا اس کو کیا سر کس نے [۴۸]

تیرے کعبے کو جبینوں سے بسایا کس نے
تیرے قرآن کو سینوں سے لگایا ہم نے

پھر بھی ہم سے یہ گلہ کہ ہم وفادار نہیں
ھم وفادار نہیں تو بھی تو دلدار نہیں
خندہ زن کفر ہے احساس تجھے ہے کہ نہیں
اپنی توحید کا کچھ پاس تجھے ہے کہ نہیں [۴۹]

بعد از شکوه، علاّ مه اقبال دعا می کند:

مشکلیں امّت مرحوم کی آسان کردے
مور بی مایہ کو ھمدوش سلیمان کردے
جنس نایابِ محبّت کو پھر ارزاں کردے
ھند کے دیر نشینوں کو مسلمان کردے
جوئے خوں می چکد از حسرتِ دیرینۂ ما
می تپد نالہ بہ نشتر کدۂ سینۂ ما [۵۰]

جواب شکوه

ہم تو مائل بہ کرم ہیں کوئی سائل ہی نہیں
راہ دکھلائیں کس سے رھرو منزل ہی نہیں
تربیتِ عام تو ہے، جوہر قابل ہی نہیں
جس سے تعمیر ہو آدم کی، یہ وہ گل ہی نہیں
کوئی قابل ہو تو ہم شانِ کئی دیتے ہیں
ڈھونڈنے والوں کو دنیا بھی نئی دیتے ہیں

SNo = 13(ٹ)

کس قدر تم پہ گراں صبح کی بیداری ہے
ہم سے کب پیار ہے! ہاں نیند تمہیں پیاری ہے
طبع آزاد پہ قید رمضان باری ہے
تمھی کہہ دو، یہی آئین وفاداری ہے

قوم مذہب سے ہے، مذہب جو نہیں تم بھی نہیں
جذب باہم جو نہیں، محفل انجم بھی نہیں
جن کو آتا نہیں دنیا میں کوئی فن، تم ہو
نہیں جس قوم کو پروائے نشیمن، تم ہو ۵۱

یوں تو سیّد بھی ہو مرزا بھی ہو افغان بھی ہو
تم سبھی کچھ ہو بتاؤ تو مسلمان بھی ہو
وہ زمانے میں معزز تھے مسلمان ہوکر
اور تم خوار ہوئے تارک قرآں ہوکر
تم ہو آپسمیں غضب ناک، وہ آپسمیں رحیم
تم خطا کار و خطا بین، وہ خطا پوش و کریم
چاہتے سب ہیں کہ ہوں اوجِ ثریا پہ مقیم
پہلے ویسا کوئی پیدا تو کرے قلبِ سلیم ۵۲

حکیم ناصر خسرو و علاّمہ اقبال اعتقاد دارند که ایشان سفر روحانی راطی نموده اند، ناصر در جریان این سفرتن تنها بود۔ امّا علاّمہ اقبال با مرشد معنوی خود یعنی با مولانا جلال الدین رومی این سفر را انجام داده است، علاّمہ اقبال می گوید که او در جریان این

سفر با روح های مختلف ملاقی شده است، یکی از آنها روح میر سیّد علی همدانی بوده است۔

ناصر خسرو

روانم نکتۂ باریک می دید   اگرچہ در شب تاریک می دید
بدیدم عالمی آباد و خرّم   درو جمعی ز ارواح مکرّم
زخود زنجیر چار ارکان گسستہ   بکندہ بند و زندان را شکستہ
همہ کردہ بہ ترک خانۂ گل   نهادہ روی جان در عالم دل
چنین گفتم بدان ارواح باهوش   کہ ای پاکان بار افکندہ از دوش
چہ بینید این چنین جاوید زندہ   همہ بار بلا از خود فگندہ
گلی بگداختہ نوری گزیدہ   شبی بگذاشتہ صبحی دمیدہ
چرا ما را خبر نہ دهید ازاین حال   زخود با ما نگوئید ایچ احوال
پرسیدم من از احوال انسان   بگفتم این گزیدہ راہ یزدان
زبان حال یکسر بر گشادند   جواب ما یکایک باز دادند
کہ ما در عالم باقی رسیدیم   همہ پیوند از آن فانی بریدیم
ازآن حالت چو باز آمد روانم   بشد عین الیقین بی شک گمانم ۵۳

در جریان این ملاقات روحانی، میر سیّد علی همدانی بہ یکی از سؤالهای اقبال را این طور پاسخ می دهد:

باتو گویم رمز باریک ای پسر!   تن همہ خاک است و جان والا گهر

جسم را از بہر جان باید گداخت پاک رااز خاک می باید شناخت
گر ببری پارہ‌ای تن را ز تن رفت از دست تو آن لخت بدن
لیکن آن جانی کہ گر دد جلوہ مست گر زدست اورا دھی آید بہ دست
جوھرش با ہیچ شی مانند نیست ھست اندر بند و اندر بند نیست
گر نگھداری بمیر د در بدن ور بیفشانی، فروغ انجمن
خویش را تا یافتن نابودن است یافتن، خود را بہ خود بخشودن است
ھرکہ خود را دید وغیر از خود ندید رخت اززندان خود بیرون کشید
تازجان بگذشت، جانش جان اوست ورنہ جانش یک دودم مھمان اوست ۵۴؎

SN6=13(K)

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۲۲۔ ایضاً، ص ۲۶۲

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SNo=13(4)

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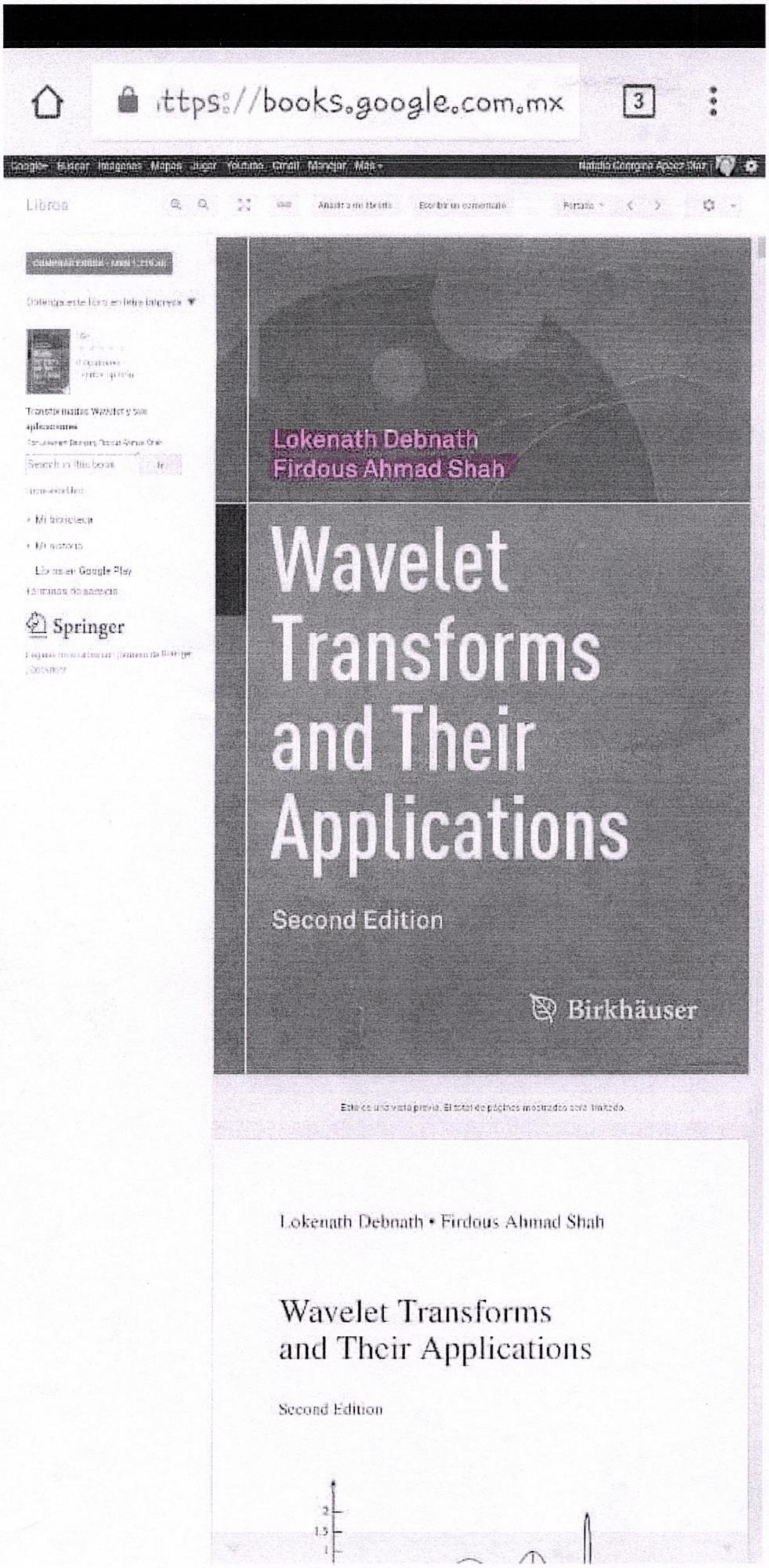
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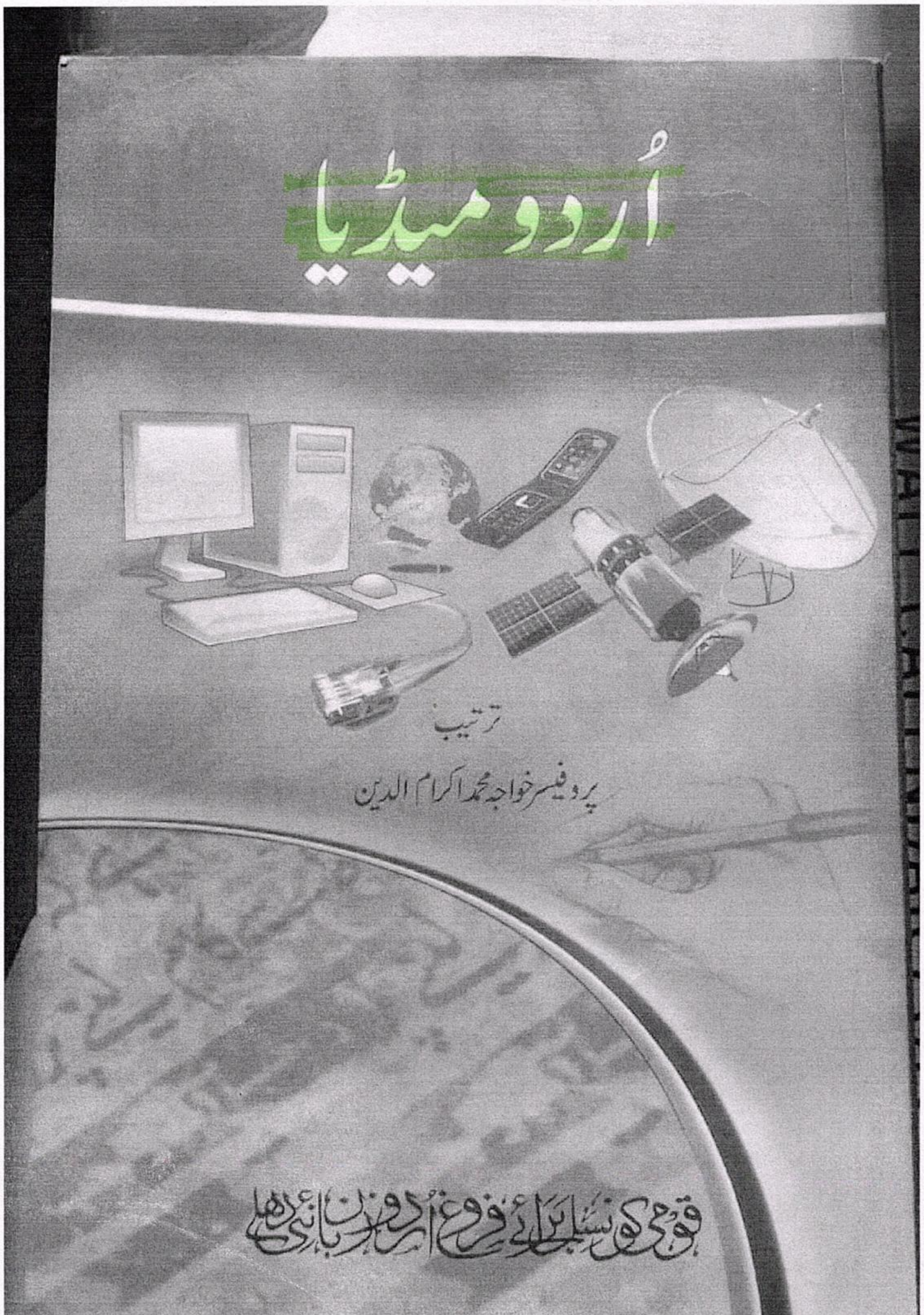

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ترتیب

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قومی کونسل برائے فروغ اردو زبان، نئی دہلی

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ناصر مرزا

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About the Book

The present work is aimed to lime light some important dimensions of Sistani life which through the centuries has evolved in a very distinctive form; incorporating the tribal geniuses, myths, beliefs, socio religious traditions, resistance movements; which has always given them a sense of pride and identity to the extent they proved themselves as a deterrent against foreign aggressions. They resisted Umayyads, Abbasids, Central Asian warriors like Tamerlane and others.

Chapter-1 presents a lucid introduction of Iran as a land of creativity and scholarship and a brief profile of Sistan, its distinctions in both physical and intellectual arena. In chapter-2, a brief sketch of the pre historic Sistan has been drawn and an abridged description of the ruling dynasties has been given; enabling us to understand how during the rise and fall of empires, Sistan gained momentum in the development of its civilization and culture and how alongside this rise and fall, the present area what is to be known as Iranian Sistan took shape. In chapter-3, an attempt has been made to bring into light the historical background of the tribes; there origin and immigration, ethnic composition, social structure and their characteristics. In chapter-4, a profile of personalities of socio-political importance, religious personalities, mystics, scholars and writers have been discussed who in their own times have [illegible] significant contributions to the society and thereby have stood the test of the times for history has saved their contribution for the posterity. In chapter-5, an analysis has been made of the traditional social structure of Sistani society; lime lighting their traditions, customs, values, social institutions, religious beliefs, myths and the other such factors.

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Dr. Abid Gulzar

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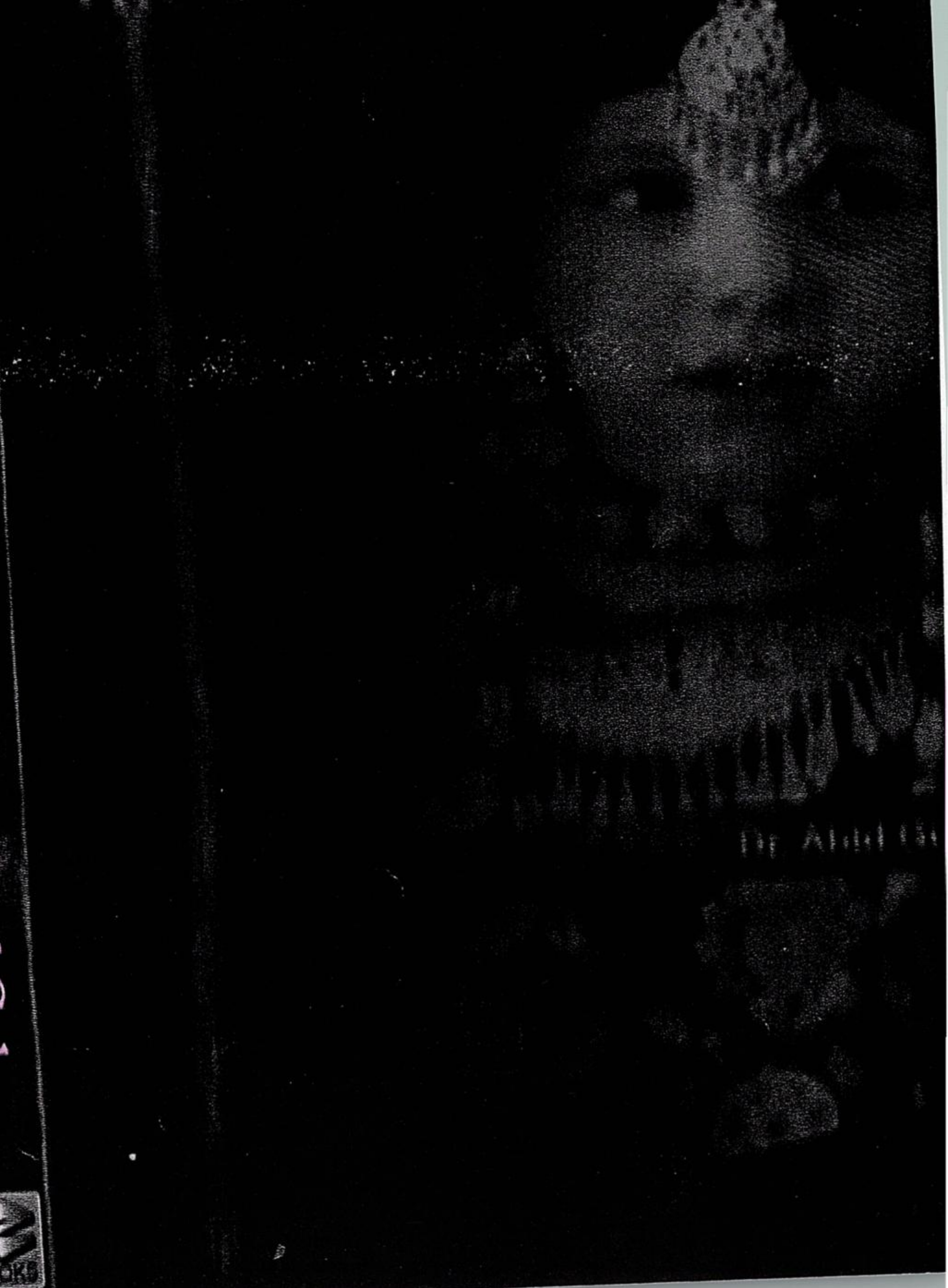

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The Pride of Persia

Dr. Abid Gulzar

Foreword by

Prof. (Dr) Gulshan Majid
Formerly Director
CCAS, University of Kashmir

Zikra International Publishers
New Delhi

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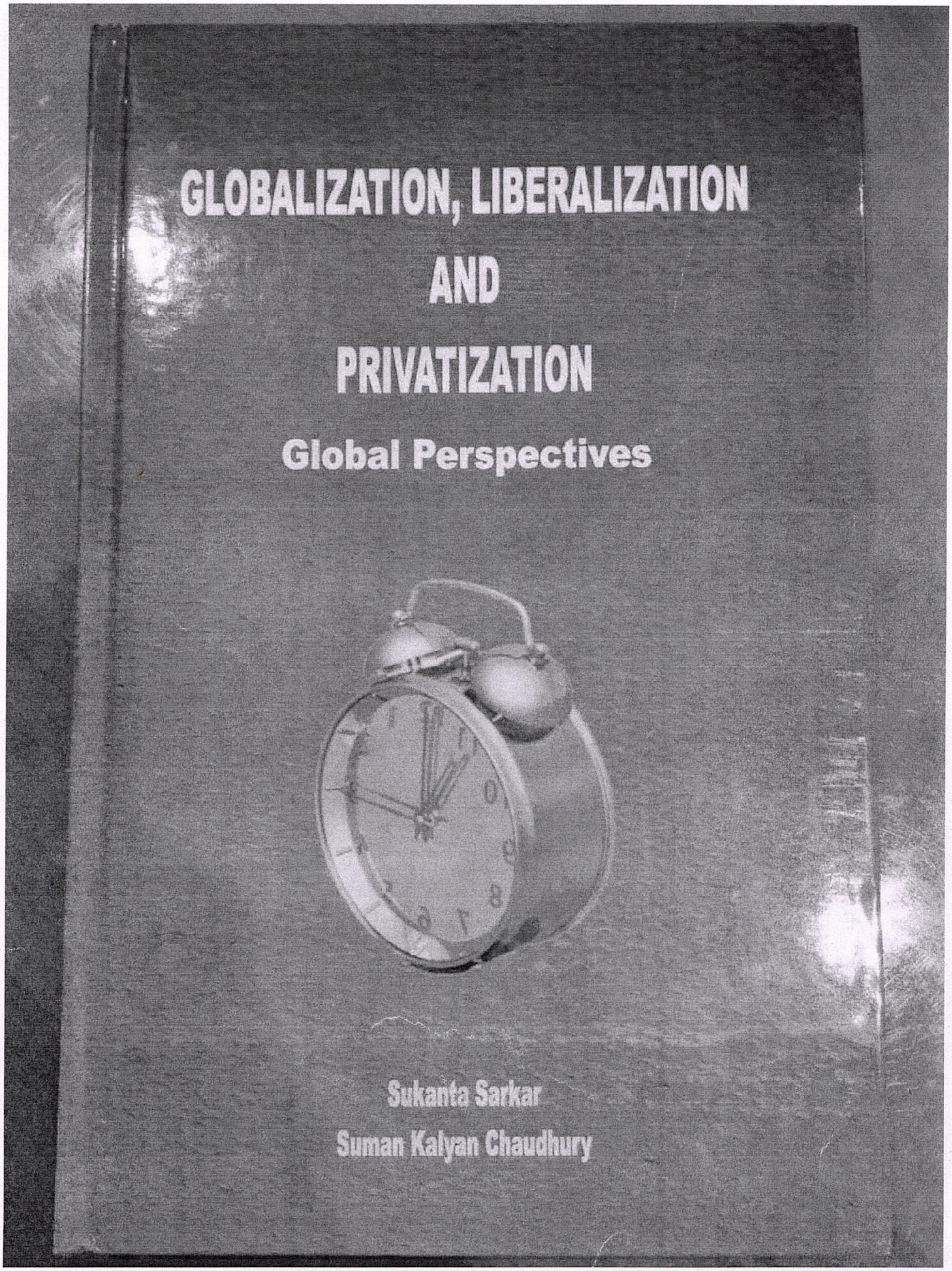
Telephone : 91-11-2325 1294, 6570 8480 Telefax: 91-11-2328 2395
Website : http://www.zikrabooks.com E-mail : zikrabooks@gmail.com

ISBN 93-82797-14-9
9 789382 797142

₹850/-
Pub.No.159

SNO = 17



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Global Perspectives

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Suman Kalyan Chaudhury

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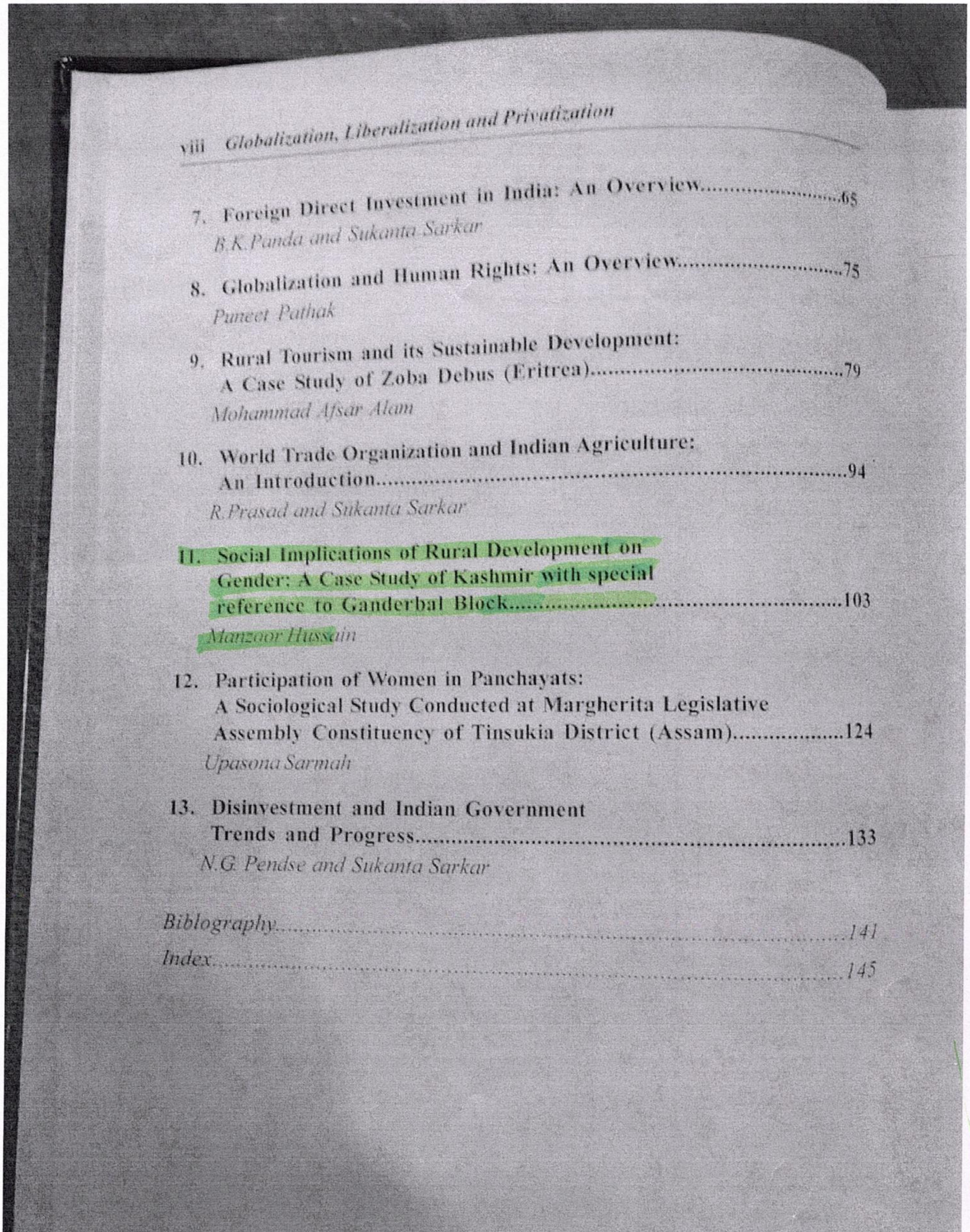

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Globalization, Liberalization and Privatization

Global Perspectives

By Editors

Dr. Sukanta Sarkar
Dr. Suman Kalyan Chaudhury

S.K. Book Agency
New Delhi

SNo = 17(c)

Published by

S.K. Book Agency
5A/12, Ansari Road, Daryaganj
New Delhi- 110 002 (India)
Ph: 011-65842996, Mob. 7210090042
E-mail: skbooksag@gmail.com

Globalization, Liberalization and Privatization *Global Perspectives*

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First Edition: 2016

ISBN: 978-93-8315-868-3

PRINTED IN INDIA

Printed at: New Delhi

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11

Social Implications of Rural Development on Gender: A Case Study of Kashmir with special reference to Ganderbal Block

Manzoor Hussain

> *"The globalization of the capital market is actually part of economic globalization. This will create a change in the entire world economy, not just restricted to some fields in some countries."*
>
> **-Richard Grasso**

Introduction

Gender is a socio-cultural construct and gender discrimination a worldwide phenomenon. Across the societies, women have been treated unequally and less value placed on their lives because of their gender. Women's differential access to power and control of resources is central to this discrimination in all institutional spheres, i.e. the household, community, market, and the state. Within the household, women and girls face discrimination in the sharing out of household resources including food, sometimes leading to higher malnutrition and mortality indicators for women. At its most extreme, gender discrimination lead to son preference, expressed in sex selective abortion or female feticide. In the labour market, unequal pay, occupational exclusion or segregation into low skill and low paid work limit women's earnings in comparison to those of men of similar education levels. Women's lack of representation and voice in decision making bodies in the community and the state perpetuates discrimination, in terms of access to public services, such as schooling and health care or discriminatory laws.

The law is assumed to be gender-neutral when in fact it may perpetuate gender discrimination, being a product of a culture with oppressive gender ideologies. While the gender division of labour tends to be seen as natural and immutable, in fact, these ideas and practices are socially constructed. This results in context-specific patterns of who does what by gender and how this is valued. Women are generally expected to fulfil the reproductive role of bearing and raising children, caring for other family members, and household management tasks, as well as home based production. Men (f)(7)=2008

tend to be more associated with productive roles, particularly paid work, and market production. In the labour market, although women's overall participation rates are rising, they tend to be confined to a relatively narrow range of occupations or concentrated in lower grades than men, usually earning less.

In the context of systemic exploitation and alienation of women faced in the past and present, one of the objectives of rural development program in India has been to improve the status of women. Rural development is a strategy to enable a specific group of people, poor, rural, women and men, to gain for themselves and their children more of what they want and need. It involves helping the poorest among those who sought a livelihood in the rural areas to demand and control more of the benefits of rural development. The group includes small scale farmers, tenants and the landless (Robert chambers, 1983, 147). The overall focus of rural development is to bring improvement in the level of living, including employment, education, health, nutrition, housing and various social services; decrease inequality of rural incomes and rural–urban differences in income; and the capacity of the rural sector to sustain and accelerate the pace of improvement in rural areas. It involves systematic, scientific and integrated use of natural resources and as part of this process enabling every person to engage himself in a productive and social useful occupation (Parthasarthy, 1984, 29). The objective is to bring poor families above the poverty line on a lasting basis by assisting them through income-generating assets and training (Dhillon, 1991, 45).

Viewed theoretically, rural development is elastic and a dynamic concept. Conceptually, rural development is a strategy and connotes a complete process of change (Munjal, 1997, 1). Development denotes some sort of advancement in a positive direction (Singh, 1987, 1). Rural development presupposes not only an integrated development of agriculture and industry but also social services (Thakur, 1988, 14). Rural development programmes comprise the following: (1) provision of basic infrastructure facilities in rural areas, e.g., schools, health facilities, roads, drinking water, electrification, etc.; (2) improvement of agricultural productivity in rural areas; (3) provision of social services like health and education for socioeconomic development; and (4) implementing of schemes for promotion of rural industry increasing agriculture productivity, providing rural employment, etc.

In Kashmir, rural development has received foremost attention at the state level and sizable funds have been invested under the programme. The aim was to bring poor families above the poverty line and to ensure a social transformation and change. However, in spite of the efforts made under the programme, the quality of rural life has not improved up to a satisfactory level. Similarly, the social implications of this programme have not been so deep and radical.

Theoretical Orientation

This study had an evaluative research design and its purpose was to assess the social implications of rural development in Kashmir valley with main focus on Ganderbal Block in District Srinagar. The theories of Sociological Dualism and Critical Minimum Effort Thesis by J.H. Broeke and Leibenstein were applicable to the present study. J.H. Broeke explained underdevelopment in terms of Sociological Dualism which he defined as 'the clashing of an imported social system with an indigenous social system of another style' (Singh, K, 1995, 67-87). He pointed out that any effort to develop the underdeveloped countries along western lines could only hasten their retrogression and decay.

The central idea of Harvey Leibenstein's thesis was that in order to attain sustained growth, it was essential that the stimulant to development was of a certain critical minimum size. Socio-economic backwardness was characterized by a set of inter-related factors which had a certain degree of stability at their small equilibrium values. The actual values were different from the equilibrium values because the economy was always being subject to stimulants and shocks. The stimulants had a tendency to raise per-capita income above the equilibrium level (Ibid., 1995, p. 67-87). But, in backward societies, long term economic development did not take place because the magnitude of stimulants was too small. Leibenstein's thesis was more realistic because it was applicable to developing countries like India. Giving a big push to the programme of development all at once was not applicable while a critical minimum effort could be properly timed and broken up into a series of smaller efforts for sustained development.

Review of Literature

M.C. Bhandari observed that there was no involvement of financing agencies in the process of identification and selection of rural development beneficiaries. The number of applications rejected by the cooperative banks was comparatively lower than the commercial banks. The DRDA did not prefer to sponsor loan applications to District Co-Operative Banks due to cumbersome loaning procedure, unfavourable terms and conditions, stipulation regarding share capital distribution, security, and wide network of rural branches of commercial bank. The quality of lending was much below the standard in as much as that in financing milk animals, no proper care was taken regarding their milk yield, availability of fodder, etc. Loans were given for single purpose which in turn did not help the small farmers to meet their consumption needs. There was biased selection of rural development beneficiaries. Pressure was brought upon the official's right from the process of identification of beneficiaries. Majority of the beneficiaries approached some officials or other after the household survey was done for becoming a beneficiary under rural development. In more than 50 per cent of the beneficiaries, village Sarpanch was instrumental in getting them selected.

Jasbir Kanwar Singh identified that big farmers derived more benefit from the banks than medium and small farmers and agricultural labourers. The family income of the big farmers was about three times more than that of the small farmers and about six times more than that of the agricultural labourers. Rural development helped the small and marginal farmers to raise their income and employment but it was not up to the target. The annual income of 23 per cent beneficiaries of the Minor Irrigation Scheme was more than Rs. 3500 and 33 per cent beneficiaries under the Minor Irrigation had more than five acres of cultivable land, which was against the existing norms. The proportion of applications rejected by banks was as low as 4.75 per cent and banks took one month for scrutinizing the applications and sanctioning loans. There was bias in the identification and selection of the rural development beneficiaries, which resulted in wrong selection of the beneficiaries to a great extent. The selection was through the approach of some influential people, rich farmers, middlemen etc. Proper survey was

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not conducted and many persons who were Above Poverty Line (APL) were chosen as beneficiaries.

K.M. George found a significant increase in income and employment of the beneficiaries under rural development. The contribution of diary to total family income increased from 5.12 per cent in pre-implementation to 36.58 per cent in post – implementation period. 70 percent of the total beneficiaries crossed the poverty line. There were some of the limitations of program. Majority of the beneficiaries (55%) argued about inadequate veterinary facilities, demand for illegal gratification by the veterinarians, poor milk procurement and marketing arrangements, non-availability of feed and fodder, inadequate loans and subsidies, procedural difficulties in insurance coverage and missing component of training to the beneficiaries as the major drawbacks of the program.

Govt. of India Planning Evaluation Organization revealed that 26 percent of the beneficiaries were already above the poverty line in terms of the norms of annual income of Rs. 3500 of a family of five and, strictly speaking, did not qualify for provision of benefit under the program. The study indicated that only 29 percent of the families were selected in the meeting of Gram Saba and the remaining 71 percent by the BDO. Problem of coordination at district level was being experienced in spite of the Governing Body and the District Development Committees set-up by the state governments. About 88 percent of beneficiaries increased their income; 12 percent reported no material change. Again 77 percent revealed an increase in their consumption level and 23 percent in the family assets. Further 65 percent of beneficiaries felt that their overall status in the village society has been elevated and 35 percent said that their overall status has not been elevated. 49.4 percent of the selected beneficiaries crossed the poverty line by rising up to the annual income level of Rs. 3500. The majority of the beneficiaries (62 percent) were not able to cross the poverty line due to inadequate assistance provided under the program. There was delay in granting loans because the banks demanded guarantee. This delay created many other types of problems for the beneficiaries.

Department of Rural Development conducted concurrent evaluation on rural development and reported that 56 percent beneficiaries were selected in the meetings of Gram Saba, 39 percent by officials and five percent by others (MP / MLA / Landlord / Employer and fellow villager). It was observed that the assets generated incremental income of more than Rs.2000/-in 27% cases, between Rs.1001 to Rs.2000/-in 24 percent cases, between Rs.501 to Rs.1000 in 17 percent cases and up to Rs. 500 in 10 percent cases. 48 percent of old beneficiaries belonging to destitute and very poor group crossed the poverty line of Rs. 3500 and five per cent families of the same group crossed the revised poverty line of Rs. 6400. The concurrent evaluation of rural development showed that the national average of block delay, bank delay and the delay in grounding the asset was 331,77 and 38 days respectively. The study revealed that working capital was required in 60 percent cases but was not provided in 32 percent cases to the beneficiaries. The repayment period was less than three years in 26 percent cases and just three years in 36 percent cases.

A.C. Kutty Krishnan reported that the selection of beneficiary families was not proper, as only 16 out of 80 sample households were really eligible for assistance under rural development. Out of these, only three crossed the poverty line. There was no significant impact of rural development on income generation. Largely, the better off section got the benefits. Many schemes sanctioned were not capable of generating sufficient income because of large financing needed and also of limited market potential. There was no planned procedure to inform the beneficiaries about the sanction of loan. Quite a long time was taken by the bankers to sanction the loan and beneficiaries had to waste their time, money and energy in getting the necessary certificates.

M. Thaha, et. al., observed that due to faulty identification, half of the identified families were already above the poverty line and were ineligible for getting assistance under the program. The amount of credit sanctioned under different schemes by banks in many cases was lower than the amount recommended by the DRDA. The loan amount sanctioned to different beneficiaries also varied from person to person. There was acute coordination problem between the financing institutions, DRDA, Block Authorities, Lead Bank and Sectorial Offices that provided infrastructure and technical support for implementation of rural development. The majority of the beneficiaries expressed that they were not allowed to choose the dealer and were supplied with substandard assets. The author further reported that majority of the beneficiaries indicated that the procedure used for sanctioning the loan was cumbersome, time consuming and they had to waste time, money and energy in getting necessary certificates and completing other formalities.

Kanwar Prakash Chand revealed that a majority (90 percent) of the beneficiaries indicated that their identification was done through village survey. Only 20 per cent of the beneficiaries crossed the poverty line of Rs.3500 per annum and the remaining showed improvement in their income but the incremental income was very much short of the poverty line. The block office forwarded 80 percent of the applications to the concerned banks within a month, but it could clear only 43 percent of those in a month's time, another 40 percent were cleared between 2-6 months. Due to pressure from the banks to repay the loan, 57 percent of the beneficiaries sold their assets to repay the loan. Higher maintenance cost of the assets as compared to the returns also forced some of the beneficiaries to sell their assets. There was lack of coordination between the DRDA and the block level officials and the various government/quasi-government organizations like Department of Agriculture, Animal Husbandry and Electricity Boards, etc.

D.S. Dhillion revealed that more than 80 percent of the beneficiaries were below 51 years of age, 60.33 percent beneficiaries illiterate, 76.33 percent were landless. In majority of the cases, the household survey was not carried out to identify the poorest of the poor beneficiaries. They were selected by the officials and the list of selected beneficiaries was not display at a common place in the village. The milk animals provided under rural development added to the income and social status of the beneficiaries but only 53.00 percent (out of eligible beneficiaries) could cross the poverty line of Rs.3500. In 63.00 percent cases, the assets were found to be intact while in the remaining 37 percent cases, they were missing. Also, in 97.00 percent cases, the assets were insured but in none of these cases, a copy of the insurance policy was given to the beneficiary with the result that they had to face hardships in getting the insurance claim.

Dhillion concluded that, in 50 percent of the cases, the assistance provided to the beneficiaries was inadequate and in none of the cases working capital was provided

QNo = 17(2)

and in 92.00 per cent cases, the loan for the second milk animal was not advanced even after six months of the first animal although the beneficiary was not a defaulter. They were not informed about the sanction of loan and their repayment capacity was not taken into consideration while fixing the repayment instalments. Again in almost all cases, branch managers, insisted on guarantee/security cover from the beneficiaries contrary to government instructions. The beneficiaries had to pay bribe to the bank officials (reported in 27 percent cases) to get the loan sanctioned and also to the veterinary doctor (in 83 percent cases) to get the health certificate of the animal to be purchased.

J. Krishnamurthy highlighted the fact that child dependency, as well as adult dependency was high in both villages of Velan and Kural of Tamil Nadu and as the family size increased, there was a corresponding increase in dependency. By virtue of these facts, as well as in the light of the household structure found in the two villages it could be concluded that there was a trend towards work force decline in the two villages. 55 percent of the households had an income under Rs.3000 per annum in Velan village and 42 percent in village Kural had an annual family income under Rs.3000. The author found inadequacies in respect of infrastructure facilities like roads, safe drinking water supplies, health care, educational facilities and so forth. The training facilities were inadequate and there was lack of veterinary services. There was also huge time gap between applying for loan after final selection and the procurement of asset.

Punjab State Institution of Public Administration in its report on "Concurrent Evaluation of Integrated Rural Development Program in Punjab, Chandigarh revealed that 25.83 percent of beneficiaries were ineligible for assistance under the program as per the definition of poverty line. This percentage was maximum in *Jalandhar* (55 percent) followed by *Amritsar* (47.50 percent) and *Gurdaspur* and *Ferozepur* districts (5.00 percent) each. The Gram Sabah's was involved in the selection of beneficiaries in 41 percent cases only and in the remaining cases, the selection was done by the officials. There was no income from assets in 29.31 percent cases and in 14 percent cases; there was no increase in the family income. The average annual income from the asset was Rs. 2911 and 85 percent of the beneficiaries assisted under the programme crossed the poverty line. This percentage was 100 percent in *Ropar* and *Gurdaspur, Faridkot* and *Sangrur* districts. The study further revealed that there was delay in providing the assets and procedure for procuring the loan was cumbersome and time consuming. The repayment period was also no satisfaction.

U.K. Bhanot revealed that the major cause of the rejection (in 73 percent cases) in Haryana (Bhiwni district) was wrong identification of rural development beneficiaries. The rejection was high as 37 percent in the case of applications sponsored by the DRDA in Haryana. He mentioned that wilful default, natural calamities, deficiency in loaning policies, untimely disbursement of loans, lack of effective supervision, denial of credit to genuine borrowers, political factor and the lack of institution-al arrangement to write off irrecoverable overdue were the various reasons for the poor recovery. There was some lack of coordination between the government and the banks; various agencies at the district and block level in the implementation of the programme. He observed that majority of the beneficiaries were not imparted any sort of guidance or training support for the activities financed.

D. P. Rao and R. Karajan reported wrong identification of rural development beneficiaries whose annual income was more than the prescribed limit of Rs. 3500 and land holding size was more than prescribed limit of five acres. An insignificant impact of IRDP in terms of employment generation and increase in income of the beneficiaries was found. The authors stated untimely credit, or marketing facilities, creation of inappropriate assets low employment potential of the Unit and increasing cost of the inputs as the major difficulties expressed by majority of the beneficiaries. 37 per cent of the beneficiaries indicated that they had to pay Rs. 200 and above to get the scheme sanctioned under IRDP.

Mohana Sundaram, V. argued that in Pongalur block of Tamil Nadu, there was improvement in income, employment levels and asset position. He held that income from dairying significantly contributed to the total income of beneficiaries. Due to adoption of dairy occupation, the assets of beneficiaries improved significantly in terms of increase in number of animals, purchase of few acres of land, construction of their own houses, and purchase of agricultural implements. The average asset improvement was highest among big farmers and least among the landless labourers. This followed that the beneficiaries had benefited from the rural development and crossed the BPL status.

P. Thippaiah and M. Davendra Babu concluded that teachers and village level workers were assigned the responsibility of the household survey that was not properly trained. The selection of ineligible families who got assistance under the programme was as high as nine per cent. Majority of the beneficiaries expressed their dissatisfaction with the present system of purchasing the assets because inferior quality assets were purchased by playing more than the market prices. The authors further indicated that large number of beneficiaries mentioned lack of infrastructure facilities and forward and backward linkages, inadequate fodder supply and veterinary services as the main drawbacks in the programme.

Tripathi Satyendra reported that in the Varanasi District of Uttar Pradesh, rural development had its limitations. This programme was basically designed to benefit the poorest of the poor in the rural areas. But, as the study showed, there were mal-practices on the part of unscrupulous officials and self-seeking village middlemen. The beneficiaries had to share the benefits with these elements. Professor Tripathi revealed that the subsidy part of the loans had been misused by the beneficiaries for obtaining the loans and by the officials. The benefits had not reached to the really needy groups nor were they suited to the requirements of the needy persons. Moreover, the delay in awarding of the benefits not only complicated the problems of the poor but also made them easy prey for haggling and extortion by the project officials. The very serious mal-practices noted in the study were uncertainty in rates of interest, non-issuance of pass books, improper entries in pass books, delay in adjustment of subsidies, and the consequent financial losses to the beneficiaries entailed in paying interest on the total loan amounts.

B. N. Thakur stated that in 'Bhagalpur district of Bihar' conflict arose because of the changes brought out by rural development in situation where the similar and dissimilar interests existed side by side. Among the factors that resisted change was fear of the new things, ignorance, traditions, ethnocentrism, vested interests. The

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study revealed that the villages were internally too much faction ridden and its old corporate unity was now marked by mounting jealousy, tensions and conflict prevailing among the different castes. Rivalry and conflict between the rich and poor classes became apparent every-time during election to the office of the 'Mukhiya' and 'Sarpanch' for the village panchayats.

Sharda, Nand Singh observed that in the Samistipur District of Bihar a number of individuals had left caste occupations and taken up jobs of their own choice and were earning their livelihood through the occupations suited to their capability and worth. The findings revealed that in certain case the individuals and the families were engaged not only in one type of occupation but also in two or more occupations and the importance of literacy and education was realized by the villagers. The number of illiterate persons was lower than those who knew reading and writing, though the number of educated or highly educated individuals was very low.

R.K. Khatkar reported that majority of the rural development beneficiaries were wrongly identified because their annual income was already above the poverty line. The VLWs were assigned the responsibility of the household survey that was not properly trained to calculate annual income of the households. He argued that in many cases of rural development beneficiaries, the time gap between sanction and disbursement of loans and delay in grounding of assets by the banks was the main cause which eluded the beneficiaries in getting proper benefit from rural development schemes However the study showed that rural development assistance made some positive impact on generating gainful employment and significantly increased the earnings and family expenses.

V. Kulandaiswamy and Ubendhiran held that the annual income of the 58.00 percent of the selected beneficiaries was already above the poverty line of Rs. 3500/. Majority of the rural development beneficiaries were benefited either under animal husbandry scheme or the milk cattle scheme. They concluded that the incremental income generated was greatest among the beneficiaries of Industries, Services and Business sector schemes while the animal husbandry scheme created the largest additional employment. The difficulties expressed by majority of the beneficiaries were untimely credit; poor marketing facilities; creation of inappropriate assets; low employment potential of the unit; increasing cost of the inputs. The beneficiaries had to incur expenditure of Rs. 200 and above to get the scheme sanctioned under rural development.

Research Methodology

This study is an empirical-cum-field study and based on evaluative research design by adopting an intensive approach through case study method. The purpose is to assess and evaluate the nature, development on beneficiaries of Ganderbal Block in Kashmir. In the backdrop of social dimensions of rural developments the present study focused to see social transformation and change among women in Kashmir with special emphasis of Ganderbal Block. The study is carried out through a micro-sociological framework and the main focus is to see as to what extent women in the concerned block has undergone social transformation and change as a result of rural development programme. The present study will prove to be a watershed for understanding the broader sociological implications of rural development in general and that of beneficiaries of Ganderbal Block, Srinagar District of Kashmir, in particular.

Universe of the study

The universe of this study consisted of Ganderbal Block in Srinagar District of Kashmir. Ganderbal Block was a rural area comprised of 125 villages (Census of India, *Jammu and Kashmir*, 2001, p. 1). Census 2001 showed the population of Ganderbal as 1, 15, 654 persons, out of which males constituted 59, 913 (52 per cent) and females 55, 741 as 48 per cent (Ibid., 2001, p. 2). Ganderbal Block was chosen for study because huge sums of money for various rural developmental activities has been invested and partly because of its geographical location, and changing socio-economic conditions. It was a developing block and the economy was developing gradually particularly in agriculture and handicraft sector. People were educationally backward and literacy rate was 44.24 per cent. People were mostly divided on the basis of class and less preference was given to caste in social relations.

Sampling: In the present study, multi-stage sampling was used. In the first stage, the regions of *Ganderbal Main* and *Gulabagh* of Ganderbal Block in Srinagar District were selected because they were considered to be thrust areas. In the second stage, 10 per cent of the Mohallas were chosen which included two Mohallas from every cluster of the Block. All the Mohallas were arranged in serial order and there after every nth Mohallas of every cluster was tick marked. The decision of taking 10 per cent sample of villages was decided after considering all the aspects and it was considered to be a fairly good representative sample. In the third stage, a list of beneficiaries involved of rural development was prepared with the help of key persons, employees, NGO's, senior citizens, and other knowledgeable persons. The sample was drawn out of the total number of beneficiaries by using systematic sampling technique. Only 250 persons could be interviewed in all the sectors of Ganderbal Block of Srinagar District in Kashmir for various reasons. As per objectives of the study, the sample includes 200 beneficiaries of rural development programme, 40 parents and 10 government officials. Later, the statistical sampling form ula was used to obtain the sample.

Formula:

$$n=\frac{t^2 x p(1-p)}{m^2}$$

Description: n = required sample sizet = confidence level at 95% (standard value of 1.96)p = estimated prevalence of beneficiaries in the project aream = margin of error at 5% (standard value of 0.05)**Calculation**In the present rural development programme of Block Ganderbal in district Srinagar, it has been estimated that roughly 40% (0.40) of the people in the project area have been benefited. This figure has been taken from the estimation of rural development statistics, department of rural development; government of J&K. Use of the standard values listed above provides the following calculation:

$$n=\frac{1.96^2 x .40(1-.40)}{.05^2}$$

$$n=\frac{3.8416 x .16.}{.0025}$$

$$n=\frac{.614656}{.0025}$$

$$n=245.86 \sim \mathbf{246}$$

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For statistical and other reasons, only 250 respondents were selected irrespective of 246.

Hypotheses of the study

Hi - Many meaningful rural development programmes have been initiated in Kashmir for the welfare of rural people in totality, and the rural masses have been benefited in whole. It is partly because the implementing agencies were serious and had expertise in the field of rural development, and partly rural people do not have fatalistic and conservative attitudes and behaviour patterns. Similarly, the social implications had been deep and radical.

Ho - Though many welfare programmes initiated by the government in Kashmir had introduced some meaningful programmes and schemes for the rural welfare in totality, the rural masses had not been benefited in whole. It was partly because the implementing agencies were neither serious nor had any expertise in the field of rural development and partly because of the fatalistic and conservative attitudes and behaviour patterns of the large number of people living in the villages.

Objectives of the study

The objectives of present study are as follows: To examine the relationship between rural development, gender and society in Kashmir; To analyses the social implications of rural developments on gender viz., change in traditional role and adoption of new role within and outside family, decision-making, educational achievement, health, and social conflict; To identity the felt needs of rural development women beneficiaries; To identity the awareness and level of participation of beneficiaries in rural development programmes.

Techniques and Sources of Data Collection

The data was collected using the interview schedule method followed by observation. The relevant literature was reviewed and analysed to provide some direction in drafting schedule, after which the schedule was pre-tested with 25 respondents to ensure that it was understandable. The schedule was then modified (for instance, terms such as *traditional role, new role, decision-making, educational achievement, health, hygiene, and social conflict* were further defined/elaborated) according to the results of the pre-test to make it more comprehensible. The structured as well as unstructured questions were put to respondents.

The use of body language such as facial expressions, gestures were given due importance. If the answers to the questions asked were ambiguous and confusing, supplementary questions were asked. Collateral interviews were used to supplement and corroborate the information. In this process, the researcher contacted socially notable persons, NGOs, religious heads, village heads, neighbours, elderly and educated people of the village and co-workers of the respondents, and the relevant information was noted down. The study involved both primary and secondary sources of data collection. For primary sources both respondents and incidents around them were observed and information was sought through interview schedule. The secondary sources of information included books, survey scripts, and material published in journals, magazines and new paper items.

Analysis and Discussion

Rural development and role of women

The role of women in the traditional societies had been characterized by dependency, inferior social status and overall sufferings. They had faced systematic discrimination and institutionalized exploitation at the hands of the male members of these societies. Women had been subordinate and submissive to men and engaged with the domestic work - cooking, washing, rearing and mending. The condition changed and women had come out of the four walls of the house to work in offices, factories and other establishments on a regular remunerative basis. The status of women changed and they work on important posts in the government and private sector.

The change had also been experienced by women in Kashmir. A significant number of women worked outside home on a regular and remunerative basis. This socio-economic mobility was mainly through attainment of modern education. The rural development assisted women to change their status under its scheme of Development of women and children in rural areas. It was specially meant for women to change their status and assist them with income generating assets and other inputs. Training was provided to them wherever needed so that they could earn a living for themselves. The table below mentioned the change in the status of women through rural development:

The table clearly indicated that 120 respondents (48.00 per cent) had changed occupation and 130 respondents (52.00 per cent) had not changed occupation. Out of 120 respondents who had changed occupation, 58 respondents (48.33 per cent were engaged with shawl work, 18 respondents (15.00 per cent) with carpet work, 22 respondents (18.33 per cent) with wood work, 14 respondents (11.67 per cent) with pottery and eight respondents (6.67 per cent) with poultry, respectively. Similarly out of 130 respondents who had not changed occupation, 46 respondents (35.38) per cent were engaged with cooking, 24 respondents (18.46 per cent) with washing, 10 respondents (7.70 per cent) with mending, 32 respondents (24.61 per cent) with rearing of children and 18 respondents (13.85 per cent) with agricultural work respectively.

The above table revealed that more than half of the respondents (52.00 per cent) had not changed occupation. These respondents argued that women still performed their traditional role of washing, cooking, mending, rearing of children and helped men in agricultural work. The respondents argued that women did not play any role in decision making. They were not consulted before any decision was taken and had least to say in decisions like marriage of children, construction of house, sending a child to school, selling and buying of movable and immovable property. It was found that these women were mostly illiterate, ignorant and unaware about their rights.

However, other view of the table was that for 48.00 percent respondents there was change in the status of women. These respondents had adopted new occupations like shawl work, carpet work, wood work and pottery which were profit oriented but the irony was that they were dependent on men for economic support because the earnings of women were still controlled by men. The respondents argued the change that was felt not only widened the chances of a suitable match for them but also regard for the girl. A household with only male earners could not afford a decent living which ultimately resulted in poverty. Therefore, women empowerment is quite important to cope up with

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Table 1.1: Change in the status of women through rural development in Ganderbal block

S.No.	Status of Women Occupational status	No.	%age	Occupation after mobility	No.	%age	Total No.	%age
1.	Cooking	46	35.38	Shawl Work	58	48.33	104	41.60
2.	Washing	24	18.46	Carpet Work	18	15.00	42	16.80
3.	Mending	10	7.70	Wood Work	22	18.33	32	12.80
4.	Rearing of children	32	24.61	Pottery	14	11.67	46	18.40
5.	Agricultural Work	18	13.85	Poultry	08	6.67	26	10.40
	Total	130	52.00		120	48.00	250	100.00

the existing poverty in rural areas. They further expressed earning women perform better in dealing with domestic and outside home situations as compared to economically dependent women.

Rural Development and Role of Women in Decision Making

Decision-making was mostly done by men in a male-dominated society. However, in a changing scenario women had a role in decision making. The interaction between the people of rural and urban areas, education and mass media induced as well as pressurized women-folk to take active part in decision making which was very crucial for the mainstream of social progress. The participation of women in decision making leads to a change in their life style, way of thinking, traditions and customs. The women gave their opinion in the marriage of youngsters, sending a child to school, construction of house, buying and selling movable and immovable property etc. When the related question of "Do women in your family took part in decision making" was asked, the response received was contained in the figures. Only 90 respondents (36.00 per cent) were of the opinion that women played a role in the decision making and 160 respondents (64.00 per cent) opined that women had no role in decision making . These two different responses have been shown in the table below:

The above figures reflected that 44 respondents (48.89 per cent) out of 90 respondents were consulted for marriage of youngsters, 11 respondents (12.22 per cent) for sending a child to school, nine respondents (10.00 per cent) for construction of house, 20 respondents (22.22 per cent) for selling and buying of movable property, respectively. It was observed simultaneously that although these women were consulted for decision-making but the final say remained within the male members of their families. The implication was that men were still the key decision makers and the role of women in decision making was not at par with men. This could be correlated with the educational backwardness of the block (literacy rate being only 46.62%), customs and traditions.

As revealed in the table, out of 160 respondents who had no role in decision making, 70 respondents (43.76 per cent) argued that decision making was not their role since it was the role of men ,13 respondents (8.12 per cent) reasoned that prevalent customs, traditions did not allow them to take part in decision making, 25 respondents (15.62 per cent) argued that decisions taken by men were good for family, 22 respondents (13.75 per cent) argued that society was male dominated, 30 respondents (18.7 per cent) gave the reason of religion respectively. Further, analysis of the data revealed that rural development had not helped women to raise their status at par with men Although some women had adopted new occupations and earned for themselves and possessed some role in decision making but they were subordinate to men who control them and their family because the men were still dominant. They had been the victims of social situations and exploitation. They gave the reasons of illiteracy, poverty, superstitions and male domination responsible for low social status.

Rural Development, Women and Educational Achievement

The literacy rate in rural India had considerably improved after launching of rural development. The launching of this programme started a development process of rural areas. The emphasis on rural development created employment opportunities which

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Table 2: Role of Women in Decision - Making in Ganderbal block

S. No.	Role in decision making			No role in decision making			Total	
	Areas	No.	%age	Reasons	No.	%age	No.	%age
1	Marriage of youngsters	44	48.89	Decision making is not women's role	70	43.76	114	45.60
2	Sending a child to school	11	12.22	Customs and Traditions	13	8.12	24	9.60
3	Construction of house	9	10.00	Good for family	25	15.62	34	13.60
4	Selling and buying of movable property	20	22.22	Male-dominated society	22	13.75	42	16.80
5	Selling and buying of immovable property	6	6.67	Traditional thinking	30	18.75	36	14.40
	Total	90	36.00		160	64.00	250	100.00

needed qualified and technical persons. In this context, the question was asked to the respondents and their family members about the level of education they had achieved, the response is shown in the table as below:

Table 1.3: Level of education of the sample population in Ganderbal block [excluding (0-6) years population].

S. No.	Literate/Illiterate	No	Total Percentage
1.	Illiterate	157	62.80
2.	Literate	93	37.20
	Total	250	100.00
S. No.	Level of Education	No.	Total %age
1.	Primary	28	30.10
2.	Middle	24	25.80
3.	Matric	19	20.43
4.	Graduate	12	12.90
5.	Post-Graduate	7	07.54
6.	Technical	3	03.23
1	Total	93	100.00

The above table revealed that out of the sample of 250 respondents in Ganderbal block, 157 respondents (62.80 per cent) were illiterate and only 93 persons (37.20 per cent) were literate. This literacy rate was lower as compared with the state's level of literacy i.e., 54.40 per cent, (males 65.70 per cent, females 41.80 per cent) as per census of India 2001. It was to note that out of 93 literate persons, 28 (30.10 per cent) were literate up to primary level, 24 (25.43 per cent) up to middle level, 19 (20.43 per cent) up to matric level, 12 (12.90 per cent) up to Graduate level, 7 (7.54 per cent) up to post-graduate level, and 3 (3.23 per cent) were having technical degree, respectively.

Rural development and reasons for educational backwardness of Ganderbal block

Economic prosperity, social environment, motivation, and distance from educational institutions played a vital role in the achievement of education. In Kashmir, women were educationally backward than their counterparts in the cities. They usually engaged their children in agricultural fields, cattle rearing and handicrafts. Large family size, lack of motivation among children, absence of educational institutions in neighbourhood, ignorance of people, religious orthodoxy and superstitions played an essential role in educational backwardness of rural women. Out of the total sample of 250 respondents, 44 respondents (17.60 per cent) reported that agricultural economy was responsible for educational backwardness; 46 (18.40 per cent) as large family size; 42 (16.80 per cent) as lack of motivation among children; 50 (20.00 per cent) as misadministration; 51 (20.40 per cent) as poverty; 17 (6.80 per cent) as non-functional social welfare organization respectively.

It was observed that besides achieving education, these children had to work in the agricultural fields, rear cattle and work on handicrafts to support the family income. Agriculture was a hindrance in attainment of education since this economy needed more labour, the parents preferred their children to work in the agricultural fields. Another

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notable reason for educational backwardness was large family size with more dependents.

The parents could not afford the schooling expenses of their additional number of children. The above findings revealed that it was quite imperative to control the rapid increase in population in order to maintain a reasonable standard of life. Poverty had badly affected the educational development of common villagers in the block Gander Bal. However, after independence the educational facilities were provided at the village level but these institutions could not come up to the expectations of common people. During the field study, it was found that children in schools faced many problems like poor accommodation, unsuitable furniture, and absence of urinals, pure drinking water and sports grounds. Besides, the social welfare organizations like Integrated Child Welfare Schemes (ICDS) were mostly dysfunctional which would have rendered educational services up to need.

Rural Development, Women and Health

Health Complaints in Block Ganderbal

The findings of the study showed that headache, blurring of vision, backache, abdominal pain, limb pains, and respiratory tract infection, weakness, etc. were the major complaints among rural women. The major health complaints are shown in the table as follows:

Table 4: Major Health Complaints in Block Ganderbal

S.No.	Health Complaints	Number	Percentage
1.	Headache	70	28.00
2.	Blurring of vision	58	23.20
3.	Backache	56	22.40
4.	Pain in abdomen	20	8.00
5.	Limb pains	20	8.00
6.	Respiratory tract infection	26	10.40
	Total	250	100.00

The above table and chart indicated that 28.00 per cent of respondents were having health complaints as headache, 23.20 per cent as blurring of vision, 22.40 per cent as backache, 8.00 per cent as abdominal pain, 8.00 per cent as limb pain and 10.40 per cent as respiratory tract infection respectively. The main reasons were the excessive exposure to work, low- nutrient diet, lack of health awareness and low per-capita income. For overall development good health of population was very essential however, in Ganderbal Block, women generally possessed poor health in spite of the fact that they live in pure and open air and without any noise/air pollution.

Rapid growth of population, poverty, illiteracy, ignorance and imbalanced diet were some of the factors that affected the conditions adversely. High fertility affected not only the socio-economic conditions of the family but also the health of mother and child. The repeated pregnancies caused nutritional drain of women which exposed both mother and child to high mortality risks. Malnutrition was directly related to the

deteriorating health conditions of mother and the child as it did not fulfil the requirement of balanced diet. Safe drinking water was not available to most of the villages and they depended on tanks, tube wells and ravines the water of these was usually polluted and unhygienic and this adversely effected their health.

For overall development good health of population was very essential in rural areas, women generally possessed poor health in spite of the fact that they live in pure and open air and without any noise/air pollution. Rapid growth of population, poverty, illiteracy, ignorance and imbalanced diet were some of the factors that affected the conditions adversely. High fertility affected not only the socio- economic conditions of the family but also the health of mother and child. The repeated pregnancies caused nutritional drain of women which exposed both mother and child to high mortality risks. Mal-nutrition was directly related to the deteriorating health conditions of mother and the child as it did not fulfil the requirement of balanced diet. Safe drinking water was not available to most of the villages and they depended on tanks, tube wells and ravines the water of these was usually polluted and unhygienic and this adversely effected their health.

Rural development, women and social conflict

The study revealed women are treated unequally and less value is placed on their lives because of their gender. It was observed that son preference, unequal wages, occupational exclusion or segregation into low skill and low paid work limit women's earnings in comparison to those of men of similar earning levels. Women's lack of representation and voice in decision making bodies in the community and the state perpetuates discrimination, in terms of access to public services, such as schooling and health care or discriminatory law

The study revealed that joint families were disintegrating and nuclear families emerging. Disintegration of joint family, interfamily conflict , disobedience of women, decrease in the respect of elderly people was responsible for social conflict The main reasons cited for disintegration of joint families were spreading of urban traits among village people, gap among the income of sexes, increase in income, desire to take independent decisions. Women had become disobedient as compared to past. In the past, the women had been very obedient and did not take part in decision making. Nowadays women sometime questioned and they take part in decision making but still the final authority lied with male members.

Younger generation did not respect the elderly people. The main reasons cited were generation gap, difference in attitudes, tastes and ideas. The respondents argued that rural development led to changes in culture. Tension existed because of clash between tradition and modernity. Among the prominent factors resisting social change, they mentioned fear of the new things, ignorance, traditions, religion, illiteracy and vested interests. These respondents cited the examples of women becoming disobedient, younger generation loosing respect for the elderly people, interfamily conflict, disintegration of joint families, decrease in neighbourly relations and lower classes and castes becoming arrogant.

5av0=17-(N)

Rural Development and Reasons for Superficial Implications

The study showed that 47.20 per cent of the respondents argued non-serious implementing agencies and 52.80 per cent fatalistic and conservative attitudes of people as the main reasons behind the superficial implications of rural development programs with the result that rural people had not benefited in whole. It was partly because the implementing agencies were neither serious nor had any expertise in the field of rural development and partly because of the fatalistic and conservations attitudes and behaviour-patterns of the large number of people living in villages though huge sums of money had been invested for various rural developmental activities, the output was not deep and radical. The benefits of development have been lop-sided and some monetary gains had been grabbed by some politically influential and socially notable individuals and families.

Rural Development and Awareness

The study revealed that majority of respondents 70.00 per cent was not aware about rural development schemes and their activities. These beneficiaries had no concept about the objectives of rural development viz., eradication of poverty in rural areas, raising standard of living, gainful employment, fulfilling basic needs, equality of access to opportunity, increase in production and productivity and peoples participation in developmental programmes. Awareness implied that rural people should have sufficient information about rural development programmes and activities, its objectives and benefits. Participation implied that rural people should participate in several rural development programmes and understand their objectives and should come to know that these programmes are for their own development. Unless rural people did not participate in the development programmes, no real progress could be achieved.

The present study revealed that social implications of rural development programme in Kashmir had not been deep and radical. A significant correlation existed between rural development programme and non-seriousness of implementing agencies/ fatalistic attitudes of beneficiaries (Table 5).

Table 5: Reasons for superficial implications of rural development programme in Kashmir

S.No	Reasons	No. of Respondents	Percentage
1.	Non-serious implementing agencies	118	47.20
2.	Fatalistic and Conservative attitudes	132	52.80
3.	Total	250	100.00

For this, a statistical measure of chi-square test was utilized and data summarized in the following 2x3 contingency table 6: -

Table 6: Relationship between rural development programme in Kashmir and non-seriousness of implementing agencies/fatalistic attitudes of beneficiaries

S. No.	Situation	Rural development programme			Total
		Successful	Partly successful	Unsuccessful	
1.	Non-Serious Implementing Agencies	20	32	66	118
2.	Fatalistic attitudes of Beneficiaries	18	70	44	132

The table 6 shows that observed frequencies for rural development programme and non-seriousness of implementing agencies/fatalistic attitudes of beneficiaries are 20, 18, 32, 70, 66, and 44 respectively. The expected frequencies were computed by the formula

E= Ct x Rt/N, where Ct stands for column total, Rt stand for row total and N for total number of frequency.

Cell (a): Observed frequency (0) = 20
Expected frequency (E) = 1 18 x 38/250= 17.93
Cell (b): 0= 18
E = 132 x 38/250 = 20. 06
Cell (c): O = 32
E = 118 x 102/250 = 48.14
Cell (d): 0 = 70
E = 132 x 102/250 = 53.85
Cell (e): 0 = 66
E = 118 x 110/250 = 51.92
Cell (f): O = 44
E = 132 x 110/250 = 58.08

These results were shown in the table 7 as follows:

Table 7 Rural development programme

S.No.	Situation	Rural development programme			Total
		Successful	Partly Successful	Unsuccessful	
1.	Non-serious implementing agencies	20.0 (17.93)	32 (48.14)	66(51.92)	118
2.	Fatalistic attitude of beneficiaries	18(20.06)	70(53.85)	44(58.08)	132
	Total	38	102	110	250

To test the null hypothesis, the expected frequency and observed frequencies were compared. The comparison was based on the following $x^2 = (O-E/E)^2$ Where O stands for observed frequencies and E stands for expected frequencies (table 1.9)

SNo=17 (a)

Table 8 Computation of x^2

O	E	O-E	(O-E)^2	(O-E/E)^2
20	17.936	2.07	4.28	0.2387
18	20.064	-2.06	4.24	0.2113
32	48.144	-16.14	260.49	5.4110
70	53.856	16.15	260.82	4.8434
66	51.920	14.08	198.24	3.8181
44	58.080	-14.08	198.24	3.4132
250	250			X^2=17.9357

Level of significance = 0.05

Computing degree of freedom (df) = (r-1) (c-1) where df stands for the degree of freedom, r for number of rows and c for number of columns

df=(2-1)(3-1)=2

Finding valve of x^2 (table valve) at a level of significance of 0.05 = 5.99 with degree of freedom 2, the inference is that since the calculated valve of x^2 (17.93) is more than the table valve of x^2 (5.99) at 0.05 level of significance for two degrees of freedom, and hence the null hypothesis (Ho= Many meaningful rural development programmes have benefited the rural masses in whole; and implementing agencies were serious and had expertise in the field of rural development; and rural people do not have fatalistic and conservative attitudes and behaviour patterns is rejected. We therefore, conclude that there is association between rural development programmes and non-seriousness of implementing agencies / fatalistic attitudes of beneficiaries.

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No-17(P)

Globalization is the process of international integration arising from the interchange of world views, products, ideas and other aspects of culture. Economic liberalization refers to both macroeconomic stabilization and micro-structural change. It has been central to adjustment policies introduced in developing countries since the late 1970s, mostly in the context of the conditions for lending set by international financial institutions. The technological and political changes that drive the process of economic globalization have massive noneconomic consequences. Financial and industrial globalization is increasing substantially and is creating new opportunities for both industrialized and developing countries. Globalization is much more than an economic phenomenon. The globalization of the world economy was preceded and made possible by the liberalization of domestic markets that began in the early 1980s in many countries. It is hoped that the present edition of this book will be beneficial to all concerned of the society, in general and students, lawyers, advocates, academicians, human rights institutions, researchers and NGOs working in economics/ finance field, in particular.

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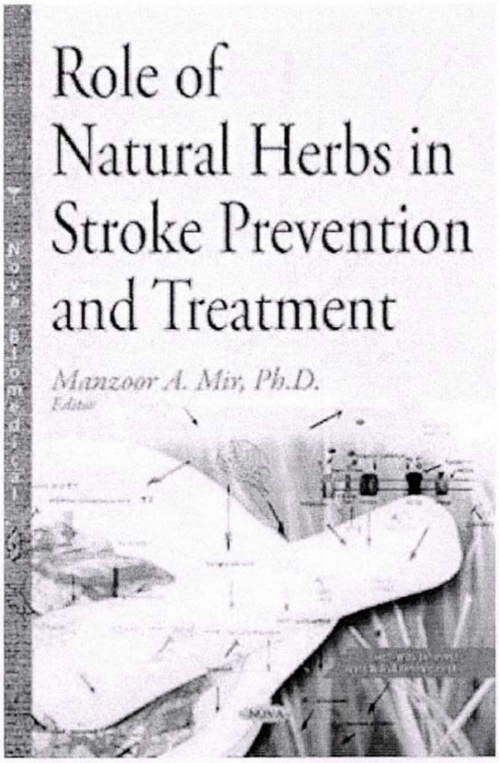
Role of Natural Herbs in Stroke Prevention and Treatment

UK ed. Edition

ISBN-13: 978-1634835558, ISBN-10: 1634835557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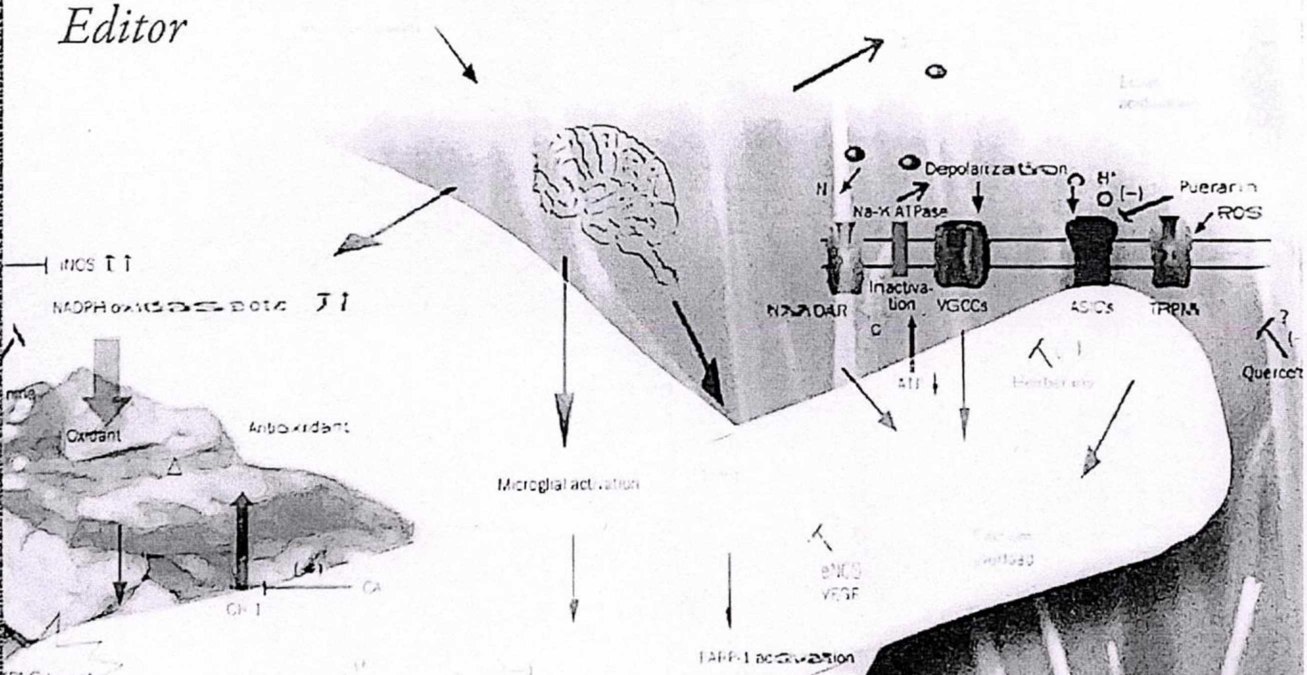

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ROLE OF NATURAL HERBS IN STROKE PREVENTION AND TREATMENT

MANZOOR A. MIR

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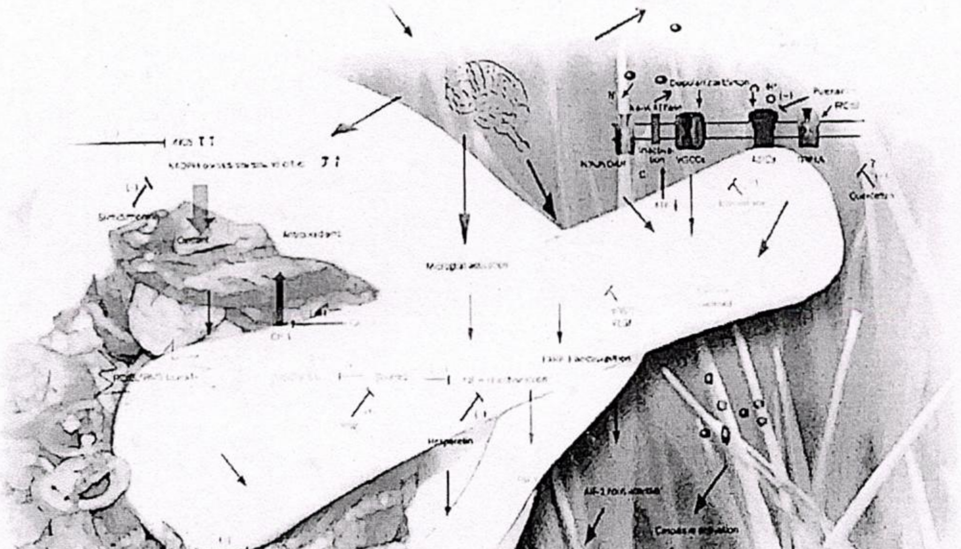
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ISBN 978-1-63483-555-8

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SNo=19

CHAPTER

22

HEAVY METAL STRESS AND MOLECULAR APPROACHES IN PLANTS

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1. INTRODUCTION

Heavy metals (HM) are classified regarding their relative density and they can be found naturally in the soil because of weathering and other pedogenic processes on rocks and the source of the material of soil. However, because of industrialization and a rapid population increase, production of anthropogenic biosolids and agrochemical waste has been enhancing the risk of soils pollution (Baker et al., 1994; Kashem et al., 2009).

Plant Metal Interaction. http://dx.doi.org/10.1016/B978-0-12-803158-2.00022-9
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SNo = 19 (9)

This is one of the main environmental problems, keeping in mind that metals reach the soil and end up depreciating the whole area (faun, flora, air, superficial and underground waters). In toxic concentrations, HMs damage plants and organisms, affecting their organs, changing their biochemical processes, organelles, cellular membranes, and causing health problems (DalCorso et al., 2010). Most of the HMs are persistent in soil because of their immobile nature, been intimately associated with soil and organic colloids. Among the metals, cadmium has a higher mobility and solubility compared with others metals in soil (Kashem et al., 2009); therefore, cadmium is important to consider in terms of contamination in the food chain (Liu et al., 2007).

The main HMs present in soil are Cadmium (Cd), copper (Cu), lead (Pb), zinc (Zn), chrome (Cr), nickel (Ni), barium (Ba), argon (Ag), cobalt (Co), mercury (Hg), and antimony (Sb), and some of these elements are essential for many physiological functions in living beings, whereas others have no known biological function (Fässler et al., 2010; Lasat, 2000). These elements in fungicides, fertilizers, animal waste, urban trash, sewage sludge in soil, and deposits of industrial dust can increase the concentration in soil, making them toxic (Fässler et al., 2010; Li et al., 2015b).

In this way soil ends up inhibiting plant growth, causing alterations in microbial and vegetal communities (Chen et al., 2003; Vangronsveld et al., 1997). Accordingly, we seek to mitigate the effect of the phytotoxicity of metals in soil by establishing the vegetation and developing an efficient process of decontamination (i.e., bioremediation), which is one technique that seeks to decontaminate the soil by living organisms, such as microorganisms and plants (Ma et al., 2011).

Phytoremediation is a well-used bioremediation technique because it keeps the biological properties and physical structure of soil; it is also inexpensive and environmentally friendly (Ali et al., 2013; Khan et al., 2000). It consists of using plants to remove inorganic contaminants, especially metals, by using the capacity of plants to accumulate high levels of pollutants (Lasat, 2000). Plants are capable of immobilizing metal in soil by forming insoluble compounds as result of the interaction of plant exudates in the rhizosphere or by adsorption in the radicular system (Kidd et al., 2009). Some species are capable of accumulating HMs in their tissues so that contamination can be removed by harvesting the plant (Maestri et al., 2010; McGrath and Zhao, 2003; Van Nevel et al., 2007). This ability to accumulate metal varies significantly between species; thus, soil contaminated with several metals requires the use of different vegetal species (Hajar et al., 2014; Hao and Jiang, 2015; Jambhulkar and Juwarkar, 2009; Quezada-Hinojosa et al., 2015).

2. HM: MICRONUTRIENTS TO SOIL CONTAMINANTS

HMs are present in soil as natural components or as a result of anthropogenic activities, such as industrial activities, application of agricultural chemical products, and inadequate removal of residues (Gil et al., 2004; Mitton et al., 2012). The conceptualization of HM encompasses many aspects, such as environmental and toxicological. HM is a term for a group of elements that have an atomic mass higher than 20 and density greater than 6 g/cm^{-3} (Rascio and Navari-Izzo, 2011). The definition of HM is also postulated in terms of its specific mass, atomic mass, atomic number, and other properties such as formation of slightly soluble sulfides and hydroxides (Duffus, 2002). Impact in environmental and human health arising from metal wastes has been associated with HM (Facchinelli et al., 2001; Wu et al., 2015). With toxicological studies, it was found that each metal shows a specific toxicological effect in a specific organism (Rascio and Navari-Izzo, 2011).

S No = 19 (b)

The term heavy metal is frequently used to reference a group of metals and semimetals (metalloids) that have been associated with the potential contamination, toxicity, or ecotoxicity. Other names are used to denominate elements in this group, such as trace elements, because of the concentration they are found in naturally, in parts per million or lower, beyond toxic metals and micronutrients. The term toxic metal must be used with caution, because some metals are only considered toxic at high levels. The term micronutrient is more convenient for elements that are proved to be essential to plants and animals in certain concentrations (Duffus, 2002).

For soils, the term contaminated by HM is used when an increase in concentration occurs when compared with natural conditions, whereas the term pollution is used when this increased concentration harms the environment (Rodríguez Martín et al., 2006).

In an analysis of health risk caused by HMs in soils, plants in the food chain introduced a concept of classification of these metals into four groups. Group 1 includes the elements Ag, Cr, Ti, Zr, and Y and represents a low risk because these elements are not absorbed by the extensions of plants because of their low solubility in soil and consequent negligible uptake by plants. High concentrations of these elements in food generally indicate direct contamination on soil or another form of contamination. Group 2 includes As, Hg, and Pb, which are strongly absorbed by soil colloids. Although they may be absorbed by plant root, they are not readily transferred into edible tissues and therefore represent minimal risk to human health. Group 3 consists of B, Cu, Mn, Mo, Ni, and Zn, which are readily absorbed by plants, and depending on the concentration may represent a risk to human health. Group 4, Cd, Co, and Se, is a human health risk when concentrated in plant tissues because of soil contamination (Ali et al., 2013; Alvarez et al., 2003; Cobbett, 2000a; Evangelou et al., 2007; Gonçalves et al., 2011; Maksymiec, 2007; Rascio and Navari-Izzo, 2011; Sharma and Dietz, 2009; Yang and Chu, 2008).

Of all potentially toxic elements present in soil, Cd and Se are the primary concerns in terms of contaminating the food chain. Problems from contamination by Se are predominantly the result of natural soil enrichment. Cadmium concentration in soil in many countries is increasing because of inadvertent additions in fertilizers, biosolids, and soil alteration from the atmosphere. Health problem from contamination by Cd have occurred only in cases of serious soil contamination (McLaughlin et al., 1999).

Some metals are classified as essential metals because they play an important biological function in the metabolism of many organisms. For example, Fe, Zn, Cu, Ni, and Mn act as cofactors for enzymes in plants, microorganisms, and mammals (Rascio and Navari-Izzo, 2011).

One factor that significantly affects metal toxicity is the chemical form in which the element is found. The problem associated with soil contamination by metals is the existence of bioavailable forms of these elements (Li et al., 2015a). The metals found in soluble forms and exchangeable forms are those that have greater bioavailability, thereby being the most worrying. In the soluble form, the metal is in an ionic form or organic complex and thereby is easily absorbed by plants or leachates, reaching underground water bodies. The most toxic form is not a free metal, but a cation or being connected with carbon chains. In organisms, the main mechanism of toxic action is the affinity for sulfur. Therefore, when present in its cationic form, metals react with the sulfhydryl radical present in the enzymatic protein structure, changing its properties and leading to harmful consequences to the living beings (Maestri et al., 2010; Yadav, 2010).

HM normally does not exist individually in soil, but coexists with another contaminant, thereby causing a combined effect of contaminants by HM in the environment. The adsorption, absorption, and

SNO=14(e)

coordination among the different HMs may affect its distribution, bioavailability, and toxicity in soil (Wang et al., 2009). Therefore, the effect of combined pollution, which depends on the metal mixture, may vary significantly (Jensen and Sverdrup, 2002).

The content of a given element in a given soil is highly dependent on the mineralogical composition of the source material (Roca et al., 2012). Knowledge of the dynamics of metals in soil allows the use of preventive practices to control the availability of these elements, distribution in the environment, and transfer from the soil to the food chain. Unlike organic contaminants, most metals do not suffer from microbial degradation or chemicals; therefore, the metal concentration in soil persists for a long period after its entry. The most important parameters that control HM adsorption and its distribution between soil and water are the type of soil, metal species and concentration, soil pH, and time of contact. In general, a better retention of the metal and lower solubility occurs more in alkaline soils; increasing the pH is one way to precipitate hydroxides that are less soluble from these metals (Al-Wabel et al., 2014).

3. PLANT STRATEGIES TO TOLERATE HM TOXICITY

Plants can present different tolerance mechanisms in response to excess of HMs, including a reduction in transport through the membrane, exclusion, phytochelatins (PCs), metallothionein (MT) formation, chelation by organic acids and amino acids, and metal compartmentalization in subcellular structures (Hall, 2002; Ovečka and Takáč, 2014; Pal and Rai, 2010).

3.1 TRANSPORT REDUCTION THROUGH THE MEMBRANE

The availability of metals to plants is strongly dependent on the chemical and physiological conditions in the rhizosphere. One of the main factors is soil pH, which has a significant effect over the solubility of HM ions. The availability of bivalent cations to the plant roots slightly increases in acidic conditions and decreases in alkaline soils (forming insoluble precipitates such as hydroxides) (Härdtle et al., 2004; Zhao et al., 2011). Furthermore, when the rhizosphere is exposed to acidic conditions ($pH < 5.0$), plant growth is significantly reduced; however, the plant can neutralize this effect by increasing the pH of the rhizosphere. The plant increases the degree of precipitation and complexation of metal ions in the vicinity of the roots and, thus, helps prevent the absorption of HM ions, thereby reducing the impact of metal toxicity. Besides pH, soil organic matter content, nitrogen forms present in the rhizosphere, and the availability of phosphorus and iron helps plants to buffer the rhizosphere (Hinsinger et al., 2011). All of these factors have significant effects on the uptake of HMs.

The first barrier against the entry of HMs, acting mainly at the root level, is the immobilization of HMs in the cell wall by extracellular carbohydrates such as mucilage and callose (Revathi and Venugopal, 2013; Shu et al., 2007; Waraich et al., 2011). This avoids the presence of free ions in the root tissue and, consequently, the translocation of ions to shoots, thus reducing phytotoxicity. In this context, pectins and histidines stand out for the immobilization of HMs in the cell wall (Baetz and Martinoia, 2014; Watt and Evans, 1999).

It is important to highlight that, among a number of ions associated with roots, only a portion is absorbed by the cells. A significant fraction is adsorbed by negatively charged groups in the cell wall of

SNO =17.(9)

roots. Thus, it is possible to have plants that accumulate a significant concentration of metal in the roots, but express a limited concentration in shoots (Ali et al., 2013; Rascio and Navari-Izzo, 2011; Visioli and Marmiroli, 2013).

3.2 EXCLUSION

Preventing entry of metals in the cytosol through exudation of compounds by the action of plasma membrane may theoretically be the best defense strategy. Some plants, known as exclusionary plants, possess specialized mechanisms to reduce the entry of HMs in the roots. Malate, citrate, and oxalate have been identified as important chelating agents secreted by roots that are involved in plant resistance to HMs (McGrath and Zhao, 2003; Sas et al., 2001; Zorrig et al., 2010).

Malate, citrate, and oxalate are weak organic acids, have a low molecular weight, possess at least one carboxyl group, and are termed oxygen-donor metal ligands. Some of these compounds are present in all plant cells as intermediates of the tricarboxylic acid cycle, the main respiratory pathway involved in the oxidation of pyruvate (Adrees et al., 2015; Akhter et al., 2014; Rascio and Navari-Izzo, 2011; Revathi and Venugopal, 2013).

The dicarboxylic acid malate, an important plant metabolite, can be present in all cell types and involved in ion balance, P and Fe uptake, and Al and Zn tolerance. In particular, it is a cytosolic Zn chelator in zinc-tolerant plants; Zn is bound to malate in the cytoplasm and transferred as a complex across the tonoplast to the vacuole. There, Zn-malate may disassociate and finally malate may be retranslocated to the cytoplasm (Bian et al., 2013; Ibrahim, 2015; Komal et al., 2014; Oliva et al., 2012; Tsednee et al., 2014; Viehweger, 2014).

Citrate, which is synthesized in plants by the enzyme citrate synthase, has a higher capacity for metal ions than malate and oxalate, and although its principal role is to chelate Fe^{2+}, it also has a strong affinity also for Ni^{2+}, Cd^{2+}, Zn^{2+}, and other divalent and trivalent ions (Oliva et al., 2012; Palmer and Guerinot, 2011; Schneider et al., 2013). Citrate metabolism in plants is carried out by several metabolic pathways located in different cellular compartments. Present in considerable amounts, citrate belongs to the key metabolites in plant cells (Anjum et al., 2015; Ezaki et al., 2013; Komal et al., 2014).

Oxalate is a common constituent of plants. Although it can be found in relatively small amounts in plants, it can be accumulated at high levels in several plants species (such as *Caryophyllaceae*, *Chenopodiaceae*, and *Polygonaceae*) (Norman et al., 2013; Tuazon-nartea and Savage, 2013). The role of oxalic acid in Al tolerance has been well-documented (Bian et al., 2013; Brunner and Sperisen, 2013; Ezaki et al., 2013; Simões et al., 2012; Yang et al., 2013; Zhou et al., 2014).

3.3 CHELATION

Chelation of HMs is a ubiquitous detoxification strategy described in a wide variety of plants. Inside the cell, HM ions that are not immediately required metabolically may reach toxic concentrations, and plant cells have evolved various mechanisms to store excess metals to prevent their participation in unwanted toxic reactions. If the toxic metal concentration exceeds a certain threshold inside the cells, an active metabolic process contributes to the production of chelating compounds(Akhter et al., 2014; Ali et al., 2013; Kobayashi and Nishizawa, 2012; Merlot et al., 2014; Oliva et al., 2012; Rascio and Navari-Izzo, 2011; Viehweger, 2014; Yruela, 2013).

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Chelation contributes to metal detoxification by reducing the concentration of free metal in the cytosol, limiting its reactivity and solubility. In plants, the major known classes of HMs chelates include PCs, MTs, organic acids, and amino acids (Cobbett and Goldsbrough, 2002; Hall, 2002; Hodson and Brookes, 2012; Soudek et al., 2014).

3.4 PHYTOCHELATINS

One of the mechanisms of tolerance to HMs in plants is related to the synthesis of thiolic peptides called PCs, which form complexes with HMs, in particular Cd, in the free sulfur (S) present in cysteine (Flores-Cáceres et al., 2015; Komal et al., 2014).

The PCs are formed by three amino acids: glutamate (Glu), cysteine (Cys), and glycine (Gly) with Glu and Cys connected via a γ-carboxylamide. The structure of the PCs is formed with an increase in the repetitions of the dipeptide γGlu-Cys followed by a Gly terminal. It has a general structure of $(\gamma\text{-Glu-Cys})_n\text{-Gly}$, where $n = 2\text{–}11$, but is usually found with the n varying from 2 to 5. The PCs have been identified in a wide variety of species of plants and in some microorganisms (Cobbett and Goldsbrough, 2002; Cobbett, 2000a, 2000b; Pal and Rai, 2010; Pérez-Clemente et al., 2013).

These peptides are enzymatically synthesized, using glutathione (GSH) as a substrate, through a reaction catalyzed by the enzyme γ-glutamylcysteine dipeptidyl transpeptidase known as PC synthase, which is activated by the presence of HMs. PC synthase is activated after a few minutes of exposure to a variety of metals and metalloids. In vitro, the activity of PC synthase was activated only in the presence of metal ions and the best activator studied was Cd followed by Ag, Bi, Pb, Zn, Cu, Hg, and Au. These metals also induced the synthesis of PCs in vivo in plant cell cultures.

The PCs are structurally related to GSH (γ-Glu-Cys-Gly), and numerous physiological, biochemical, and genetic studies have confirmed that GSH (or, in many cases, related compounds) is the substrate for the biosynthesis of PCs (Hossain et al., 2012; Weydert and Cullen, 2011; Yadav, 2010).

In addition to the PCs, some plants may have other peptides related to PCs in the presence of HMs. Legumes produce peptides with the structure $(\gamma\text{-Glu-Cys})_n\text{-}\beta\text{Ala}$ (Grill et al., 1986), which are formed by homo-GSH that can partially or completely replace GSH in these plants. Some species of the family *Poaceae* (*Gramineae*) produce peptides containing serine as an amino terminal, with the structure $(\gamma\text{-Glu-Cys})_n\text{-Ser}$, called hydroxymethyl-PCs (Pal and Rai, 2010). These peptides are formed from the presence of hydroxymethyl-GSH in addition to GSH in these plants.

Cd is the strongest inducer of PC in vivo and is the element that forms the most stable complexes with PCs because of its high affinity for sulfur (Lux et al., 2011). However, PC synthesis is not only related to that element. Grill and Zenk (1987), studying the synthesis of PC in a cell culture suspension of *Rauvolfia serpentina* exposed to metals, concluded that the metals induce the synthesis of PCs in the following decreasing order: Cd^{2+}, Pb^{2+}, Zn^{2+}, Sb^{3+}, Ag^{+}, Hg^{2+}, As^{5-}, Cu^{+}, Sn^{2+}, Au^{3+}, and Bi^{3+}. According to these same authors, Ni, Te, W, and Se ions did not induce PC synthesis.

3.5 METALLOTHIONEINS

MTs are low-molecular-weight proteins that are nonenzymatic, rich in cysteine (Cys), and efficient in complexing the metals by affinity with sulfur present in the Cys (Cobbett and Goldsbrough, 2002).

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MTs are classified based on the arrangement of Cys. Class I MTs have more than 20 conserved Cys, are common in mammals and vertebrates, and known to confer tolerance to Cd^{2+}. The MTs without a specific arrangement of Cys are classified as class II MTs and include all those found in plants, fungi, and invertebrates (Carpenè et al., 2007).

Despite MTs being more common in animals, there are four types of MTs in plants, classified according to the arrangement of Cys in the protein formation. The Cys are present in plants MTs like Cys-x-Cys, Cys-x-x-Cys (where x is an amino acid different from Cys), or groups of Cys–Cys (Carpenè et al., 2007).

The diversity of MTs in plants suggests that they may not only differ in amino acid sequence, but also in function and specificity of a particular metal (Ali et al., 2013). However, there is still no information about the true function of each MT in a plant because of the difficulty in obtaining purified MT. The MT has a tendency to hydrolyze itself, particularly in the region between Cys in the protein sequence. Nevertheless, various functions have been proposed for MTs in plants, such as detoxification of metals (mainly Cu), complexation of cytosolic Zn, and metal secretion via trichome on the leaves (Coyle et al., 2002; Grill and Zenk, 1987; Komal et al., 2014).

3.6 ORGANIC ACIDS AND AMINO ACIDS

Because of the reactivity of metal ions with sulfur, nitrogen, and oxygen, carboxylic acids and amino acids represent potential ligands of HMs.

Citrate, malate, and oxalate have been implicated in several processes, including tolerance to HMs, metal transport through the xylem, and vacuolar sequestration (McGrath and Zhao, 2003; Rascio and Navari-Izzo, 2011; Zorrig et al., 2010). Citric acid is the largest Cd^{2+} ligand when it is in low concentrations; it forms complexes with Ni^{2+} in hyperaccumulator plants and contributes to the accumulation and tolerance to Zn^{2+} (Labanowski et al., 2008; Soudek et al., 2014; Zorrig et al., 2010).

Histidine, an amino acid produced by plants in response to the presence of metals, is involved in a mechanism of tolerance to Ni, and in low concentrations it is involved with Co tolerance (McGrath and Zhao, 2003; Rascio and Navari-Izzo, 2011; Visioli and Marmiroli, 2013).

3.7 COMPARTMENTALIZATION

Cells use a combination of compartmentalization, chelation, and exclusion to restrict the deleterious effects of HMs and to ensure that the correct kind of metal is delivered to its target protein. The main storage compartment of HMs in plant cells is the vacuole and there is evidence of vacuolar sequestration of metal ions in plants, which prevents the movement of HMs in the cytosol and transports them to a limited area (Ernst, 2006; Hall, 2002; Lux et al., 2011; Rascio and Navari-Izzo, 2011; Soudek et al., 2014; Yang and Chu, 2008).

Transporters potentially related to this process have been identified in *Arabidopsis thaliana*. The superfamily of P-type adenosine triphosphatase (ATPase) uses the energy of adenosine triphosphate hydrolysis to translocate cations through biological membranes and can be divided into several subfamilies, including carriers of HMs P_{IB}-ATPase (Colangelo and Guerinot, 2006).

The vacuole is a key cellular compartment where the metal may be stored when in excess, providing a source during periods of deficiency. For example, Fe is known to be transported to the vacuole by the VIT1 transporter. The remobilization of Fe from the vacuole is mediated by the actions of NRAMP3 and

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NRAMP4, which are regulated under Fe deficiency and are located in the vacuolar membrane. Although NRAMP3 or NRAMP4 mutants show no phenotype, nramp3 and Nramp4 mutants have a lethality rate of 90% when grown in Fe-deficient soils, suggesting that these proteins are functionally redundant and necessary for Fe mobilization under Fe deficiency (Palmer and Guerinot, 2011).

4. EFFECT OF HMS ON PRODUCTIVITY

The toxic effects of HMs in plants depends on the plant species, the concentration and type of metal, the chemical form in which the HM is present, soil composition, and pH (Nagajyoti et al., 2010; Nagata et al., 2013). The prolonged use of phosphate fertilizers, application of sewage sludge, industrial waste, pesticides, and poor agricultural practices have been associated with this contamination by HMs in the soil (Bell et al., 2001; Kashem et al., 2009; Passariello et al., 2002; Schwartz et al., 2001).

Reduced growth is one of the most common physiological consequences of exposure to HMs in plants (Hu et al., 2013; Tamás et al., 2008). The changes induced by the metal ions in the physiological and structural integrity of the leaves reduce the rates of photosynthesis and respiration, which has deleterious effects on the power supply and the efficiency of other metabolic processes. Transpiration and transport processes between several organs are also affected (Ying et al., 2010). Furthermore, HM toxicity has adverse effects on the roots, reducing the ability of the plant to absorb water and nutrients (Sharma and Dietz, 2009). Consequently, major changes in the functioning of roots and leaves will affect developmental processes, such as formation of flowering, embryogenesis, and seed formation.

5. CLIMATIC CHANGES AND HM TOXICITY

The most common methods of remediation of contaminated soils are physical, chemical, and biological, although the methods of physical and chemical remediation are both very difficult and expensive, in addition to negatively affecting the soil ecosystem. One potential method for the remediation of soils contaminated with HM is phytoremediation, which is an economical and environmentally friendly technique that uses tolerant plants and associated microorganisms to remove, turn, stabilize, volatilize, or absorb HMs in soil using biochemical processes (Rajkumar et al., 2013).

The evidence available in the literature regarding climate change and increased CO_2 concentration will have positive effects on phytoremediation of HMs and plant growth. An increase in root exudate and microbial diversity caused by increased CO_2 concentration could facilitate the phytoremediation of HMs (depending on the plant and metal in question), an increase in cycling, availability of nutrients, mobilization and immobilization of metals, and on plant growth and in soil quality. However, the impacts caused by global warming could hamper the process of phytoremediation, although the findings of recent studies are inconsistent.

6. CONCLUSIONS AND FUTURE PROSPECTS

Contamination by HMs is a major problem affecting crop yield. The ability to tolerate HMs is different according to the plant species because they differ in their ability to tolerate HMs. Some plants grow well in soil enriched with toxic levels of HMs, whereas others do not grow at all. Recent studies indicate that GSH plays an important role in HMs tolerance. The HM stress induces production

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of reactive oxygen species(ROS) generated by oxidative stress and GSH detoxifies ROS by the GSH–ascorbate cycle. In addition to the metal ions accumulated, high levels of ROS negatively affects plant development. The metal ions are detoxified by PCs synthesized by GSH upon plant exposure to HMs. The PCs form complexes with metal ions and are stored in the vacuole. This tolerance mechanism to HMs in plants strongly suggests that the plants are not limited to GSH. In particular, the role of GSH, PCs, cysteine synthesis, and glyoxalase has been related to HM tolerance. Several plant species have been identified as HMs accumulators; however, plants of agricultural importance are not good accumulators and continue to suffer from the stress caused by exposure to HMs. A viable and affordable alternative to reduce stress in agricultural plants would be the use of bioremediators such as mycorrhizal fungi. Mycorrhizae use different mechanisms to tolerate HMs and act as a physical barrier preventing the entry of a metal into the plant. In addition to decreasing the plant stress caused by HMs, mycorrhizae may stimulate greater productivity.

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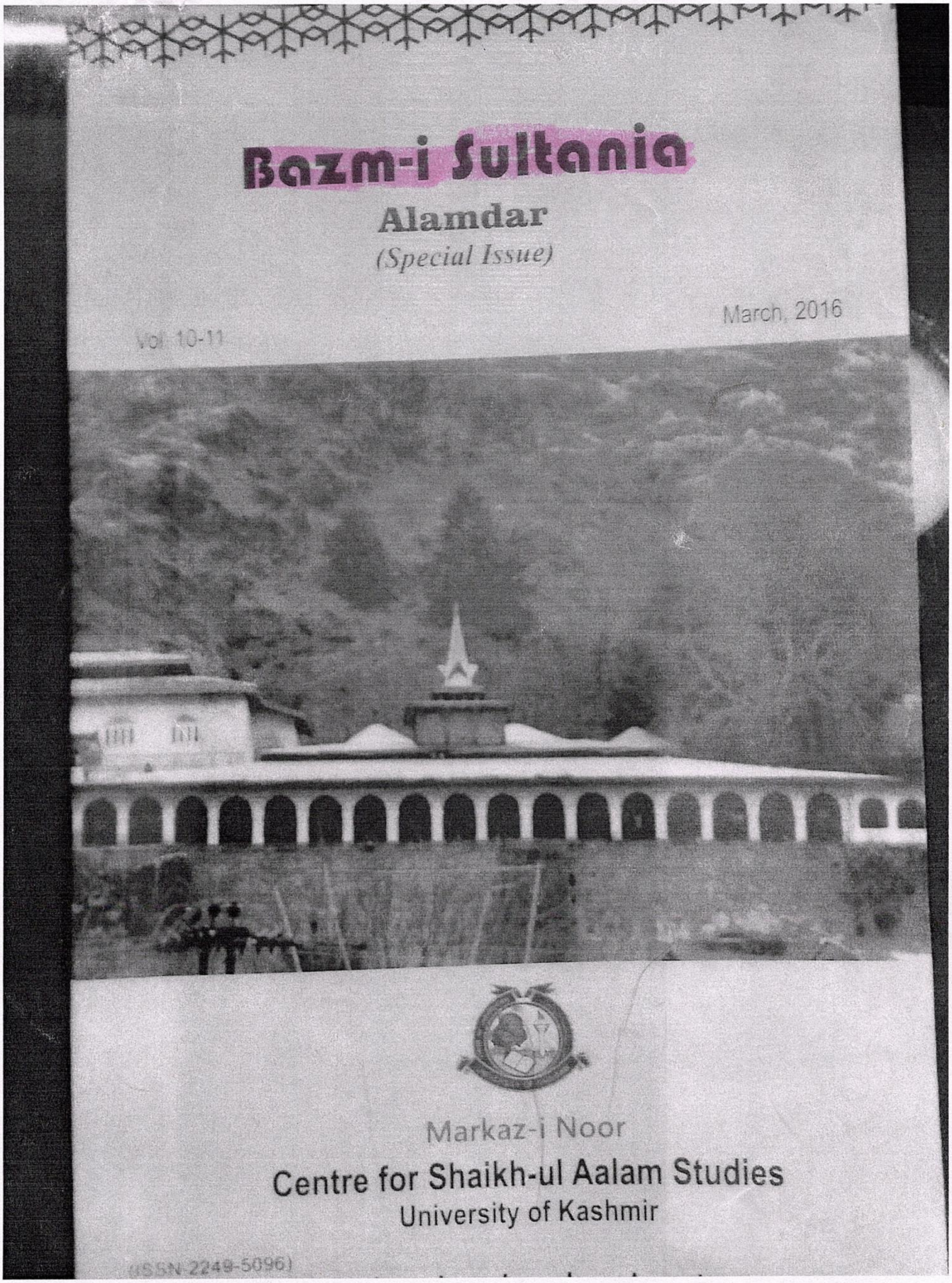

Bazm-i Sultania

Alamdar

(Special Issue)

Vol. 10-11

March, 2016

Markaz-i Noor

Centre for Shaikh-ul Aalam Studies

University of Kashmir

(ISSN 2249-5096)

(SNo=20(91))

بزم سُلطانیہ

خصوصی شمارہ علمدار

جلد۔۔۔۱۰۔۱۱ مارچ ۲۰۱۶ عیسوی

مرکز نوؔر

سنٹر فار شیخ العالم سٹڈیز، یونیورسٹی آف کشمیر

Mehak Press sgr # 9419063159

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azm-i Sultania

Alamdar
(Special Issue)

March, 2016

Sno = 20

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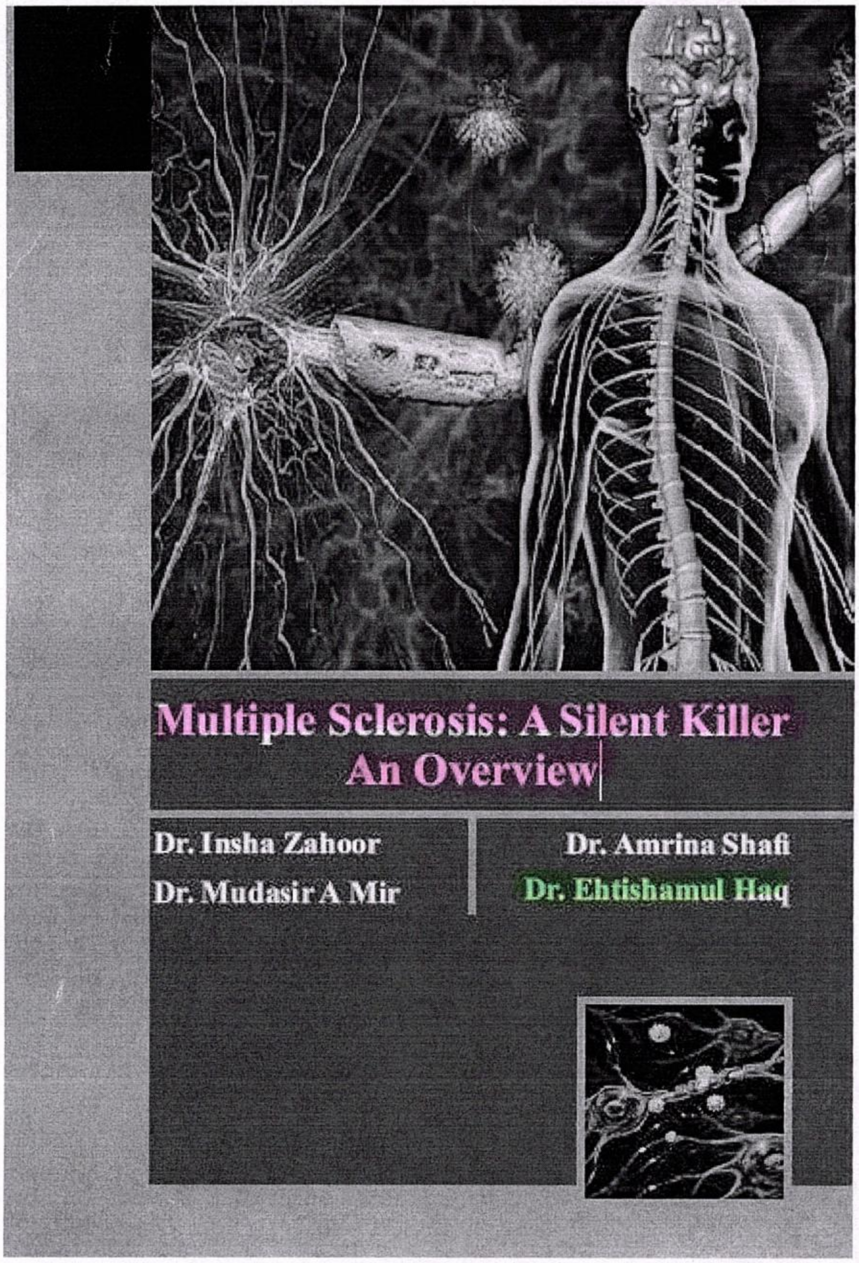

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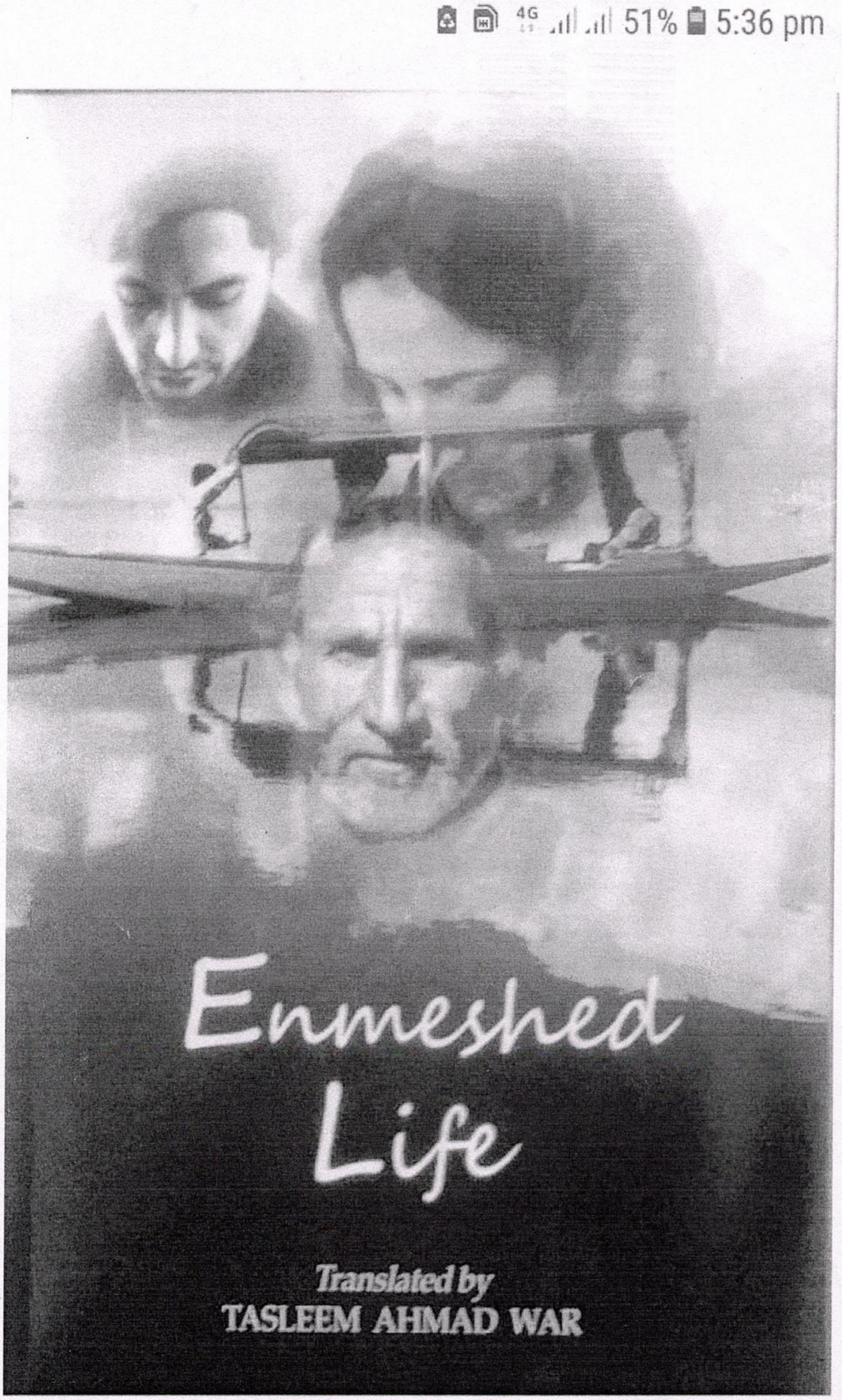

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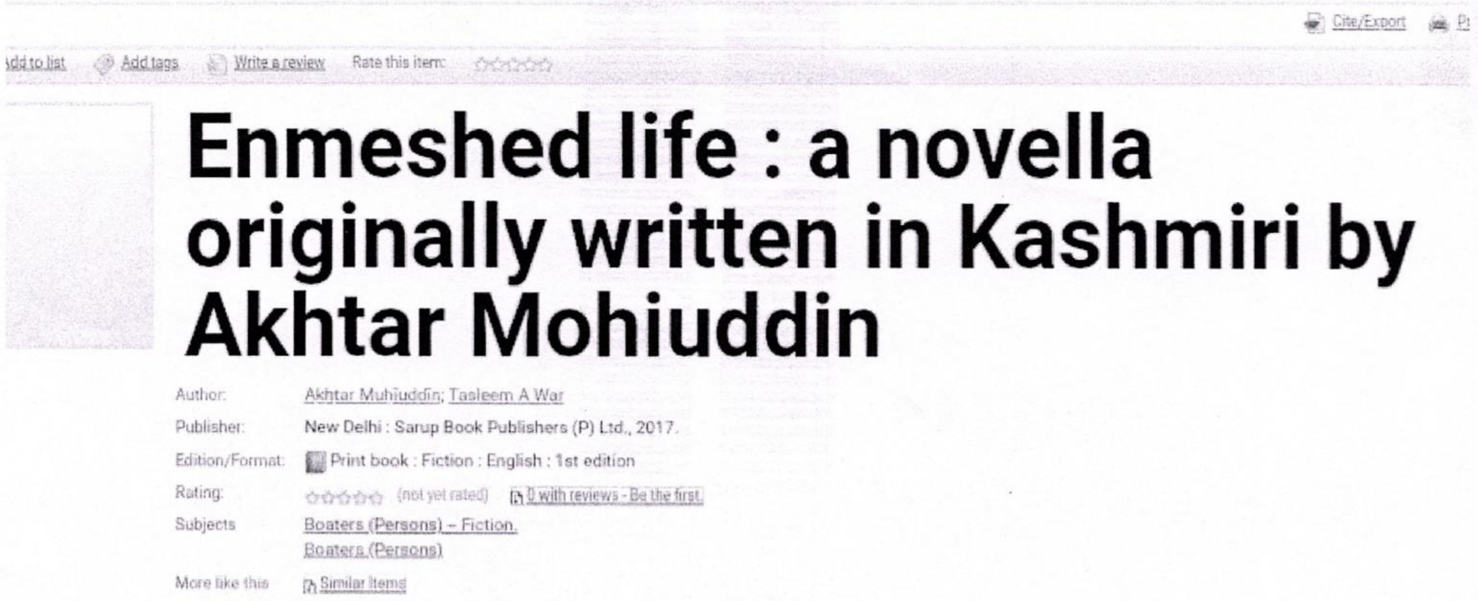
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صدر شعبہ فارسی، کشمیر یونیورسٹی، سرینگر۔

SNO-23A

مقدمہ

کشمیر کی فارسی تواریخ کا مختصر جائیزہ

کشمیر جیسے ہندوستان کی ایک بہت ہی خوبصورت ریاست ہے ویسے ہی اس کی تاریخ بھی اس قدر حسین رہی ہے اور دلکش بھی۔ اگر چہ اس کی تاریخ میں بڑے المناک واقعات بھی رونما ہوئے ہیں لیکن جب سے کشمیر آباد ہوتا گیا اسکی خوبصورتی اور اسکے فطری مناظر نکھرتے گئے اور زمانے گزرنے کے ساتھ ساتھ اسمیں مختلف قومیں آباد ہوئیں اور مٹیں اور پھر آبادی بنتی گئی۔ اس طرح موت وحیات کا یہ سلسلہ جاری رہا۔ لوگ مختلف عقیدوں، روایتوں اور مذاہب سے منسلک رہے اور یہ عقائد و مذاہب بھی تاریخ بننے کے ساتھ ساتھ کبھی ڈوبے اور کبھی اُبھرے۔ تاریخ کی یہ آنکھ مچولیاں بڑی دلکش لیکن بڑی رزخیز رہیں۔ زرخیز اسلئے کہ انہوں نے اپنے پیچھے بڑے ہی اُستوار تہذیب وتمدن کے نقوش چھوڑے۔ آثار باقی رکھے اور عقائد وروایات کا ایک بہت ہی دیر پا اثر قائم رکھا جس کے حسین اور منفو د نقوش آج بھی پورے ہندوستان بلکہ پوری دنیا میں تابنا کی کے ساتھ روشن ہیں۔

SNO - 23B

اسمیں شک نہیں کہ ازمنہ قدیم سے ہی کشمیر علم وادب کا گہوارہ رہا ہے۔ ظہور اسلام سے قبل یہ خطہ سنسکرت زبان کا ایک اہم مرکز تھا اور یہاں کی علمی وادبی زبان سنسکرت تھی۔ یہاں کے قدیم مورخ کلہن پنڈت کی تاریخ راج ترنگنی سے پہلے بھی چند تاریخیں لکھی گئی تھیں لیکن تاریخ کو ایک فن کی حیثیت سے روشناس کرانے کا سہرا کلہن پنڈت کے سر باندھا جاسکتا ہے۔ راج ترنگنی سنسکرت زبان میں کشمیر کی وہ پہلی تاریخ ہے جو دستیاب ہے اس لحاظ سے اگر مورخ کلہن کو کشمیر کا ابوالمورخین کہا جائے تو بے جا نہیں ہوگا۔ یہ تاریخ راجہ جے سنگھ کے عہد میں ۱۱۴۸ء میں لکھی گئی۔ اس تاریخ کی اہمیت کا انداز اس بات سے لگایا جاسکتا ہے کہ اس کا ترجمہ نہ صرف فارسی زبان میں بلکہ انگریزی، اردو اور فرانیسی زبان میں بھی ہو چکا ہے۔ اس کا پہلا فارسی ترجمہ ملا احمد کشمیری نے سلطان زین العابدین (۱۴۱۸ء۔۱۴۷۰ء) کے حکم سے بحر الاسمار کے نام سے کیا۔ اس کے بعد شہنشاہ اکبر کے عہد میں ملا عبدالقادر بدائنی نے اس پر نظر ثانی اور ایک مخصوص ترتیب کے ساتھ اس کا ترجمہ کیا۔

عہد سلاطین میں سلطان زین العابدین (۱۴۱۸ء۔۱۴۷۰ء) کشمیر کا وہ پہلا حکمران ہے جس نے مختلف علوم وفنون کے ساتھ ساتھ فارسی تاریخ نویسی کی طرف بھی توجہ مبذول کرائی۔ اس کے دربار سے وابستہ ہندو مورخ جون راج نے کلہن کے طرز پر تاریخ کشمیر راج ترنگنی کے نام سے ہی لکھی جس میں راجہ جے سنگھ کے دور سے لیکر سلطان زین العابدین کے دور تک کے راجاؤں کا تذکرہ ملتا ہے۔ جونراج کے انتقال کے بعد اس کے شاگرد ”شری ور“ نے سلطان زین العابدین کے حکم سے ”زینہ راج ترنگنی“ لکھی جس میں ۱۴۵۹ء سے لیکر ۱۴۸۹ء تک کے حالات وواقعات درج ہیں۔

بقول جی۔ ایم۔ ڈی صوفی مذکورہ تاریخ کے علاوہ ''شری ور'' ن مولانا جامی کی مشہور مثنوی ''یوسف زلیخا'' کا ''کتھاہ کوتکا'' کے نام سے سنسکریت میں ترجمہ کیا۔ ''شری ور'' کی وفات کے بعد ''پراجہ بھٹ'' نے ''راج ولی پٹا کا'' میں ۱۴۸۶ء سے ۱۵۱۲ء تک کے حالات وواقعات درج کئے ہیں۔ پراجہ بھٹ کے بعد ان کے ایک شاگرد ''شک'' نے بھی کلہن کے طرز تحریز پر راج ترنگنی کے نام سے تاریخ کشمیر مرتب کی جس میں ۱۵۱۲ء سے ۱۵۹۶ء تک کے حالات واواقعات کی نشاندہی کی گئی ہیں۔ کلہن کی راج ترنگنی ک بعد جتنی بھی راج ترنگنیاں لکھی گئی ان کا انگریزی ترجمہ datta نے Knigs of Kashmir کے نام سے کیا ہے جو اس وقت دستیاب ہے۔

جہاں تک کشمیر میں فارسی تاریخ نویسی کا تعلق ہے اس بارے میں یہی کہا جاسکتا ہے کہ اس ی ابتداء ظہور اسلام کے بعد ہی ہوئی۔ عہد سلاطین میں سلطان زین العابدین کی شاہانہ سرپرستی میں ''ملا احمد کشمیری'' نے ایک تاریخ ''وقایع کشمیر'' کے نام سے لکھکر کشمیر میں فارسی تاریخ نویسی کا بابائے آدم کہلانے کا شرف حاصل کیا۔ بعض محققین کے مطابق ''وقایع کشمیر'' مورخ رتنا کر کی لکھی ہوئی سنسکرت تاریخ ''رتنا گر پران'' کا فارسی ترجمہ ہے۔ ملا احمد کشمیری نے ہی پہلی بار مہا بھارت کا سنسکرت سے فارسی ترجمہ کیا تھا۔ جو آج کل ناپید ہے۔

سلطان زین العابدین کے عہد کا دوسرا اہم مورخ ملا نادر تھا جنہوں نے ''تاریخ ملا نادری'' کے نام سے تاریخ کشمیر لکھی تھی اسی دور کے قاضی ابراہیم نے ''تاریخ قاضی ابراہیم'' اور قاضی حمیدالدین نے ''تاریخ قاضی حمید'' کے ناموں سے کشمیر کی تواریخ رشتہ تحریر میں لائی تھیں لیکن افسوس ہے کہ شہمیری عہد کی یہ معتبر فارسی

SNO -23D

تاریخیں اب نایاب ہیں۔ البتہ اس دور کے آخیر میں لکھی گئی ''تاریخ رشیدی'' دستیاب ہے جس کے مصنف مرزا حیدر دوغلت کاشغری تھے۔ میرزا حیدر نے دومرتبہ یعنی ۱۵۲۳ء اور ۱۵۴۰ء میں کشمیر پر حملے کئے اپنے پہلے حملے میں وہ ناکام رہے جب کہ دوسرے حملے میں کامیاب ہوکر تخت شاہی حاصل کر کے ۹۴۷ھ میں دس سال تک کشمیر پر حکومت کرتے رہے۔ تاریخ رشیدی دراصل وسط ایشاء کے مغلوں کی ایک جامع تاریخ ہے جسے مولئف مذکور نے ابوسعید خان والی کاشغر کے بیٹے عبدالرشید خان کے نام سے معنون کر کے اس کا نام ''تاریخ رشیدی'' رکھا۔ لیکن تاریخ کا ایک حصہ کشمیر پر بھی مختص ہے جس میں کشمیر کی سیاسی، سماجی، معاشی اور اقتصادی حالات کے علاوہ یہاں کے تہذیب وتمدن، رہن سہن اور ثقافت پر بھی روشنی ڈالی گئی ہے۔

شہمیریوں کے بعد کشمیر میں چک سلاطین (۱۵۵۴ء سے ۱۵۸۶ء) برسر اقتدار آئے۔ یہ دور نہ صرف سیاسی کشمکش کے لحاظ سے بلکہ فارسی علم وادب کی ترقی کے لحاظ سے بھی ایک اہم دور رہا ہے۔ اس دور میں لکھی گئی تواریخ ''تاریخ کشمیر'' از سید علی ماگرے اور بہارستان شاہی کے اموں سے دستیاب ہیں سید علی ماگرے کی ''تاریخ کشمیر''، شہمیری سلاطین کے عہد میں لکھی گئی نایاب تواریخ کے بعد کشمیر کی تاریخ سے متعلق یہ ابتدائی اور اولین دستیاب فارسی تاریخ ہے۔ ''تاریخ سید علی'' تاریخی لحاظ سے کافی اہم ہے کیونکہ اس اس میں مصنف نے بعض اہم چشم دید واقعات بھی درج کئے ہیں مثال کے طور پر اس نے میرزا حیدر دوغلت کاشغری کی حکومت کا ابتداء سے لیکر اختتام تک انکھوں دیکھا حال اس میں درج کیا ہے۔ اس بات کا بھی پتہ چلتا ہے کہ اس نے شہمیری دور میں لکھی گئی بعض اہم تواریخ جواب نایاب ہیں سے بطور ماخذ بہت

SNO - 23C

استفادہ کیا تھا۔

سید علی ماگرے کی ''تاریخ کشمیر'' کے بعد کشمیر کی تاریخ سے متعلق ''بہارستان شاہی'' نام کی فارسی تاریخ خاص طور پر قابل ذکر ہے یہ تاریخ اگرچہ شاہان مغلیہ کے عہد حکومت (۱۰۲۳ھ) میں تالیف کی گئی لیکن اس کا مصنف (نامعلوم) چک دور میں بقید حیات تھا۔ کشمیر کی مقامی تاریخوں میں بہارستان شاہی ایک مستند اور معتبر تاریخ ہے۔ یہ دوسری تاریخ ہے جو کشمیر میں اسلام کی ترویج و اشاعت کے بعد فارسی زبان میں لکھی گئی۔ کتاب کے مصنف کا نام معلوم نہیں۔ البتہ اس کے آخر پر ایک قطعہ درج کیا گیا ہے جس کی رو سے سال تصنیف ۱۰۲۳ھ مطابق ۱۶۱۴ء ہے۔

چک سلاطین کے بعد جلال الدین محمد اکبر ۹۹۴ھ مطابق ۱۵۸۶ء کو تخت نشین ہوئے۔ وہ کئی بار کشمیر کی سیاحت پر آئے۔ ان کے عہد میں فن خطاطی اور فن تاریخ نویسی کو ایک نئی تحریک ملی۔ مغل دور میں کشمیری مورخین نے جو تاریخیں لکھیں ان میں سے ایک ''تاریخ کشمیر'' از حیدر ملک چاڈورہ ہے اس تاریخ میں زمانہ قدیم سے لیکر جہانگیر کے عہد تک کے سیاسی و تاریخی حالات درج ہیں۔ یاہس پر اس بات کا تذکرہ کرنا بیجا نہ ہوگا کہ حیدر ملک چاڈورہ نے نہ صرف دربار اکبری میں تعظیم و تکریم پائی تھی بلکہ وہ جہانگیر کے دربار میں بھی ملازم تھے اور اپنی خدمات کی بدولت چغتائی اور رئیس الملکی کے خطابات سے نوازے گئے تھے۔ انہوں نے اپنی تاریخ کشمیر کو ۱۰۲۷ھ میں شروع کر کے ۱۰۳۰ھ تک مکمل کیا تھا۔

مغل دور میں ہی کشمیر کی تاریخ سے متعلق ایک اور تاریخ ''واقعات کشمیر'' کے نام سے رشتہ تحریر میں لائی گئی اس کے مصنف خواجہ محمد اعظم دیدمری کے نام سے

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مشہور تھے۔ جو ۱۱۰۳ھ مطابق ۱۶۹۱ء میں اورنگ زیب کے عہد میں جبکہ مغلوں کی طرف سے ابونصر خان ناظم کشمیر تھا پیدا ہوئے اور ۱۰ محرم ۱۱۷۹ھ میں اس دنیائے فانی سے انتقال کر گئے۔ واقعات کشمیر نہ صرف کشمیریوں کے واقعات کا ایک مجموعہ ہے بلکہ ان کی علمی، ادبی اور اوصافی خدمات کا ایک حصہ بھی ہے۔ اس تاریخی کتاب کا سال تصنیف ۱۱۴۸ھ اور سال اختتام ۱۱۵۹ھ ہے۔

عہد اورنگ زیب (۱۰۶۸ھ تا ۱۱۱۹ھ) میں لکھی گئی کشمیر کی فارسی تواریخ میں پنڈت نرائین کول عاجز کی تاریخ ''منتخب التواریخ'' معتبر اور مستند تاریخ ہے۔ عاجز کی تاریخ دو حصوں پر مشتمل ہے پہلے حصے میں ہندو راجگان کشمیر کا مختصر تذکرہ کیا گیا ہے دوسرے حصے میں شہمیری اور چک دور کے حالات و واقعات پر روشنی ڈالی گئی ہے۔ مغلوں کے بعد ۱۱۶۶ھ مطابق ۱۷۵۳ء میں کشمیر پر افغانوں کا قبضہ ہو گیا۔ انہوں نے ۲۶طسال تک کشمیر پر حکومت کی۔ اس زمانے میں کشمیر کی مالی و اقتصادی حالت ابتر ہوئی تھی۔ مشہور محقق ایس، ڈبلیو لارنس[۱] اس دور کو کشمیر کے بدترین دور سے تعبیر کرتے ہوئے لکھتے ہیں **Kashmir became subject to the pattan rule the crullest worst of all** لیکن اس کے باوجود اس دور میں شعری ادب کے ساتھ ساتھ نثری ادب بالخصوص تاریخ نویسی کو بھی فروغ ملا۔ اس دور کی بیشتر تواریخ اگرچہ زمانے کے دست برد سے نہ بچ سکیں لیکن پھر بھی جو دستیاب فارسی تواریخ ہیں ان میں ''باغ سلیمان'' ایک منظوم تاریخ ہے جسے سعد اللہ سعادت نے تالیف کیا ہے۔ اس کا سال تصنیف ''باغ سلیمان'' سے بحروف ابجد ۱۱۹۴ھ برآمد ہوتا ہے۔ اس دور کی ایک اور تاریخ ''گوہر عالم'' کے نام سے ملتی ہے۔ یہ تاریخ کشمیر کی مقامی تاریخوں میں

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ایک خاص درجہ رکھتی ہے اس کا مصنف محمد اسلم منعمی ہے۔ اس میں زمانہ ابتداء سے لیکر ۱۳۰۰ھ تک کے سیاسی حالات و واقعات درج ہوئے ہیں ''تاریخ کشمیر'' از خلیل مرجانپوری اس عہد کی ایک اور اہم فارسی تاریخ ہے اس کی اہمیت ایک فارسی تذکرے کے طور پر بھی مسلم ہے کیونکہ اس میں دور کے شعراء اور علماء تفصیلی تذکرہ بھی ملتا ہے اس لحاظ سے یہ ایک زخیم تاریخ ہے۔

''تاریخ بیان واقع'' کشمیر کی مقامی تاریخوں میں ایک اور اہم تاریخ ہے جسے تاریخ نادری کے نام بھی موسوم کیا جاتا ہے۔ یہ تاریخ ۱۱۹۸ھ مطابق ۱۷۸۳ء کے حالات پر مشتمل ہے اس کے مصنف عبدالکریم مورخ ہونے کے ساتھ ساتھ ایک برگزیدہ اور بلند پایہ عالم و فاضل بھی تھے وہ نادرشاہ کے وزیر خارجہ بھی رہ چکے تھے۔ ایک اور تاریخ ''احوال ملک کشمیر کے نام سے موسوم ہوئی ہے اس کے مصنف کا نام لعل محمد عرف لالہ جو اور ''توفیق'' تخلص تھا۔ عام طور پر ملا محمد توفیق کے نام سے معروف تھے۔ اس زمانے کے افغان ناظم راجہ سکھ جیون مل[۲] نے ملا محمد توفیق کو ملک الشعراء کے خطاب سے نوازا تھا اور شاہنامہ کشمیر لکھوانے کا کام بھی ان کے سپرد کیا تھا ان کے شاہنامے میں یوسف شاہ چک کے عہد سے لیکر اورنگ زیب کے عہد تک حالات درج ہوئے ہیں۔ ایک اور طویل مثنوی ریاض الاسلام جو ''تاریخ شایق'' کے نام سے مشہور ہے اس زمانے کی یادگار ہے اس کا مصنف عبدالوہاب شایق شاعر ہونے کے ساتھ ساتھ تاریخ نویسی کے استاد تھے۔

افغانوں کے بعد کشمیر ۱۸۱۹ء میں مہاراجہ رنجیت سنھ کے قبضۂ اقتدار میں

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آیا۔ سکھوں کی طرف سے کشمیر پر گیارہ ناظموں نے حکومت کی۔ یہ دور عام طور پر کشمیر میں ظلم و جبر اور بربریت کا دور رہا ہے۔ اس دور میں اگرچہ کشمیر بیشتر علمی و ادبی سرمایہ ضائع ہوا لیکن پھر بھی چند قابل قدر تواریخ معرض وجود میں آئی۔

سکھ دور کی ایک اہم تاریخ ''مجموع التواریخ'' کے نام تحریر ہوئی ہے جس کے مصنف پنڈت بیربل کاچرو تھے جو پنڈت دیارام کاچرو خوشدل کے بیٹے تھے۔ پنڈت دیارام کاچرو شدل کے بیٹے تھے۔ یہ تاریخ ۱۲۵۱ھ مطابق ۱۸۳۵ء میں اس وقت لکھی گئی جبکہ مہاراجہ رنجیت سنگھ کی طرف سے مہان سنگھ ناظم کشمیر تھے۔ اس دور کی ایک اور تاریخ ''گلزار کشمیر' کے نام سے موسوم ہوئی ہے اس کے مصنف دیوان کرپارام اپنے زمانے کے مشہور مورخوں میں شمار ہوتے تھے۔ ان کا باپ کا نام دیوان جوالاسہاے اور دادا کا نام امیر چند تھا۔ دیوان جوالاسہاے نے تیس سال تک ڈوگرہ حکمرانوں کی ملازمت کی۔ دیوان کرپارام کے عہد نظامت میں شہروں اور قصبوں میں عدالتیں اور صدر مقامات قایم کئے گئے۔ سکولوں میں شاستری اور فارسی زبان شروع کی گئی۔ گلزار کشمیر ۱۸۵۷ء میں کرپارام نے مکمل کر لی اور یہ کتاب ۱۸۷۵ء میں ہی زیور طبع سے آراستہ ہوئی ہے اس تاریخ میں راجگان ہنود سے لیکر ڈوگرہ عہد تک کے حالات واقعات درج ہوئے ہیں۔ اس دور میں ایک تاریخ کشمیر ''خلاصۃ التواریخ'' کے نام سے تحریر ہوئی۔ اس کے مصنف مرزا سیف الدین تھے نے میجر جان ہچر کی تحریک پر یہ تاریخ ۱۸۵۹ء میں اگرچہ فارسی زبان میں ہی رشتہ تحریر میں لائی گئی تھی لیکن اس تاریخ کا اصلی فارسی متن اس وقت نایاب ہے صرف اس کا اردو ترجمہ بازار میں دستیاب ہے۔ اس تاریخ میں ابتدائی ہندو راجاؤں سے لیکر مہاراجہ رنبیر سنگھ تک کے

حالات وواقعات درج ہوئے ہیں۔

سکھوں کے بعد کشمیر پر ڈوگرہ خاندان (۱۸۴۳ء...۱۹۴۶ء) نے سو سال سے زائد عرصہ تک حکومت کی۔ اس خاندان کا پہلا حکمران مہاراجہ گلاب سنگھ ۱۸۴۶ء میں کشمیر کا بادشاہ بنا اور ۵۵ سال تک کشمیر پر حکومت کی۔ گلاب سنگھ کے اس خاندان کے کئی اور بادشاہوں نے یکے بعد دیگرے کشمیر پر حکمرانی کی۔ یہ دور بھی مجموعی طور پر کشمیر میں پرآشوب دور کے طور پر گزرا ہے لیکن اس کے باوجود اس دور میں نہ صرف فارسی زبان کی ساکھت کشمیر میں برقرار رہی بلکہ اس کو اور بھی تقویت ملی۔ مہاراجہ رنجیت سنگھ کی حکومت کے دوران ہی کچھ نئی روایات جاری ہوئیں۔ انگریزی تعلیم کی طرف توجہ دی گئی۔ جگہ جگہ مدرسے قایم کئے گئے۔ سنسکریت زبان کی پیش رفت کیلئے جموں میں رگھوناتھ مندر کے احاطے میں ایک پارٹ شالہ قایم کیا گیا اس کے علاوہ دارالترجمہ بھی بنایا گیا جہاں عربی، فارسی کتابوں کے ترجمے ڈوگری، اردو اور پنجابی زبانوں میں بھی کروائے گئے۔ طب اور سائنس کی کتابوں کے ترجمے بھی سنسکریت زبان میں کئے گئے۔ اگرچہ سنسکریت زبان کی ترویج کی طرف خاص توجہ مبذول رہی پھر بھی ادبی اور دفتری زبان فارسی ہی رہی۔

عہد سلاطین کے مانند اس دور میں مسلمان شاعروں اور عالموں کے ساتھ ساتھ ہندو شعرأ اور علماء نے بھی فارسی علم وادب کی خدمت کی۔ اس دور کے ہندو شاعروں اور ادیبوں میں ٹھاکر داس، پنڈت راج کاک درفرخ، پنڈت گوپال کول، پنڈت سیتارام بقایا، پنڈت رامودر ترسل، پنڈت مہتاب جیو ترسل، پنڈت ھتاراچند ترسل، کچھمن بٹ چالاک، پنڈ تطوطارام، پنڈت ٹیکارام، پنڈت شیو جی در، پنڈت

واسہ کول اگرہ، پنڈت تیج رام، پنڈت بل کاک فوتہ دار، پنڈت بشن چندر وشن کول، پنڈت بیربل کول، پنڈت دیارام، پنڈت لکی رام وغیرہ سرفہرست ہیں۔ واضح رہے کہ اس دور میں فارسی شعروشاعری کی ترقی کے ساتھ ساتھ نثر نویسی بالخصوص تاریخ نویسی کو بھی کافی عروج ملا۔ ....

حواشیہ

ا۔ Kasheer by G.M. Sofy Vol. 1. P. 167

۲۔ Valley of Kashmir by Sir Walter Lawrance. p.196

۳۔ سکھ جیون مل شاعروں، فاضلوں اور عالموں کا کافی قدردان تھا اس نے شاہنامہ کشمیر لکھنے کے لئے سات نمائیندہ شعراء کو متعین کیا تھا ان میں ملا محمد شایق بھی شامل تھا۔

SNO - 23K

تاریخ کشمیر ـــــــ تحقیقی جائزہ

جیسا کہ ہم جانتے ہیں کہ ازمنہ قدیم میں اس صفحہ ہستی پر بہت سی قومیں اور سلطنتیں آباد ہوئیں اور مٹیس ۔ ان کے بارے میں ہمیں جو معلومات بہم ہوسکتی ہیں وہ یا تو زبان زد عام کہانیوں پر مبنی ہوتی ہیں یا ان قوموں اور سلطنتوں کے قدیم عمارات کے کھنڈرات، ھتھیار یا سکے وغیرہ ہوسکتے ہیں ۔ لیکن یہ تمام معلومات بغیر ایک تاریخ کے غیر معتبر مستند ہیں کیونکہ تاریخ ہی ایک ایسا اقینہ ہے جس میں آنے والی نسل اپنے گزشتہ حالات تہذیب وتمدن، سماجی وسیاسی حالات، قدیم رہن سہن اور رسم ورواج کی پرانی روایات کا مشاهده کرسکتی ہیں ۔ بشرطیکہ مورخ نے راست بیانی سے کام لیا ہو ۔ کیونکہ اگر مورخ نے مبالغہ آرائی سے اپنی تحریر کو رونق بخشی ہوگی تو اسکی تاریخ کی حثیت محض ایک فرضی داستان کی سی رہ جاتی ہے ۔

تاریخ ہی ایک ایسا مستند درجہ رکھتی ہے جس سے آنے والی نسل کو ابتدا سے اپنے ارتقاء کے حالات کی تحقیق اور سابقہ زمانہ کے حالات معلوم کرانے میں مدد ملتی ہئے اور ان گزشتہ واقعات کا بغور مطالعہ کرکے ان سے مستفید ہوکر اعلیٰ مقاصد کو حاصل کرنے میں کامیاب ہوسکتی ہے ۔ کارڈ میکالے کا کہنا ہے کہ یہ امر یقین ہے کہ ’’جو لوگ تاریخ کے کھوپرے کو نہ توڑیں وہ کبھی فخر تک نہیں پہنچ سکتے ۔ دور دراز ممالک کی سیاحت اور عہد گزشتہ کے واقعات کا مطالعہ کرنے کا حقیقی فائدہ یہی ہے کہ لوگوں کو

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اس تنگ خیالی سے بچایا جائے جو اس صورت میں یقینی ہوتی ہے کہ ان کا تعلق صرف ایک ہی نسل اور ایک ہی مقام سے رہے کیونکہ اس حالات میں وہ مستنیات کو قواعد معینہ اور اتفاقیہ امور کو اسباب لازم میں مل جل دیتے ہیں''۔[۱]

کشمیر کی تاریخ میں کئی قابل ملاحظ روایات پر مبنی حکایات و واقعات ہماری نظروں کے سامنے آجاتے ہیں۔ جو اگرچہ ابھی دقیق تحقیق سے عاری ہیں لیکن کشمیر کی تاریخ کا ایک حصہ بن چکی ہیں اور بعض معتبر مقامی مورخوں، تذکرہ نگاروں اور بیرونی ممالک کے تاریخ دانوں اور سیاحوں نے بھی کشمیر کی تاریخ کا الیک حصہ سمجھکر اپنالی ہیں ان روایات میں ایک عام روایت خود کشمیر کی اصل سے تعلق رکھتی ہے جس کا خلاصہ یوں ہے:

قدیم ترین روایات کی رو فسے کشمیر کی ساری وادی ایک وسیع چھیل تھی اور ستی سرا کہلاتی تھی۔ اسمیں جلد بہر نامی ایک دیو رہتا تھا و پانی سے نکل کر لوگوں کو بہت اذتیں پہنچایا کرتا تھا۔ آخر لوگوں نے تنگ آکر برھما سے التجا کی اور برھما کے ایماء پر ایک خدا پرست ریشی جسکا نام کشب رشی بتایا جاتا ہے کشمیر میں داخل ہوا اور اس نے جلد بہر کو مار ڈالنے کی ترکیب سوچی۔ بارہمولہ کے قریب ڈھلوان میں ریشی موصوف نے پہاڑ کی تہہ کو کاٹ لیا اور پورے ستی سر کا پانی اسی شگاف سے نکلنے لگا۔ نتیجہ یہ ہوا کہ جلد بہر پانی کی کمیابی سے بمودار ہوا اور کشب ریشی نے اپنی روحانی طاقت کے سہارے پر اس کو قتل کر دیا۔[۲] کشب ریشی کے نام کی مناسبت سے کشمیر کا قدیم نام کشپ مر پڑا جو رفتہ رفتہ کاشمر یا کشمیر بن گیا۔

کشب ریشی کے ہاتھوں جلد بہر دیو کے قتل ہونے کی دلچسپ داستان تاریخ

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حسن کے موئف پیرزادہ حسن شاہ کھو یہامی نے یوں لکھی ہے:

''جلد بہر کے مظالم کی دردناک کہانیاں سنکر کشب رشی کا دل کشمیریوں کے حال پر تڑپ اٹھا۔ اس نے سالہا سال تک خدا کی عبادت کی جو بارگارہ ایزدی میں قبول ہوئی۔ کشب ریشی نی جلد بہر کے شر سے نجات دلانے کی استدعا کی اور خداوند کے حضور میں برہما، بشن اور ہمشیر اس بدذات دیو کو قتل کرنے پر مامور ہوئے لیکن پانی جسمیں چُھپے رہنے کی وجہ سے اسے قتل کرنے میں کامیاب نہ ہوسکے۔ آخر بشن نے سودرسن چکر تجے میں جلد بارہمولہ کے قریب پہاڑ کو کاٹ دیا اور پانی کے خارج ہوجانے کے نتیجے میں جلد بہر نمودار ہوا اور خدا کی قدرت ایک مینا کی شکل میں نمودار ہوئی جس نے سمیر پہاڑ کا ایک حصہ یا ٹکرا اپنی چونچ میں لاکر جلد بہر کے اوپر ڈال دیا اور مرگیا''۔[۲] اکلہن نے بھی اپنی راج ترنگنی میں کشمیر کے بارے میں لکھا ہے:

''کہ یہاں ستی سرنامی جھیل واقعہ تھی جو پرجاپتی کشب نے برھما۔ وشنو اگور شیو کی رہبری میں دیوتاؤں سے مدد حاصل کر کے جلد بہر دیو کو جو اس جھیل میں رہتا تھا مروا ڈالا اور اس زمین کو جو جھیل کے باعث زیر آب تھی کشمیر کے نام سے آباد کیا''۔[۳] اس سلسلے میں ایک اور قابل غور بات یہ ہے جو معیبر اسنادّ اور مدلل روایت سے ''نگارستان کشمیر'' میں درج ہے اگسکے مؤلف ناظم سیر ہماروی یوں لکھتے ہیں:

''ایک روایت یہ ہے کہ میر نام ایک پری تھی اس پر کشف[۴] نام دیو عاشق تھا۔ حضرت سلیمان علیہ السلام جب اس طرف آیئے تو انہوں نے کشف سے فرمایا کہ اگر تو اس کا پانی نکال دے جتو میر تجھ کو دیدہ جائے گی۔ کشف نے آلہ جھکر سے اسکا پانی نکالدیا۔ حضرت نے میر سے اسکا نکاح کردیا۔ اسلئے اس خطہ کا نام ''کشف میر'' ہوا۔

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(مکمل تاریخ کشمیر ص ۱۵) اس روایت میں دیو پری کا معاملہ وہی سابقہ روایتوں کا سا اضافہ ہے۔ اصل حقیقت صرف اسی قدر معلوم ہوتی ہے کہ یہ خطہ چاروں طرف سے پہاڑوں سے گھرا ہوا تھا درمیان میں پانی بہرا ہوا تھا۔ امتداد زمانہ سے ایک طرف پہاڑ کے منہدم ہونے سے سطح زمین نمودار ہوگئی جیسا کہ صاحب ''تاریخ ریاست جموں وکشمیر'' نے لکھا ہے۔ کچھ عرصہ کے بعد حضرت سلیمان ادھر آ کے انہوں نے اس خطہ کو آباد کیا۔ حضرت کی تشریف آوری کا ذکر ''پنڈت رتنا گر'' نے اپنی تاریخ میں اسطرح کیا ہے کہ راجہ نراندر کی تخت نشینی کے چند روز بعد سند یمان نما ایک شخص جو مغربی مما لک کے رکھیشر وں میں سے تھا کشمیر پہنچکر کوہ لار جیت پر مقیم ہوا۔ سند یمان کا ویمان (تختِ روان) آسمان پر چلتا تھا تما جن، دیو، چرند، پرند اسکے مطیع تھے۔ اسی نے بھی کشمیر کا پانی خارج کروایا تھا۔ (مکمل تاریخ کشمیر حصہ اول حاشیہ غص ۱۰۲۔۱۰۱) ان تمام روایتوں سے حضرت سلیمان کا کشمیر میں آنا اور پانی خارج کروانا ثابت ہے ا۔ گویا ناظم صاحب نے یہ ثابت کرنے کی کوشش کی ہے کہ کشمیر کو سب سے پہلے حضرت سلیمان نے آباد کیا تھا۔ لیکن محمد الدین فوق نے ستی سر سے پانی نکلوانے کا سہرا کشپ ریشی کے سر ہی رکھا ہے۔ وہ اپنی تاریخ میں یوں رقمطراز ہے:۔

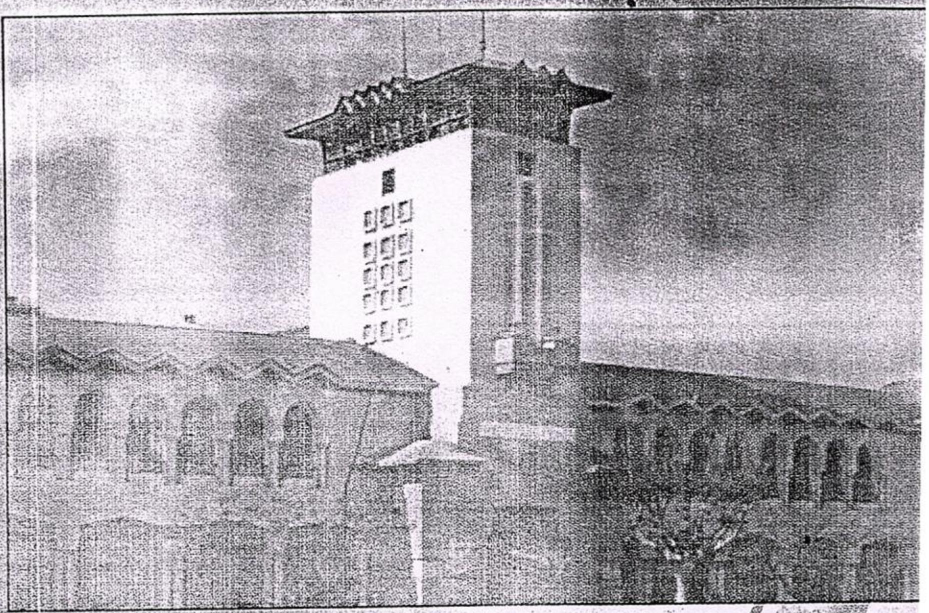
''جن مُسلمان مورخوں نے ستی سر کے پانی نکالنے کا آلہ حضرت سلیمان کو قرار دیا ہے انہوں نے مریحی غلطی کھائی ہے۔ بعض پہاڑوں پر حضرت سلیمان کی نشت گاہوں کا پایا جانا اس امر کی کوئی شافی دلیل نہیں کہ اس نے کشمیر کی بنیاد ڈالی تھی ھا ھگر کیپے تعصبی کی نگاہ سے دیکھا جائے تو صاف معلوم ہوگا کہ اس زمین کو آباد ہوئے پانچ ہزار برس سے زیادہ عرصہ گزر چکا ہے لیکن حضرت سلیمان کا جگ کے شروع ہونے

SNO= 24.

DANISH

(RESEARCH JOURNAL)

Vol.XXXIV-2016-17



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پیامِ عشق و اخلاق در شعر بیدل

عشق، اخلاق و برادری از مفاهیم کلیدی در زندگی بشری است و انسان با عشق، اخلاق و برادری و این همه نیز با انسان معنی و مفهوم پیدا می کنند۔ موضوع های موردِ توجّه در دیوان میرزا عبدالقادر بیدل دهلوی، موضوع های عشق، اخلاق و برادری هستند۔ عشق، اخلاق و برادری از عناصر عمده و اساسی بینش و حرکات عرفانی هستند۔ عشق همواره یکی از بحث های جالب و کلیدی در زندگی بشر بوده است و بسیاری از بزرگان و متفکران درباره آن اظهار نظر کرده اند۔ عشقی که در شعر بیدل است عشقِ عرفانی است۔ عشق عرفانی، یک عشق دوسره است که ''یحبهم و یحبونه''۔ همین عشق آیین بیدل است و او به هیچ آیینی تا بدین غایت پایی بند نیست، بنابر گفته یی او عشق همه چیزش را تاراج کرده است و خود باقی مانده۔ لذا هر کس که اندک آشنائی با این بزرگ داشته باشد با شنیدنِ نامِ او شور و شیدایی او را تداعی خواهد کرد۔ عشق صفت الٰهی است که چون ظرفیتِ بنده ای با شکستنِ مرزهای مادی و خودی فراخی پذیرش آن را پیدا کند از آن بهره مند شود و همه ی وجودش را باژ گونه سازد۔

بیدل دهلوی که یکی از بزرگترین شاعران سبک هندی به شمار می رود، در دیوانِ غزلیاتش واژه و مفهومِ عشق به طور چشم گیری به کار رفته است۔ ذکر همه این

SNo = 24(2)

(ISSN0975-6566)DANISH

دانش

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SNO=24(b)

شاه نواز شاه،
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پیامِ عشق واخلاق درشعرِ بیدل

عشق ، اخلاق وبرادری از مفاهیم کلیدی در زندگی بشری است وانسان با شق ، اخلاق و برادری واین همه نیز با انسان معنی و مفهوم پیدا می کنند۔ موضوع های موردتوجه در دیوان میرزا عبدالقادر بیدل دهلوی ، موضوع های عشق ، اخلاق و برادری هستند۔ عشق ، اخلاق و برادری از عناصر عمده واساسی بینش وحرکات عرفانی هستند ۔ عشق همواره یکی از بحث های جالب وکلیدی در زندگی بشر بوده است و بسیاری از بزرگان ومتفکران درباره آن اظهار نظر کرده اند۔ عشقی که در شعر بیدل است عشقِ عرفانی است ۔ عشق عرفانی ، یک عشق دوسره است که "یحبهم و یحبونه"۔ همین عشق ائین بیدل است واو به هیچ آیینی تا بدین غایت پایی بند نیست ، بنا بر گفته یی او عشق مه چیزش را تاراج کرده است وخود باقی مانده۔ لذا هر کس که اندک آشنائی با این زرگ داشته باشد با شنیدنِ نام او شور وشیدایی اورا تداعی خواهد کرد۔ عشق صفت الٰهی ست که چون ظرفیتِ بنده ای با شکستنِ مرزهای مادی وخودی فراخی پذیرش آن را پیدا نداز آن بهره مند شود وهمه ی وجودش را باژگونه سازد۔

بیدل دهلوی که یکی از بزرگترین شاعران سبک هندی به شمار می رود، در ان غزلیاتش واژه مفهومِ عشق به طور چشم گیری به کار رفته است۔ ذکر همه این

اشعار از عهدهٔ این مقاله ممکن نیست. برای بیدل زندگی بی عشق مفهومی ندارد. به [illegible] ولی این مسلم است که بیدل هرگز به دنبال عشق مجازی و هوس آلود نبوده است. هوس
علّت است که عشق را شعلهٔ تابی در رشتهٔ جانِ عاشق می داند و برآن است که تا زنا صفت انسان را به عشقِ حقیقی تعلقی نیست بیدل از صفت هوس منزّه بود چنانچه خود می
است و نفس می کشد، شمع صفت گرمای جان پرور عشق از دلش کم نمی شود: گوید:

تا نفس هست، ز دل کم نشود گرمی عشق   شعلهٔ تابی است که در رشتهٔ جان دارد شمع   دل عاشق به هوس رام نگردد   اخگر نشود تکمه ی پیراهن کاغذ ٦

عشق بیدل یک عشق رسوا گراست و آنقدر بزرگ اولیٰ است که هر دو عالم را در خود نابرین بیدل عشق ازلی را ابدی می داند و می گوید هرگاه آتش عشق یکبار در قلبی روشن شود
یگر از میان نخواهد رفت. بیقراری و هیجان عاشق دایمی است و عاشق خود به سبب
سوزاند:

عشق هر جا در خیال مجلس آرایی نشست   هر دو عالم، در چراغ کلبهٔ دیوانه سوخت   همین سوز ابدی دل، جاویدان است. بیدل عنوان می کند که داغ عشقم و تن آسایی را
غزلهای بیدل برای بیان عشق و شوریدگی هایش زبان دیگری دارد؛ زیرا تنها قالبست ندارم و می گوید مانند شعلهٔ پیچ و تاب بر جبینم نقش بسته است:
«غزل» می تواند محمل زبان «عشق» باشد: داغ عشقم نیست الفت با تن آسانی مرا   پیچ و تاب شعله باشد نقش پیشانی مرا ٧
بیتابی عشق اینهمه نیرنگ هوس ریخت   عنقا پری افشاند که طوفان مگس ریخت   نش عشق برای بیدل آب بقا است و شمع در عین سوختن دم از عشق می زند:
بیدل پیرو مکتب عشق بود. از ین رو از لحاظ ژرف ساخت، مهم ترین ویژگی بنیاد عشق زد شمع که ای سوختگان، خوش باشید   شعله هم آب بقاییست که من می دانم ٨
غزلِ وی، سخن عشق است. او عشقِ واقعی را از زمان کودکی تجربه کرد. بیدل نیز ل معتقد است از ذات یکتا که من عاشق او هستم مرا دور سر عشق گردانید، یعنی فدای
غزلیاتش «بیدل» و دلشده ی زیبایی است؛ ولی دلشده ی زیبایی مطلق است که بت خود کرد، یعنی از دیگر سوداهای دنیوی مرا آزاد ساخت و دور ساغر این عشق، مرا
بیان این زیبایی، از عناصر حسی و ملموس کمک می گیرد تا ناز معشوق بیانی نمادین و مجاز گردون تسلسل پیوند داد. چون عشق حقیقت پایانی ندارد، این تسلسل نیز پایانی ندارد
برای مفهومی عرفانی باشد: اعشق بیدل مجبور است که مادام العمر به همین عشق پایبند باشد و به همین تسلسل بی

طلسم نازِ معشوقست سرتاپای من   غبارم گر ز جا برخاست زلف او پریشان شد بت باقی بماند

«عشق» موجب اعتلا و رشد روح و روان انسان می شود. حتی امروزه روان شناسان گردون تسلسل بست دور ساغر عشقم   که گردانید یارب این قدر دور سر عشقم؟ ٩
روان پزشکان آن را به عنوان انگیزه، نیرو و انرژی پیشنهاد می کنند.   ماف و آثاری که بیدل برای عشق بر می شمرد بسیار متنوع، شگفت و قدرتمند است،
گاه موج اشک و گاهی گرد افغانست دل   روزگاری شد به کار عشق حیرانست دل   یا این موهبتِ ارجمندِ الهی در نظر او با هیچ امرِ دیگری قابل قیاس نیست. به نظر بیدل

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[illegible] پیدایش جهان نیز عشق است، عشق حق به [illegible] معرفت، اگر عشق نمی بود جهانی نبود [illegible] بیدل عشق را امری بسیار مهم و مسیر آن را بس دشوار خوانده است، مقوله ای که بسیاری از عارفان، بدان اذعان دارند. او عقل و علم را، دو ابزار نا کارآمد در برابر عشق دانسته است. از منظر بیدل، همهٔ حوادث عالم، تحت تأثیر عشق قرار دارند. چنانچه نظامی گنجوی هم در بیتِ بسیار زیبائی خلقت و آفرینش را بر مبنای عشق می داند و می گوید:

گر اندیشه کنی از راه بینش　　به عشق ایستاده است آفرینش

بیدل دهلوی با اشاره به زبان خلقت، از عشق به عنوان منشاء آفرینش انسان یاد می کند و معتقد است که سرشت انسان با عشق آمیخته شده است؛

عشق از خاک من آن روز که وحشت می بیخت　　رفت گردی ز خود و آینه حیرت می ریخت ۱۰

بعضی از صوفیا تصوّر می کنند که قبل از پیدایش هر چیزی عشق موجود بوده است و عشق ازلی است و خداوند بر اساس همین عشق دست به خلقت می زند و این عشق ابدی و پایان ناپذیر است. بیدل هم عشق را قبل از خلقت آسمان و زمین می داند و معتقد است که از سوز عشق آهی بلند می شود و در هوا به صورت سایبانی در می آید و تبدیل به آسمان می گردد و از غبار عشق که با غبار غم آسودگی یافت زمین به وجود آمد؛

آهی به هوا چتر زد و چرخ برین شد　　داغی به غبار الم آسود و زمین شد
جگری آبله زد، تخم غمی پیدا شد　　دلی آشفت غبار المی پیدا شد ۱۱

بیدل اسیران عقل و استدلال را مورد انتقاد قرار می دهد و عاشقان را نسبت به عاقلان ترجیح می دهد. او در ابیات زیادی به عاجز بودن عقل در برابر عشق پرداخته است و کسانی که عاقل و عافیت سنج هستند با عشق میانه ای ندارند و در یک تشبیه زیبا می گوید همانطور که

نمی شود [illegible] آتش را کنار هم گذاشت نمی توان عقل [illegible]

عقل رنگ آمیز، کی گردد حریف درد عشق؟　　خامه تصویر [illegible]
عافیت سنجان، طریق عشق کم پیموده اند　　دوری دار [illegible] جوی [illegible]
عقل را مپسند با عشق جنون پرور طرف　　بی خبر، تا چند سازی [illegible] با اخگر طرف؟
عقل اگر در بارگاه عشق می لافد چه باک　　بر در سلطان سر [illegible] گدا خواهد شکست

نیز بیدل عشق را مختاری داند و انسان نمی تواند که با [illegible] تدبیر [illegible] زیرا عاشق اختیاری از خود ندارد و حتی انسان عاشق نمی تواند [illegible] یوسف پیامبر بی گناه بود ولی به زندان افتاد:

عشق مختار است، با تدبیر عقلش کار نیست　　این کنم یا آن [illegible] مختار [illegible]
عشق مختار است، بیدل نیک و بد در کار نیست　　بی گناهی یوسف [illegible] به زندان می برد

بیدل در تشبیهی می گوید که همانطور که وقتی پروانه ای گرد [illegible] سوخته [illegible] خاکسترش با شمع یکی می شود و به صورت اشک از شمع فرو می [illegible] در شعله [illegible] می سوزد و با فنایش صفات او با معشوقش [illegible] معشوقش برایش ممکن می شود: ......

هر چه از چشم بتان افتد، غبار عاشق است　　اشک گرم شمع [illegible] خاکستر پروانه [illegible]

بنا بر عقیدهٔ بیدل باعث محبت می شود که آن دوگانگی بین عاشق و معشوق رنگ خود را از دست بدهد و بینِ آب و تری دیگر فاصله ای باقی نمی ماند و هنگامی که یک قطره به دریا بپیوندند، پیدا کردنِ آن قطره مشکل و ناممکن خواهد بود:

محبت از من و تو رنگ امتیاز گداخت　　تری ز آب [illegible] فاصله [illegible] ۱۸

ز محوِ عشق غیراز عشق، نتوان یافت آثاری — به دریا قطره چون گردید گم، مشکل شود پیدا [۱۹]

بیدل عاشقانِ حقیقی را مانند آیینه می داند که غیراز حیرت و سرگردانی در وادیِ عشق به محبوب، چیز دیگر را در خود متجلّی نمی کنند، زیرا که بارگاهِ محبوب از حیله و نیرنگ و تزویر به دور است و از این که به اوصاف و اعتباراتِ ظاهریِ این دنیا متصف گردد، مبرّا می باشد:

آیینه ز تحیّر، اینجا چه نقش بندد؟ — از رنگ شرم دارد، صورتِ نگارِ عنقا [۲۰]

بیدل در بیانی زیبا می گوید همانطور که بوی خوش گُل باعثِ زنجیر شدنِ بلبل در کنارِ گل می شود و بلبل از گُل جدا نمی شود و بلبل عاشق و مجنونِ گل است، خوی و خصلتِ معشوق نیز همچون کمندی است که برای اسیر کردنِ عاشق به کار می رود:

خلقِ معشوقان، کمندِ صیدِ مشتاقان بس است — نیست غیراز بوی گُل زنجیرِ پای عندلیب [۲۱]

زمانی که عاشق صیدِ معشوقِ خویش می شود دیگر رها شدن از آن برایش دشوار است همانطور که کریمانِ مهمانِ شب رسیده را نگه می دارند و نمی گذارند بروند، عاشقان هم که مبتلای زلفِ سیاهِ معشوقِ خویش اند، از قیدِ او رهایی ندارند:

بیدل از پیچ وخم زلفش رهای مشکل است — بر کریمان سهل نبود رخصتِ مهمانِ شب [۲۲]

بیدل راهِ عشق را بسیار سخت و دشوار می داند و هر کسی از پسِ آن بر نمی آید و عاشق در اظهارِ عشقِ خودی گوید از اینکه در عشقِ محبوب سوخته ام و شعله های وجودم فروکش کرده و چیزی جز خاکستر از من باقی نمانده است بسیار خوشحال و راضی هستم زیرا که می دانم که آن همه سختی و مشکلاتِ راهِ عشق را با صبوری و شکیبایی تحمّل کرده ام و عشق باعث می شود که وجودِ انسان به هلالِ ماه تبدیل شود:

خاکستر است شعله ام، امروز خوشدلم — یعنی رسانده ام به صبوری شتاب را [۲۳]

صرفِ نقصانیم دیگر از کمالِ ما مپرس — عشق پُر کرده است آخر، هلال از ماه را [۲۴]

بیدل حرارتِ سوز وگدازِ عشق را چون میِ خوشگوار می نوشد و می گوید [illegible] رنج و بلا و سوز هستیم:

ما جرعه کشِ ساغرِ سرشارِ گدازیم — شبنم صفت از عالمِ آب است دلِ ما [۲۵]

بیدل همچنان که به وسیلهٔ اشعارِ خود درسِ اخلاقیات و برادری [illegible] اخلاق جمعِ خلق است. [illegible] است که نفس را، که مقتضیِ سهولتِ صدورِ افعال از وی [illegible] احتیاج به فکر و رویّتی می باشد. علمِ اخلاق علمی است که دربارهٔ تهذیبِ نفس و رفتارِ متقابلِ افرادِ یک جامعه یا جوامعِ مختلف وضع شده و به حکمتِ عملی مشهور است. اخلاق در عرفان و تصوف از اهمیّتِ بسزایی برخوردار بوده است و در سیر و سلوکِ الی الله جدا شدن از رذایلِ اخلاقی و متصف شدن به صفاتِ نیکویِ انسانی، احتیاجِ بسیار [illegible] انسانی که اخلاقِ خود را به زیورِ نیکی آراسته گردانند، در میانِ مردم از جایگاهِ والایی برخوردار خواهند بود. اما افراد بداخلاق، هیچ یار و یاوری ندارند، سعدی در گلستان، در [illegible] افرادِ بدخوی چنین گوید:

بدخوی در دستِ دشمنی گرفتار است — که هر کجا رود از چنگ [illegible] نباشد
اگر ز دستِ بلا بر فلک رود بدخوی — ز دستِ خوی بدِ خویش در بلا باشد [۲۶]

در کلامِ بیدل، مفهومِ حسنِ خلق در ابیاتِ پیش رو قابلِ بررسی است. بیدل اخلاقِ خویش را وسیله ای برای تسخیرِ دلها می داند:

در کفِ اخلاقِ توست رشتهٔ تسخیرِ خلق — غافل از احسان مباش [illegible] بنده نیست [illegible]

به عقیدهٔ بیدل، اخلاقِ نیکو سبب آرامش می شود:

نرم رفتاری به معنی خواب راحت کردن است — بستر و بالین هم [illegible] زیرِ سری دارد آب [۲۸]

SNo = 24(e)

SNO=24(f)

بیدل جایگاهِ نیکوخلقان را بهشت دانسته و دوزخ را سرای جاودانِ انسان های بد اخلاق معرّفی کرده است:

به حسن خلق بیدل تا توان در جنّت آسودن　　چه لازم در دل دوزخ نشستن از شرارت ها ۲۹

پس هدف اصلی از اخلاق حرف زدن و آن را تعلیم کردن نیست۔ امّا همین که او در غزل های خودش کوشش می کند، از یکی دو اصطلاحِ عرفانی استفاده کند و مقام معشوق را آنقدر بالاتر ببرد که حکم معبود پیدا کند۔ کافی است تا او از اخلاق سرای هم رشته هایی در غزل به دست دهد به ویژهٔ این که می دانیم ۔ بیدل نیز همچون دیگر منادیانِ اخلاق علی الخصوص یک معلّم است۔ معلّمی که معتقد است جامعه برای پیشرفت هیچ وسیله وراهی جز اصطلاح [illegible] دارد۔ اگر اخلاق را پای بندی و تعهدِ انسان بر پاره ای اصول مسلّم، بدیهی و آرمان ها از بدانیم، همین که عاشق در مقابل جفای معشوق به مقامِ تحمّلِ درد عشق می رسد و در بند عشق بودن از رهای برایش مهم تر می شود، یعنی این که پاره ای اصول که حتی در مکتب بیدل به آن واقعی نهاده نمی شود۔ انسان ساز و آدم پرور می شود و از ین باپت بیدل استادِ مسلّم نهادینه کردن اصول اخلاقی بر مدار عشق و دیگر دوستی است ۔ و درست ازین زاویه اگر به موضوع نگاه کنیم ، می توانیم به ضرس قاطع بگوییم که همه آموزه های شعرِ عاشقانهٔ فارسی که راهی به لهو ولعب و نفس پرستی ندارند، در مسیر تعلیم و اخلاق گرایی و پند و اندرز [illegible] گیرند و ازین باپت بیدل معلّم راستینِ اخلاق گرایی است۔

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۳ـ ایضاً، شمارهٔ غزل ـ ۴۰۵ صفحه ـ ۲۸۸

۴ـ ایضاً، شمارهٔ غزل ـ ۱۲۵۳ صفحه ـ ۶۳۹

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۱۸ـ ایضاً، شمارهٔ غزل ـ ۱۵۸ صفحه ـ ۱۸۹

۱۹ـ ایضاً، شمارهٔ غزل ـ ۲۶ صفحه ـ ۱۳۶

PNO = 24(9)

۲۰۔ ایضاً، شمارۂ غزل۔ ۱۸۱ صفحہ۔ ۱۹۸

۲۱۔ ایضاً، شمارۂ غزل۔ ۳۸۹ صفحہ۔ ۲۸۱

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۲۹۔ ایضاً، شمارۂ غزل۔ ۲۸۱ صفحہ۔ ۲۳۸

SNo = 25

IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 08, Issue 7 (July. 2018), ||V (VI) || 28-37

On the Bounds for the Zeros of a Polynomial

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Abstract. In this paper we find bounds for the zeros of a complex polynomial when the coefficients of the polynomial are restricted to certain conditions.

Mathematics Subject Classification (2010): 30C10, 30C15.

Key Words and Phrases: Coefficient, Open Disc, Polynomial, Zeros.

Date of Submission: 12-07-2018 Date of acceptance: 28-07-2018

I. INTRODUCTION

In connection with the bounds for the zeros of a polynomial with real coefficients, Gulzar [3] recently proved the following results.

Theorem A. Let $P(z)=\sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n such that for some positive numbers k_1, k_2, ρ and some integer λ with $k_1 \geq 1, k_2 \geq 1, 0<\rho \leq 1, 0<\lambda \leq n-1$,

$$k_1 a_n \geq a_{n-1} \geq \ldots\ldots \geq k_2 a_\lambda \geq a_{\lambda-1} \geq \ldots\ldots \geq a_1 \geq \rho a_0 .$$

Then all the zeros of P(z) lie in the closed disk

$$|z+k_1-1| \leq \frac{1}{|a_n|}\{k_1 a_n + 2(k_2-1)|a_\lambda| - \rho(a_0+|a_0|) + 2|a_0|\}.$$

Theorem B. Let $P(z)=\sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n such that for some positive numbers k_1, k_2, ρ and some integer λ with $k_1 \geq 1, k_2 \geq 1, 0<\rho \leq 1, 0<\lambda \leq n-1$,

$$k_1 a_n \geq a_{n-1} \geq \ldots\ldots \geq k_2 a_\lambda \geq a_{\lambda-1} \geq \ldots\ldots \geq a_1 \geq \rho a_0 .$$

Then for any R>0,the number of zeros of P(z) in $\frac{|a_0|}{M} \leq |z| \leq \frac{R}{c}, c>1$ does not exceed

$$\frac{1}{\log c}\log\frac{K}{|P(0)|},$$

where

$$K=|a_n|R^{n+1}+|a_0|+R^n[\ k_1(|a_n|+a_n)-|a_n|+2(k_2-1)|a_\lambda|+|a_0|-\rho(|a_0|+a_0)\ ],$$

$$M=|a_n|R^{n+1}+R^n[\ k_1(|a_n|+a_n)-|a_n|+2(k_2-1)|a_\lambda|+|a_0|-\rho(|a_0|+a_0)\ ]$$

for $R \geq 1$ and

$$K=|a_n|R^{n+1}+|a_0|+R[\ k_1(|a_n|+a_n)-|a_n|+2(k_2-1)|a_\lambda|+|a_0|-\rho(|a_0|+a_0)\ ],$$

$$M=|a_n|R^{n+1}+R[\ k_1(|a_n|+a_n)-|a_n|+2(k_2-1)|a_\lambda|+|a_0|-\rho(|a_0|+a_0)\ ]$$

for $R \leq 1$.

SNo = 25(a)

II. MAIN RESULTS

The aim of this paper is to consider the polynomial of Theorem A with complex coefficients and find bounds for its zeros and for the number of its zeros in a specific region. In fact, we prove the following results.

Theorem 1. Let $P(z)=\sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2, ρ and some integer λ with $k_1 \geq 1, k_2 \geq 1, 0<\rho \leq 1, 0<\lambda \leq n-1$,

$$k_1|a_n| \geq |a_{n-1}| \geq \ldots\ldots \geq k_2|a_\lambda| \geq |a_{\lambda-1}| \geq \ldots\ldots \geq |a_1| \geq \rho|a_0|$$

and for some real numbers α, β,

$$|\arg a_j - \beta| \leq \alpha \leq \frac{\pi}{2}, j=0,1,2,\ldots\ldots,n.$$

Then P(z) has all its zeros in the closed disk

$$|z+k_1-1| \leq \frac{1}{|a_n|}\{\ k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|$$

$$+2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)+2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\ \}.$$

Remark 1. Choosing $\alpha=0, \beta=0$ and $a_j \geq 0, \forall j$ in Theorem 1, we get Theorem A.

For different values of the parameters , we get many different results. For example taking $k_2=1$ in Theorem 1, we get the following result.

Corollary 1. Let $P(z)=\sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, ρ and some integer λ with $k_1 \geq 1, 0<\rho \leq 1, 0<\lambda \leq n-1$,

$$k_1|a_n| \geq |a_{n-1}| \geq \ldots\ldots \geq |a_\lambda| \geq |a_{\lambda-1}| \geq \ldots\ldots \geq |a_1| \geq \rho|a_0|$$

and for some real numbers α, β,

$$|\arg a_j - \beta| \leq \alpha \leq \frac{\pi}{2}, j=0,1,2,\ldots\ldots,n.$$

Then P(z) has all its zeros in the closed disk

$$|z+k_1-1| \leq \frac{1}{|a_n|}\{\ k_1|a_n|(\cos\alpha+\sin\alpha)+2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)$$

$$+2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\ \}.$$

Taking $\rho=1$ in Theorem 1, we get the following result.

Corollary 2. Let $P(z)=\sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2 and some integer λ with $k_1 \geq 1, k_2 \geq 1, 0<\lambda \leq n-1$,

$$k_1|a_n| \geq |a_{n-1}| \geq \ldots\ldots \geq k_2|a_\lambda| \geq |a_{\lambda-1}| \geq \ldots\ldots \geq |a_1| \geq |a_0|$$

and for some real numbers α, β,

$$|\arg a_j - \beta| \leq \alpha \leq \frac{\pi}{2}, j=0,1,2,\ldots\ldots,n.$$

Then P(z) has all its zeros in the closed disk

$$|z+k_1-1| \leq \frac{1}{|a_n|}\{\ k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|$$

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$$-|a_0|(\cos\alpha-\sin\alpha-1)+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\ \}.$$

Next, we prove the following result.

Theorem 2. Let $P(z)=\sum_{j=0}^{n}a_jz^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2, ρ and some integer λ with $k_1\geq 1, k_2\geq 1, 0<\rho\leq 1, 0<\lambda\leq n-1$,

$$k_1|a_n|\geq|a_{n-1}|\geq......\geq k_2|a_\lambda|\geq|a_{\lambda-1}|\geq......\geq|a_1|\geq\rho|a_0|$$

and for some real numbers α,β,

$$|\arg a_j-\beta|\leq\alpha\leq\frac{\pi}{2}, j=0,1,2,......,n.$$

Then P(z) has no zeros in the open disk $|z|<\dfrac{|a_0|}{M}$,

where

$$M=|a_n|R^{n+1}+R^n\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|$$

$$-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R\geq 1$$

$$=|a_n|R^{n+1}+R\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|$$

$$-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R\leq 1.$$

For different values of the parameters, we get many different results. For example taking $k_2=1$ in Theorem 2, we get the following result.

Corollary 3. Let $P(z)=\sum_{j=0}^{n}a_jz^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, ρ and some integer λ with $k_1\geq 1, 0<\rho\leq 1, 0<\lambda\leq n-1$,

$$k_1|a_n|\geq|a_{n-1}|\geq......\geq|a_\lambda|\geq|a_{\lambda-1}|\geq......\geq|a_1|\geq\rho|a_0|$$

and for some real numbers α,β,

$$|\arg a_j-\beta|\leq\alpha\leq\frac{\pi}{2}, j=0,1,2,......,n.$$

Then P(z) has no zeros in the open disk $|z|<\dfrac{|a_0|}{M}$,

where

$$M=|a_n|R^{n+1}+R^n\big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|$$

$$-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,}^{n-1}|a_j|\ \big]$$

$$\text{for } R\geq 1$$

$$=|a_n|R^{n+1}+R\big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|$$

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$$-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,}^{n-1}|a_j|\;]$$

$$\text{for } R\le 1.$$

Taking $\rho=1$ in Theorem 2, we get the following result.

Corollary 4. Let $P(z)=\sum_{j=0}^{n}a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2 and some integer λ with $k_1\ge 1, k_2\ge 1, 0<\lambda\le n-1$,

$$k_1|a_n|\ge|a_{n-1}|\ge\ldots\ldots\ge k_2|a_\lambda|\ge|a_{\lambda-1}|\ge\ldots\ldots\ge|a_1|\ge|a_0|$$

and for some real numbers α,β,

$$|\arg a_j-\beta|\le\alpha\le\frac{\pi}{2}, j=0,1,2,\ldots\ldots,n.$$

Then P(z) has no zeros in the open disk $|z|<\dfrac{|a_0|}{M}$,

where

$$\begin{aligned}M&=|a_n|R^{n+1}+R^n\Big[\;(k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\&\qquad-|a_0|(\cos\alpha-\sin\alpha)+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\Big]\\&\qquad\qquad\text{for } R\ge 1\\&=|a_n|R^{n+1}+R\Big[\;(k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\&\qquad-|a_0|(\cos\alpha-\sin\alpha)+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\Big]\\&\qquad\qquad\text{for } R\le 1.\end{aligned}$$

Next we prove

Theorem 3. Let $P(z)=\sum_{j=0}^{n}a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2, ρ and some integer λ with $k_1\ge 1, k_2\ge 1, 0<\rho\le 1, 0<\lambda\le n-1$,

$$k_1|a_n|\ge|a_{n-1}|\ge\ldots\ldots\ge k_2|a_\lambda|\ge|a_{\lambda-1}|\ge\ldots\ldots\ge|a_1|\ge\rho|a_0|$$

and for some real numbers α,β,

$$|\arg a_j-\beta|\le\alpha\le\frac{\pi}{2}, j=0,1,2,\ldots\ldots,n.$$

Then the number of zeros of P(z) in $\dfrac{|a_0|}{M}\le|z|\le\dfrac{R}{c}, c>1$ is less than or equal to

$$\frac{1}{\log c}\log\frac{K}{|a_0|},$$

where

$$\begin{aligned}M&=|a_n|R^{n+1}+R^n\Big[\;(k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\&\qquad-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\Big]\\&\qquad\qquad\text{for } R\ge 1\end{aligned}$$

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$$= |a_n|R^{n+1} + R\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- \rho|a_0|(\cos\alpha-\sin\alpha+1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R \le 1,$$

$$K = |a_n|R^{n+1} + R^n\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- \rho|a_0|(\cos\alpha-\sin\alpha+1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R \ge 1$$

$$= |a_n|R^{n+1} + R\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- \rho|a_0|(\cos\alpha-\sin\alpha+1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R \le 1.$$

For different values of the parameters, we get many different results. For example taking $\rho = 1$ in Theorem 2, we get the following result.

Corollary 5. Let $P(z) = \sum_{j=0}^{n} a_j z^j$ be a polynomial of degree n with complex coefficients such that for some positive numbers k_1, k_2 and some integer λ with $k_1 \ge 1, k_2 \ge 1, 0 < \lambda \le n-1$,

$$k_1|a_n| \ge |a_{n-1}| \ge \ldots\ldots \ge k_2|a_\lambda| \ge |a_{\lambda-1}| \ge \ldots\ldots \ge |a_1| \ge |a_0|$$

and for some real numbers α, β,

$$|\arg a_j - \beta| \le \alpha \le \frac{\pi}{2},\ j = 0,1,2,\ldots\ldots,n.$$

Then the number of zeros of P(z) in $\frac{|a_0|}{M} \le |z| \le \frac{R}{c}, c > 1$ is less than or equal to

$$\frac{1}{\log c}\log\frac{K}{|a_0|},$$

where

$$M = |a_n|R^{n+1} + R^n\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- |a_0|(\cos\alpha-\sin\alpha) + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R \ge 1$$

$$= |a_n|R^{n+1} + R\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- |a_0|(\cos\alpha-\sin\alpha) + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

$$\text{for } R \le 1,$$

$$K = |a_n|R^{n+1} + |a_0| + R^n\Big[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2-1)|a_\lambda|$$

$$- |a_0|(\cos\alpha-\sin\alpha) + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j|\Big]$$

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$$\text{for } R \geq 1$$

$$= |a_n| R^{n+1} + |a_0| + R\Big[\ (k_1|a_n|(\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2 - 1)|a_\lambda|$$

$$- |a_0|(\cos\alpha - \sin\alpha) + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1} |a_j|\Big]$$

$$\text{for } R \leq 1.$$

III. LEMMAS

For the proofs of the above results, we need the following lemmas.

Lemma 1. Let f(z) (not identically zero) be analytic for $|z| \leq R, f(0) \neq 0$ and $f(a_k) = 0,$ $k = 1,2,......,n$. Then

$$\frac{1}{2\pi}\int_0^{2\pi} \log|f(\mathrm{Re}^{i\theta}|d\theta - \log|f(0)| = \sum_{j=1}^{n} \log\frac{R}{|a_j|}.$$

Lemma 1 is the famous Jensen's Theorem (see page 208 of [1]).

Lemma 2. Let f (z) be analytic for $|z| \leq R, f(0) \neq 0$ and $|f(z)| \leq M$ for $|z| \leq R$. Then the number of zeros of f(z) in $|z| \leq \frac{R}{c}, c > 1$ does not exceed $\frac{1}{\log c}\log\frac{M}{|f(0)|}$.

Lemma 2 is a simple deduction from Lemma 2.

Lemma3. For any two complex numbers z_1, z_2 such that $|z_1| \geq |z_2|$ and for some real α, β, $|\arg z_j - \beta| \leq \alpha \leq \frac{\pi}{2}, j = 1,2$, we have

$$|z_1 - z_2| \leq (|z_1| - |z_2|)\cos\alpha + (|z_1| + |z_2|)\sin\alpha.$$

Lemma 3 is due to Govil and Rahman [2].

IV, PROOFS OF THEOREMS

Proof of Theorem 1. Consider the polynomial

$$F(z) = (1 - z)P(z)$$

$$= -a_n z^{n+1} + (a_n - a_{n-1})z^n + ... + (a_{\lambda+1} - a_\lambda)z^{\lambda+1} + (a_\lambda - a_{\lambda-1})z^\lambda + ... + (a_1 - a_0)z + a_0$$

$$= -a_n z^{n+1} + (k_1 a_n - a_{n-1})z^n - (k_1 - 1)a_n z^n + (a_{n-1} - a_{n-2})z^{n-1} + ... + (a_{\lambda+1} - k_2 a_\lambda)z^{\lambda+1}$$

$$+ (k_2 - 1)a_\lambda z^{\lambda+1} + (k_2 a_\lambda - a_{\lambda-1})z^\lambda - (k_2 - 1)a_\lambda z^\lambda + (a_{\lambda-1} - a_{\lambda-2})z^{\lambda-1} + ...$$

$$+ (a_2 - a_1)z^2 + (a_1 - \rho a_0)z + (\rho - 1)a_0 z\} + a_0$$

For $|z| > 1$ so that $\frac{1}{|z|^j} < 1, j = 1,2,....,n$, we have by using the hypothesis and Lemma 3,

$$|F(z)| \geq |a_n| z^n\Big[\ |z + k_1 - 1| - \frac{1}{|a_n|}\{\ |k_1 a_n - a_{n-1}| + |a_{n-1} - a_{n-2}|.\frac{1}{|z|} + ... + |a_{\lambda+1} - k_2\alpha_\lambda|.\frac{1}{|z|^{n-\lambda-1}}$$

$$+ (k_2 - 1)|a_\lambda|.\frac{1}{|z|^{n-\lambda-1}} + |k_2 a_\lambda - a_{\lambda-1}|.\frac{1}{|z|^{n-\lambda}} + (k_2 - 1)|a_\lambda|.\frac{1}{|z|^{n-\lambda}}$$

$$+ |a_{\lambda-1} - a_{\lambda-2}|.\frac{1}{|z|^{n-\lambda+1}} + ... + |a_2 - a_1|.\frac{1}{|z|^{n-1}} + |a_1 - \rho a_0|.\frac{1}{|z|^{n-1}} + (1 - \rho)|a_0|.\frac{1}{|z|^{n-1}}$$

$$+ |a_0|.\frac{1}{|z|^n}\ \}\Big]$$

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$$\begin{aligned}
&>|a_n|z^n[\ |z+k_1-1|-\frac{1}{|a_n|}\{\ |k_1a_n-a_{n-1}|+|a_{n-1}-a_{n-2}|.+....+|a_{\lambda+1}-k_2\alpha_\lambda|.\\
&\quad +(k_2-1)|a_\lambda|.+|k_2a_\lambda-a_{\lambda-1}|.+(k_2-1)|a_\lambda|.+|a_{\lambda-1}-a_{\lambda-2}|.+.....\\
&\quad +|a_2-a_1|.+|a_1-\rho a_0|.+(1-\rho)|a_0|+|a_0|\ \}\ ]\\
&\geq|a_n|z^n[\ |z+k_1-1|-\frac{1}{|a_n|}\{\ (k_1|a_n|-|a_{n-1}|)\cos\alpha+(k_1|a_n|+|a_{n-1}|)\sin\alpha\\
&\quad +(|a_{n-1}|-|a_{n-2}|)\cos\alpha+(|a_{n-1}|+|a_{n-2}|)\sin\alpha+......\\
&\quad +(|a_{\lambda+1}|-k_2|a_\lambda|)\cos\alpha+(|a_{\lambda+1}|+k_2|a_\lambda|)\sin\alpha+2(k_2-1)|a_\lambda|\\
&\quad +(k_2|a_\lambda|-|a_{\lambda-1}|)\cos\alpha+(k_2|a_\lambda|+|a_{\lambda-1}|)\sin\alpha+(|a_{\lambda-1}|-|a_{\lambda-2}|)\cos\alpha\\
&\quad +(|a_{\lambda-1}|+|a_{\lambda-2}|)\sin\alpha+......+(|a_2|-|a_1|)\cos\alpha+(|a_2|+|a_1|)\sin\alpha\\
&\quad +(|a_1|-\rho|a_0|)\cos\alpha+(|a_1|+\rho|a_0|)\sin\alpha+(1-\rho)|a_0|+|a_0|\ \}\ ]\\
&\geq|a_n||z|^n[\ |z+k_1-1|-\frac{1}{|a_n|}\{\ k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&\quad +2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\ \}\ ]\\
&>0
\end{aligned}$$

if

$$\begin{aligned}
|z+k_1-1|>\frac{1}{|a_n|}\{\ &k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&+2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\ \}.
\end{aligned}$$

This shows that those zeros of F(z) whose modulus is greater than 1 lie in the closed disk

$$\begin{aligned}
|z+k_1-1|\leq\frac{1}{|a_n|}\{\ &k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&+2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\ \}.
\end{aligned}$$

Since the zeros of F(z) whose modulus is less than or equal to 1 already satisfy the above inequality, it follows that all the zeros of F(z) and hence P(z) lie in the closed disk

$$\begin{aligned}
|z+k_1-1|\leq\frac{1}{|a_n|}\{\ &k_1|a_n|(\cos\alpha+\sin\alpha)+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&+2|a_0|-\rho|a_0|(\cos\alpha-\sin\alpha+1)+2\sin\alpha\sum_{j=1,j\neq\lambda}^{n-1}|a_j|\ \},
\end{aligned}$$

thereby proving Theorem 1.

Proof of Theorem2. For the polynomial

$$\begin{aligned}
F(z)&=(1-z)P(z)\\
&=-a_nz^{n+1}+(a_n-a_{n-1})z^n+......+(a_{\lambda+1}-a_\lambda)z^{\lambda+1}+(a_\lambda-a_{\lambda-1})z^\lambda+.....+(a_1-a_0)z+a_0\\
&=-a_nz^{n+1}+(k_1a_n-a_{n-1})z^n-(k_1-1)a_nz^n+(a_{n-1}-a_{n-2})z^{n-1}+....+(a_{\lambda+1}-k_2a_\lambda)z^{\lambda+1}
\end{aligned}$$

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$$
\begin{aligned}
&+(k_2-1)a_\lambda z^{\lambda+1}+(k_2a_\lambda-a_{\lambda-1})z^\lambda-(k_2-1)a_\lambda z^\lambda+(a_{\lambda-1}-a_{\lambda-2})z^{\lambda-1}+\ldots..\\
&+(a_2-a_1)z^2+(a_1-\rho a_0)z+(\rho-1)a_0z.+a_0\\
&=a_0+G(z)
\end{aligned}
$$

where

$$
\begin{aligned}
G(z)=&-a_nz^{n+1}+(k_1a_n-a_{n-1})z^n-(k_1-1)a_nz^n+(a_{n-1}-a_{n-2})z^{n-1}+\ldots.+(a_{\lambda+1}-k_2a_\lambda)z^{\lambda+1}\\
&+(k_2-1)a_\lambda z^{\lambda+1}+(k_2a_\lambda-a_{\lambda-1})z^\lambda-(k_2-1)a_\lambda z^\lambda+(a_{\lambda-1}-a_{\lambda-2})z^{\lambda-1}+\ldots..\\
&+(a_2-a_1)z^2+(a_1-\rho a_0)z+(\rho-1)a_0z.
\end{aligned}
$$

for $|z|\le R$, we have by using the hypothesis and Lemma 3,

$$
\begin{aligned}
|G(z)|\le\;&|a_n|R^{n+1}+|(k_1-1)a_n|R^n+|k_1a_n-a_{n-1}|R^n+|a_{n-1}-a_{n-2}|.R^{n-1}+\ldots.+|a_{\lambda+1}-k_2a_\lambda|.R^{\lambda+1}\\
&+|(k_2-1)a_\lambda|.R^{\lambda+1}+|k_2a_\lambda-a_{\lambda-1}|.R^\lambda+|(k_2-1)a_\lambda|.R^\lambda\\
&+|a_{\lambda-1}-a_{\lambda-2}|.R^{\lambda-1}+\ldots..+|a_2-a_1|.R^2+|a_1-\rho a_0|.R+|(\rho-1)a_0|.R\\
\le\;&|a_n|R^{n+1}+R^n[\ (k_1-1)|a_n|+|k_1a_n-a_{n-1}|+|a_{n-1}-a_{n-2}|+\ldots\ldots+|a_{\lambda+1}-k_2a_\lambda|\\
&+(k_2-1)|a_\lambda|+|k_2a_\lambda-a_{\lambda-1}|+(k_2-1)|a_\lambda|+|a_{\lambda-1}-a_{\lambda-2}|+\ldots..\\
&+|a_2-a_1|+|a_1-\rho a_0|+(1-\rho)|a_0|\ ]\\
\le\;&|a_n|R^{n+1}+R^n[\ (k_1-1)|a_n|+(k_1|a_n|-|a_{n-1}|)\cos\alpha+(|k_1a_n|+|a_{n-1}|)\sin\alpha\\
&+(|a_{n-1}|-|a_{n-2}|)\cos\alpha+(|a_{n-1}|+|a_{n-2}|)\sin\alpha+\ldots\ldots\\
&+(|a_{\lambda+1}|-k_2|a_\lambda|)\cos\alpha+(|a_{\lambda+1}|+k_2|a_\lambda|)\sin\alpha\\
&+2(k_2-1)|a_\lambda|+(k_2|a_\lambda|-|a_{\lambda-1}|)\cos\alpha+(k_2|a_\lambda|+|a_{\lambda-1}|)\sin\alpha\\
&+(|a_{\lambda-1}|-|a_{\lambda-2}|)\cos\alpha+(|a_{\lambda-1}|+|a_{\lambda-2}|)\sin\alpha+\ldots..\\
&+(|a_2|-|a_1|)\cos\alpha+(|a_2|+|a_1|)\sin\alpha+(|a_1|-\rho|a_0|)\cos\alpha\\
&+(|a_1|+\rho|a_0|)\sin\alpha+(1-\rho)|a_0|\ ]\\
=\;&|a_n|R^{n+1}+R^n[\ (k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\ ]
\end{aligned}
$$

for $R\ge1$.

For $R\le1$,

$$
\begin{aligned}
|G(z)|\le|a_n|R^{n+1}+R[\ &(k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\ ].
\end{aligned}
$$

Since G(z) is analytic for $|z|\le R$ and G(0)=0, it follows by Schwarz lemma that

$|G(z)|\le M|z|$ in $|z|\le R$, where

$$
\begin{aligned}
M=|a_n|R^{n+1}+R^n[\ &(k_1|a_n|(\cos\alpha+\sin\alpha+1)-|a_n|+2k_2|a_\lambda|\sin\alpha+2(k_2-1)|a_\lambda|\\
&-\rho|a_0|(\cos\alpha-\sin\alpha+1)+|a_0|+2\sin\alpha\sum_{j=1,j\ne\lambda}^{n-1}|a_j|\ ]
\end{aligned}
$$

for $R\ge1$.

SNo= 25(h)

$$= |a_n| R^{n+1} + R^n [\ (k_1 |a_n| (\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2 |a_\lambda| \sin\alpha + 2(k_2 - 1)|a_\lambda|$$
$$- \rho |a_0| (\cos\alpha - \sin\alpha + 1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1} |a_j| \ ]$$

for $R \leq 1$.

Hence ,

$$|F(z)| = |a_0 + G(z)|$$
$$\geq |a_0| - |G(z)|$$
$$\geq |a_0| - M|z|$$
$$> 0$$

if $|z| < \dfrac{|a_0|}{M}$.

In other words, no zero of F(z) lies in $|z| < \dfrac{|a_0|}{M}$.

Since the zeros of P(z) are also the zeros of F(z), it follows no zero of F(z) lies in $|z| < \dfrac{|a_0|}{M}$. That completes the proof of Theorem 2.

Proof of Theorem 3. For the polynomial

$$F(z) = (1 - z)P(z)$$
$$= -a_n z^{n+1} + (a_n - a_{n-1}) z^n + ... + (a_{\lambda+1} - a_\lambda) z^{\lambda+1} + (a_\lambda - a_{\lambda-1}) z^\lambda + ... + (a_1 - a_0) z + a_0$$
$$= -a_n z^{n+1} + (k_1 a_n - a_{n-1}) z^n - (k_1 - 1) a_n z^n + (a_{n-1} - a_{n-2}) z^{n-1} + ... + (a_{\lambda+1} - k_2 a_\lambda) z^{\lambda+1}$$
$$+ (k_2 - 1) a_\lambda z^{\lambda+1} + (k_2 a_\lambda - a_{\lambda-1}) z^\lambda - (k_2 - 1) a_\lambda z^\lambda + (a_{\lambda-1} - a_{\lambda-2}) z^{\lambda-1} + ...$$
$$+ (a_2 - a_1) z^2 + (a_1 - \rho a_0) z + (\rho - 1) a_0 z. + a_0,$$

for $|z| \leq R$, we have by using the hypothesis and Lemma 3,

$$|F(z)| \leq |a_n| R^{n+1} + |(k_1 - 1) a_n| R^n + |k_1 a_n - a_{n-1}| R^n + |a_{n-1} - a_{n-2}| . R^{n-1} + ... + |a_{\lambda+1} - k_2 a_\lambda| . R^{\lambda+1}$$
$$+ |(k_2 - 1) a_\lambda| . R^{\lambda+1} + |k_2 a_\lambda - a_{\lambda-1}| . R^\lambda + |(k_2 - 1) a_\lambda| . R^\lambda$$
$$+ |a_{\lambda-1} - a_{\lambda-2}| . R^{\lambda-1} + ... + |a_2 - a_1| . R^2 + |a_1 - \rho a_0| . R + |(\rho - 1) a_0| . R + |a_0|$$
$$\leq |a_n| R^{n+1} + |a_0| + R^n [\ (k_1 - 1)|a_n| + |k_1 a_n - a_{n-1}| + |a_{n-1} - a_{n-2}| + ... + |a_{\lambda+1} - k_2 a_\lambda|$$
$$+ (k_2 - 1)|a_\lambda| + |k_2 a_\lambda - a_{\lambda-1}| + (k_2 - 1)|a_\lambda| + |a_{\lambda-1} - a_{\lambda-2}| + ...$$
$$+ |a_2 - a_1| + |a_1 - \rho a_0| + (1 - \rho)|a_0| \ ]$$
$$\leq |a_n| R^{n+1} + |a_0| + R^n [\ (k_1 - 1)|a_n| + (k_1 |a_n| - |a_{n-1}|) \cos\alpha + (|k_1 a_n| + |a_{n-1}|) \sin\alpha$$
$$+ (|a_{n-1}| - |a_{n-2}|) \cos\alpha + (|a_{n-1}| + |a_{n-2}|) \sin\alpha + ...$$
$$+ (|a_{\lambda+1}| - k_2 |a_\lambda|) \cos\alpha + (|a_{\lambda+1}| + k_2 |a_\lambda|) \sin\alpha$$
$$+ 2(k_2 - 1)|a_\lambda| + (k_2 |a_\lambda| - |a_{\lambda-1}|) \cos\alpha + (k_2 |a_\lambda| + |a_{\lambda-1}|) \sin\alpha$$
$$+ (|a_{\lambda-1}| - |a_{\lambda-2}|) \cos\alpha + (|a_{\lambda-1}| + |a_{\lambda-2}|) \sin\alpha + ...$$
$$+ (|a_2| - |a_1|) \cos\alpha + (|a_2| + |a_1|) \sin\alpha + (|a_1| - \rho |a_0|) \cos\alpha$$
$$+ (|a_1| + \rho |a_0|) \sin\alpha + (1 - \rho)|a_0| \ ]$$

SNo-25 (i)

$$= |a_n|R^{n+1} + |a_0| + R^n\Big[\, (k_1|a_n|(\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2 - 1)|a_\lambda| \\ - \rho|a_0|(\cos\alpha - \sin\alpha + 1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j| \,\Big]$$

for $R \geq 1$.

For $R \leq 1$,

$$|F(z)| \leq |a_n|R^{n+1} + |a_0| + R\Big[\, (k_1|a_n|(\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2 - 1)|a_\lambda| \\ - \rho|a_0|(\cos\alpha - \sin\alpha + 1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j| \,\Big].$$

Hence, by Lemma 2, the number of zeros of F(z) and hence P(z) in $|z| \leq \frac{R}{c}, c > 1$ is less than or equal to

$$\frac{1}{\log c}\log\frac{K}{|a_0|},$$

where

$$K = |a_n|R^{n+1} + |a_0| + R^n\Big[\, (k_1|a_n|(\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2 - 1)|a_\lambda| \\ - \rho|a_0|(\cos\alpha - \sin\alpha + 1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j| \Big] \quad \text{for } R \geq 1$$

$$= |a_n|R^{n+1} + |a_0| + R\Big[\, (k_1|a_n|(\cos\alpha + \sin\alpha + 1) - |a_n| + 2k_2|a_\lambda|\sin\alpha + 2(k_2 - 1)|a_\lambda| \\ - \rho|a_0|(\cos\alpha - \sin\alpha + 1) + |a_0| + 2\sin\alpha \sum_{j=1, j\neq\lambda}^{n-1}|a_j| \Big] \quad \text{for } R \leq 1.$$

By using Theorem 2, the result then follows.

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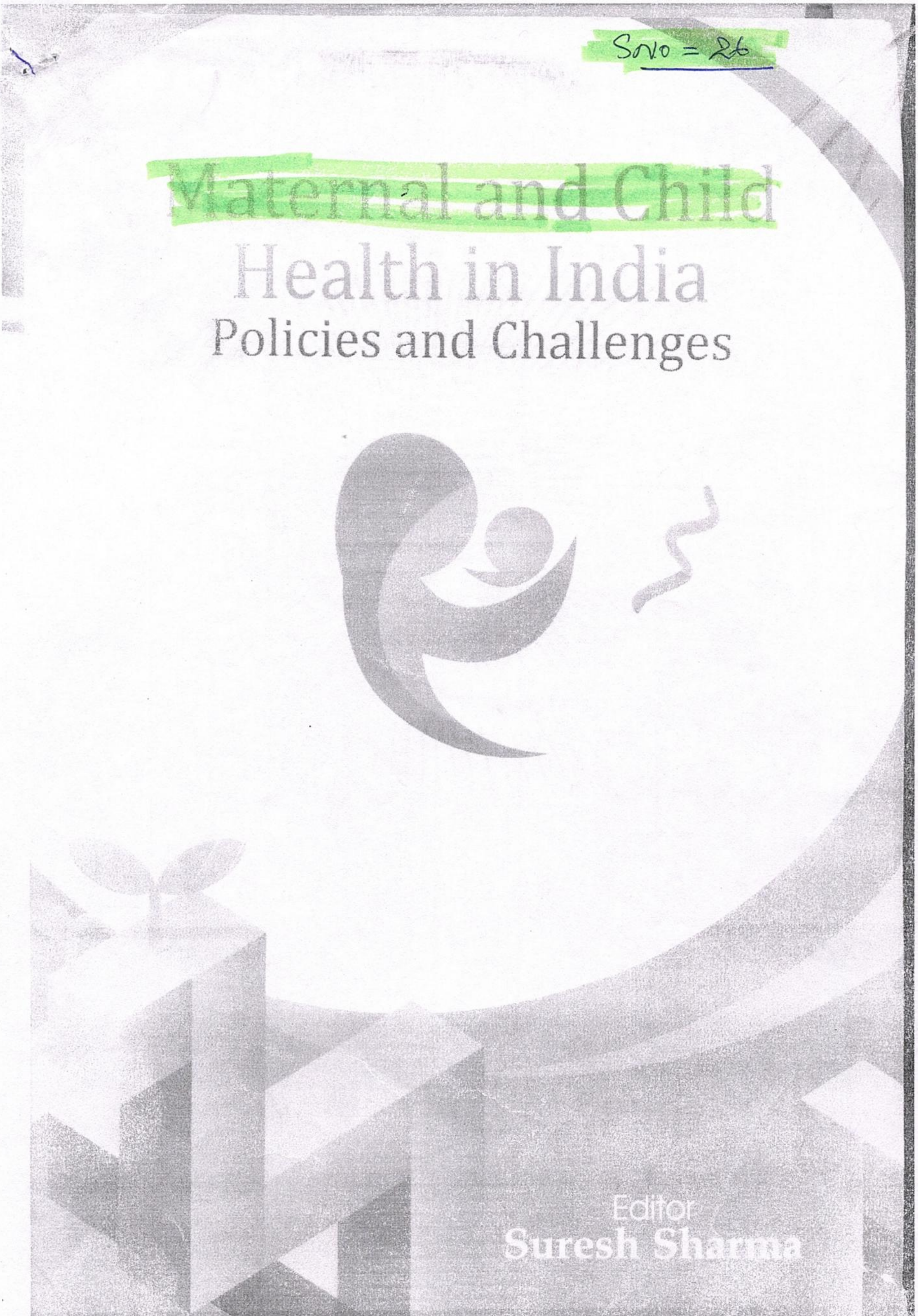

Maternal and Child Health in India

Policies and Challenges

Editor
Suresh Sharma

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16

A Study of Involvement of Men in Reproductive Health in Jammu and Kashmir-India

Bashir Ahmad Bhat*

16.1 Introduction

Reproductive health has long been viewed as solely a woman's issue, family planning and reproductive programmes have largely focused exclusively on women. In most locales around the world, particularly in developing countries, men are little involved in their partners' health care during pregnancy. Biology, however, demands that men play a central role not only in reproduction but also in sexual health. Men's involvement in pregnancy care has been emphasised in different studies identifying the sectors where men can contribute for the well being of their pregnant wives (Drennan 1998). Some of the important ways by which men are supposed to contribute their cooperation are: (a) plan their families, (b) support contraceptive use, (c) participate in acquiring maternity care, (d) ensuring nutritious food for their wives during pregnancy, (e) arrange for skilled care during delivery, (f) avoid delays in seeking care, (g) help after baby is born, and (h) be a responsible fathers (UNICEF 1998). Men are often the ones who decide when a women's condition is serious enough to seek medical care (Drennan 1998). Thus, men's decision and action during the pregnancy, delivery and after the baby is born often make the difference between illness and health and life and death of the women (Thaddeus and Maine 1994).

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Reproductive health services that focus only upon women have limited impact and effectiveness. The Cairo (International Conference on Population and Development, ICPD) 1994 and Beijing 1995 conferences have brought necessity of involving men as partner under sharp focus. "Male involvement" in reproductive health and family planning programmes is not just promoting the use of male methods of contraception, but men's supportive roles in their families, communities and workplaces to promote gender equity, girls' education, women's empowerment and sharing of child rearing and caring. In particular, it was argued that further progress in attaining reproductive health goals would depend on men changing their attitude and behaviour towards reproductive health and gender issues. It also suggests the importance of responsible, respectful and non-coercive sexual behaviour and of shared reproductive decision making (UNFPA 1995). In addition, the AIDS crisis has made the need to address men in reproductive health policies and programmes not only clear but also urgent. As a result, interest in and commitment to involving men in reproductive health has intensified during the 1990s. Therefore, interest has emerged to know the role of men in reproductive health.

Several demographic studies have shown that men may want larger families than their wives (Anderson 2001). In West Africa, men want four more children than women, though in Bangladesh, East Africa, Egypt, Morocco and Pakistan, men and women express similar desires in terms of family size (Ezeh, Seroussi and Raggers 1996). Historically, most countries have overtly targeted women in family planning programmes (Lasee and Becker 1997; Bankole and Singh 1998), while males have largely been excluded from such programmes that provide family planning services (Edwards 1994). Most modern contraceptive methods are designed to be used by females. Men seem to be less concerned than women about family planning, perhaps because the former do not carry the burden of pregnancy and child birth directly. The lack of male involvement in contraception is also related to the limited methods available for men (Ringheim 1993). The technology has been slow to produce contraceptive methods for men (Anderson 2001) owing to limited funding and lack of commercial interest in male fertility regulation (Ringheim 1995). The studies indicate than even if wife wants to use contraception, it is the men who have a potentially important role to determine whether women adopt family planning. Husband's approval was found to be most important determinant of contraceptive use in Indonesia (Joesoef, Baughman and Utomo 1988) while in Kenya the wife's perception of her husband's approval of family planning emerged as most powerful in explaining contraceptive use (Lasee and Becker 1997). Other studies revealed that poor communication between husband and wife is an important barrier to the adoption of contraception (Omondi-Odhiamb 1997). The success of contraception depends on the agreement and cooperation of husband, while communication between spouses also improves the chance of effective family planning. In addition, there are barriers to the expansion of male participation in family planning. While men should share the responsibility with their partners, those who want to take the responsibility for contraception have limited choices, they can either undergo a vasectomy or use condoms. Ideally, a basket of contraceptive methods should be available to men.

A few studies on the involvement of men in reproductive health services and the problems in involving men have been conducted in India also. A study conducted in Uttar Pradesh has found that men have limited knowledge of women's reproductive health matters (Moore 1999). Around 78 per cent men were unable to correctly identify the fertile period in the menstrual cycle and one-half could not correctly identify a symptom of serious pregnancy or childbirth complications. About 71 per cent did not know that symptoms were not always apparent with a sexually transmitted disease (STD). Approximately 47 per cent were not aware that STDs could be transmitted from a pregnant woman to a foetus or a newborn. The findings of this study are supported by another study in Maharashtra, which shows that though majority of the men are aware of the need for antenatal, delivery, and postnatal care but fewer know details and fewer husbands accompany their wives for care; husbands are more likely to be present for care of problems than for routine care (ICRW 2005).

So far as pregnancy care is concerned, a study conducted in Maharashtra found that majority of husbands in the State accompany

SNO = 26 (d)

their wives for the first check up to confirm pregnancy, but the women generally went alone or with the other female members of the family for subsequent visits (Barua 1998). It also found that husbands ignore wife's health care during pregnancy, except for the awareness for the need for antenatal registration and a nutritious diet. Delivery and post delivery periods were found to be exclusively women's affairs. An important study, however, has shown that it is not the men alone who are responsible for their poor involvement in Reproductive and Child Health (RCH) services but one of the major obstacles to increase male involvement and responsibility in reproductive health stems from the service delivery systems, which are almost entirely oriented to women and often provide little or no information about male contraceptive methods (Pachauri 1997). Physicians often show negative attitudes toward vasectomy, and health workers are sometimes poorly trained in counselling men about safer sexual practices, contraception and delivery care (UNFPA 1995). Poor knowledge of men related to contraception, pregnancy and delivery care coupled with women's dependence on men for accessing healthcare is one of the barriers for poor utilization of reproductive and child health care services (Murthy *et al.* 2002). However, an intervention study by Population Council in India indicated that men are interested in participating in maternity care and can take more contraceptive responsibility if they are provided adequate information and counselling about maternity care and contraception (Population Council 2001). The study clearly demonstrated that allowing men to participate in their wives' antenatal and postpartum care by providing information through individual and joint counselling increased couples' discussion and use of contraception, knowledge about pregnancy and family planning (Population Council 2001).

But there are far-fewer surveys of men than that of women. Cultural and programmatic barriers often have impeded efforts to survey men on such topics as fertility and family planning, as they have impeded men's participation in family planning programmes themselves. Some family planning programmes have neglected men, assuming that men are indifferent or even opposed to family planning. Some countries, especially those with low HIV prevalence lack interest in surveying men, while others, lack the funds to survey men. Many service providers and programme designers have concluded that neglecting men and their

reproductive health is a losing strategy with adverse consequences for both men and women.

Of late the surveys around the world increasingly are interviewing men and reporting on their contraceptive use, reproductive preferences, attitudes toward family planning, and sexual behaviours. Before 1990 only four nationally representative surveys of men were conducted. Since 1990, 76 surveys of men in 48 countries have been conducted as part of the Demographic and Health Surveys (DHS) and the Reproductive Health Surveys (RHS) programmes, including the Young Adult Reproductive Health Surveys (YARHS). But most of these surveys of men have been conducted in Sub-Saharan Africa. Only a handful of countries in Asia have surveyed men. The increase in men's surveys reflects widening recognition of men's importance in sexual and reproductive health. Although the Ministry of Health and Family Welfare, Government of India, is committed to implementing ICPD Programme of Action, but enough attention has not yet been given to the involvement of men in maternal and child health care. This study assumes interest to know the role of men in maternity, delivery and post-delivery periods extended by them to their wives. But there are very few studies that have studied the role of men in the utilization of reproductive health care in India. National Family Health Survey-3 (NFHS-3) conducted during 2006 in India has collected information from men about their involvement in maternity care but this huge data set has not yet been analysed at the State level. We, therefore, plan to use the NFHS data for analyzing the involvement of men in maternity in Jammu and Kashmir.

16.2 Main Objectives

The main objectives of this study are as follows:

- To study the socio-economic and demographic characteristics of the respondents.
- To know the attitudes of men regarding the family size preferences, family planning and women's health.
- To know the involvement and participation of men in maternity, delivery, post-natal care and family planning.
- The study will also try to examine whether there is any scope for some interventional programmes for men in

SNo=26 e)

Jammu and Kashmir State in order to involve more and more men to play their role in improving the maternity health care in the state and bring down the maternal and infant deaths to lowest possible extent.

16.3 Data and Methods

The study has two distinct components: quantitative and qualitative. For the quantitative analysis we use data from the third round of National Family Health Survey (NFHS-3) conducted in India during 2005-2006. The NFHS-3 is the first national level survey which has collected information from men aged 15-44 years. The men's questionnaire covered the following aspects: background characteristics; reproductive behavior and intentions; knowledge and use of contraception; male involvement in health care, sexual life, health and nutrition; attitudes towards gender roles; and knowledge and prevalence of HIV/AIDS and other sexually transmitted infections. The analysis is restricted to Jammu and Kashmir State only. In Jammu and Kashmir NFHS-3 was carried out from April to July 2006 and collected information from 1076 men aged 15-54 years. The variables of involvement of men in maternity analysed are; desire to limit children, use of family planning methods, attitudes towards contraception, helping spouses in availing ANC, PNC and delivery services. We use both bivariate and multivariate techniques to analyse the quantitative data.

A logistic regression model was fitted to identify the significant determinants of the misconceptions of men related to contraception. The response variable is coded as completely misconceived and partially misconceived. Degree of misconception is computed by combining the responses of the men's perception of contraception attitude agreed or disagreed with three general statements about contraception (contraception is women's business and man should not worry about it, women who use contraception may become promiscuous and women who are breastfeeding cannot become pregnant) and perceptions about the effectiveness of condom use (if a male condom is used correctly, it protects pregnancy only sometimes). Of these four indicators of contraception, if a man agrees to at least three of the above statements, he is considered to be completely misconceived otherwise, he is considered to be partially misconceived. The dependent variable has a value of '1' for completely misconceived about contraception and '0' for partially misconceived about contraception.

The demographic and socio-economic variables included as statistical controls in multivariate models are age (15-19, 20-29, and 30-39 and 40 years and above); marital status (unmarried, ever married); education of the women (illiterate, less than middle school complete, middle school complete, and high school or more education); current work status (not working, salaried, skilled worker, agricultural worker); residence (urban, rural); exposure to mass media (regularly exposed to mass media, not regularly exposed to mass media); economic status (poor, rich, very rich) and region of residence (Kashmir, Jammu). We estimate adjusted effects of each of these predictor variables on response variables. In this context, 'adjusted' means that other selected predictor variables are statistically controlled by holding them constant at their mean values. The adjusted percentages are based on a single logistic regression that includes all the predictor variables. In calculating adjusted percentages for categories of any given predictor variable, the set of control variables consist of all other predictor variables, which are controlled by setting at their mean values. In Table 16.6 we have presented the logistic regression coefficients or the odds ratios. SPSS V. 17 was used to tabulate the data and calculate the regression coefficients.

The quantitative research is followed by focused group discussions. We conducted nine focus group discussions (FGDs) with men between November-December 2009 in Kashmir Valley. Kashmir valley consists of three geographical regions, namely, North Kashmir, South Kashmir and Central Kashmir. We selected Pulwama from South Kashmir, Kupwara from North Kashmir and Budgam from Central Kashmir for FGDs. In each district three FGDs were conducted. FGD participants were identified by anganwadi workers and health workers and school teachers. Participant selection was purposive to ensure homogeneity in terms of age, education, and marital status. Each FGD lasted for approximately 30-45 minutes and included six to eight participants. A total of 64 men participated in FGDs. Moderators and note takers were given extensive training to ensure they remained neutral and non-judgmental regarding the

SNo=26 (7)

sensitive subject matter. Moderators were younger than the respondents. A flexible guideline was used to facilitate the discussions. Informed consent was obtained verbally and the discussion was recorded only after verbal permission was received from the participants. These audiotapes were translated from the local languages (Kashmiri) into English. The main purpose of the qualitative component was to provide more comprehensive, in-depth explanation and understanding for the quantitative survey findings.

16.4 Area of Study

According to 2011 Census, Jammu and Kashmir had a population of 12.5 million, accounting roughly for 1 per cent of the total population of the country. The decadal growth rate during 2001-2011 was about 23.7 per cent which was higher than the decadal growth rate of 17.6 per cent at the national level. The sex ratio of the population (number of females per 1,000 males) in the State according to 2011 Census was 889, which is much lower than for the country as a whole (940). 27 percent of the total population lives in urban areas which is almost the same as the national level. As per 2011 Census, the literacy rate among population aged 7 years and above was 68 per cent as compared to 74 per cent at the national level. Female literacy (58 per cent) continues to be lower than the male literacy (78 per cent). As per the Sample Registration System, the current Total Fertility Rate (TFR) of 1.9 in Jammu and Kashmir is slightly lower than the TFR of 2.4 at the All India Level. With the introduction of Reproductive and Child Health Programme, more and more couples are now using family planning methods. As per District Level Household Survey-3 (DLHS-3), 41 per cent of women are now using modern family planning methods as compared to 49 per cent in India as a whole. According to Sample Registration System (SRS 2013) Jammu and Kashmir had an infant mortality rate of 39 per 1,000 live births, a birth rate of 18 and a death rate of 6 per 1,000 population. The corresponding figures at the national level were 52, 21 and 7.0, respectively. According to the latest estimates, expectation of life at birth in Jammu and Kashmir has increased to 65.3 years as compared to 63.4 at the national level and the gap between the life expectancy at birth by gender in the State has gradually closed down and currently the female life expectancy is higher (66.8 years) than male life expectancy (64.1 years).

With the implementation of Reproductive and Child Health Programme (RCH) more and more women are coming forward to utilise antenatal and postnatal care services. As per NFHS-3, 85 per cent of women who gave birth in the five years preceding the survey had received antenatal care from a health professional. Similarly, more and more women are now utilising institutional services for delivery as about half of the births in the five years prior to the survey in Jammu and Kashmir took place in a health facility. Jammu and Kashmir is also progressing well in the field of child immunisation. More than 90 per cent of children have been immunised against various vaccine preventable diseases, however, because of drop outs only two-thirds (67 per cent) of children aged 12-23 months in Jammu and Kashmir are fully vaccinated against six major childhood illnesses: tuberculosis, diphtheria, pertussis, tetanus, polio, and measles.

16.5 Findings

16.5.1 *Men's Fertility Preferences*

Table 16.1 shows future fertility preferences of currently married women and men in Jammu and Kashmir and India. The overall percentage of men and women who want no more children is similar in India but lower percentage of men (69 per cent) than women (74 per cent) in Jammu and Kashmir want no more children or are already sterilised. Besides, while 83 per cent of men and women in India with two children want no more children, the corresponding figures in Jammu and Kashmir are 69 per cent for men and 78 per cent for women. Thus, fertility preferences are higher for men than women in J&K.

Table 16.1: Percentage of Currently Married Men and Women who want to limit Childbearing by No. of Living children in J&K and India

	J&K		India	
No. of Living Children	Women	Men	Women	Men
1	15.6	16.8	27.7	26.9
2	77.6	68.8	83.2	83.6
Total	73.7	69.2	70.5	70.6

Source: NFHS-3 (2005-06)

SNO=26(9)

Table 16.2 shows the distribution of the ideal number of children stated by women and men aged 15-49 years in J&K and India. 69 per cent of women and 65 per cent of men in J&K consider the ideal family size to be two children or less. Among all men and women who gave a numeric response in NFHS-3, the average number of children considered to be ideal is 2.3 at the national level. But in J&K, the ideal family size is slightly higher for men (2.4) than for women (2.3).

Table 16.2: Indicators of Sex Preference by Men and Women in J&K and India

Indicator of Fertility Preference	J&K Women	J&K Men	India Women	India Men
Ideal mean Sons	1.1	1.1	1.1	1
Ideal No. Of Mean Daughters	0.8	0.8	0.8	0.7
Either sex	0.4	0.5	0.4	0.6
Want more sons than daughters	23.4	23.9	22.4	20
Want more daughters than sons	3.1	2.2	2.6	2

Source: NFHS-3 (2005-06).

A strong preference for sons has been found to be pervasive in Indian society, affecting both attitudes and behaviour with respect to children and the choice regarding number and sex composition of children (Das Gupta *et al.* 2003; Mishra *ei al.* 2004; Bhat and Zavier 2003; Arnold *et al.* 1998,). In NFHS-3, women aged 15-49 years and men aged 15-54 years, who gave a numerical response to the question on the ideal number of children, were also asked how many of these children they would like to be boys, how many they would like to be girls, and for how many the sex would not matter. It can be seen from Table 16.2 that as in many other Indian states, there is a preference for sons than daughters in Jammu. and Kashmir as the mean ideal number of sons is 1.1 among both men and women. However, slightly higher proportion of men (24 per cent) than women (23 per cent) in J&K want more sons than daughters, while in India as a whole higher percentage of women than men want more sons than daughters. Thus, in Jammu and Kashmir, men have a strong son preference than is found among women.

During the focus group discussions, it was found that apart from various already known reasons for more sons, the ongoing militancy in Jammu and Kashmir is to some extent responsible for a higher son preference among men as can be observed from the FGDs conducted in Pulwama and Kupwara.

> *"We have lost more than 50 thousand youth in the ongoing struggle. We do not have any guarantee about the security of our sons. We know of families who had a single son who was lost during militancy. So in order to ensure that there is one son, we have no option but to desire more sons".*

16.5.2 *Knowledge of Family Planning Methods*

Knowledge of contraception is almost universal in Jammu and Kashmir both among men and women (Table 16.3). Female sterilisation is the most widely known method of contraception among men and women. Except for Pill and IUD, higher percentage of men than women in J&K knew each method of family planning. The government of India's family planning programme promotes three temporary methods: the pill, the IUD, and condoms. Of these three methods, men in J&K are most likely to know about condoms (92 per cent) and women are most likely to know about the pill (89 per cent). Men in J&K have little knowledge of IUD as four out of 10 men in J&K have not heard about IUD. As the knowledge of at least one modern method is quite high among men the differentials by various background characteristics are not large.

Table 16.3: Percentage of Currently Married Men and Women Knowing Different Methods of Family Planning and Percentage of Women using Family Planning in J&K and India

	Knowledge FW				Current use	
	J&K		INDIA		J&K	India
Method	Women	Men	Women	Men		
Any Method	98.3	98.5	99.3	99	52.6	56.3
Any Modern Method	98.3	99.3	99.3	98.3	44.9	48.5
Female sterilisation	96.4	97.7	98.4	93.8	26.3	37.3
Male Sterilisation	81.3	92	83.2	90.9	2.6	1
Pill	88.6	84.9	87.2	83.5	4.7	3.1
IUD	79.9	58.1	74.3	60.3	2.7	1.7
Condom	72.2	92.7	76.1	90.3	8	5.2
Withdrawal	42	48	36.3	44.2	6.2	2.5

Source: NFHS-3 (2005-06).

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16.5.3 *Exposure to Family Planning Messages*

Exposure to family planning messages is seen as widening the horizon of understanding on issues related to contraceptive use and helping to achieve desired family size. Information contained in Table 16.4 shows that men are much more likely than women to be exposed to media messages on family planning. Overall, 90 per cent of men have been exposed to family planning messages in the past few months compared with 50 per cent of women. Radio is the most important source of family planning message in J&K, while as at national level highest proportion of men are more likely to be exposed to family planning message through TV. A higher proportion of men than women reported exposure to family planning messages through each channel of communication.

Table 16.4: Percentage of Currently Married Men and Women Exposed To Family Planning Message By Source In J&K and India

	J&K		INDIA	
	Women	Men	Women	Men
Radio	34	60.1	32.8	52.9
TV	39.3	54.9	49.5	64.1
Newspaper	15.6	36.5	22.2	50.1
None	50.2	10.6	38.7	8.1

Source: NFHS-3 (2005-06).

16.5.4 *Use of Contraception*

The current level of contraceptive use, i.e. the contraceptive prevalence rate (CPR) defined as percentage of currently married women aged 15-49 years, who are currently using a contraceptive method or whose husbands are using a contraceptive method, is also presented in Table 16.3. The contraceptive prevalence rate among currently married women is 53 per cent; in J&K as compared to 56 per cent at the national level. Female sterilisation accounts for half of contraceptive use in J&K, down from 57 per cent at the time of NFHS-2. Only 2.6 per cent were using male sterilisation in 2006 and this percentage has further declined to 1 per cent as per DLHS-3. Condom use has stagnated around 8-9 per cent during 2006-2008. Thus, male methods accounted for 17 per cent of the total contraceptive use in J&K in 2006 as compared to only 9 per cent at the national level. Male sterilisation is highest in Kashmir valley than in Jammu region. It is also higher among men aged 40 years and above, and also among urban men, illiterate men and among Muslims than other sub groups. Condom use on the other hand is highest in Jammu region than in Kashmir region. Condom use is also higher among men aged 30-39 years in urban men, those men who have at least completed high school education and among Hindu men than their counterparts. In general, better-educated men, wealthier men, and men from urban areas are more likely than other men to use spacing methods, particularly condoms and withdrawal.

Though overall, male methods account for 23 per cent of the total modern contraceptive use but male sterilisation accounts for less than 10 percent of the total sterilisation use. However, if we look at the official statistics on the use of sterilisation (both male and female) before the onset of militancy (1989), male sterilisation accounted for about 25 percent of the sterilisation used during 1980-1989. Then, what are reasons that male involvement has declined in use of family planning? One of the reason for higher use of male sterilisation before militancy was the special incentive campaigns introduced by the government for government employees. During these campaigns, employees accepting male sterilisation used to get two advance increments. These incentives for male sterilisation are no longer in place in the State now. During the militancy, militants launched a campaign against family planning in general and male sterilisation in particular. Men who had accepted male sterilization were disgraced and at some place were not allowed to lead in prayers. Militants and their followers discouraged small family norm and even some of them offered incentives for couples opting for higher number of children. Though, with improvement in situation in the State after 1998, services for female sterilisations were initiated but services for male sterilisation were not initiated till 2005. So even if some men were interested in having male sterilisation, non-availability of services proved to be a barrier for them. Both men as well as health workers seem to have lost interest in Non Scalpel Vasectomies (NSVs) and it appears that it will be difficult for the NSV component to gain the lost momentum. The views expressed by the participants of FGDs in all the three districts proved this point.

(SNO=26 i)

> *"I and two more colleagues of mine had a plan to opt for male sterilisation and wanted to take the benefit of double advance increments. However, we were told that this scheme has been withdrawn some seven years back. We than decided to opt for female sterilisation, but services were not available at the government health facilities. Consequently, there was no option but to avail the services from a private maternity home".*

> *"After the militancy erupted, not only the health sector suffered a setback, but there was hardly any doctor willing to offer his services for male sterilisations either at government hospital or private hospital. So male sterilisations was beyond a common's mans reach. Besides, some men who had accepted vasectomy earlier were disgraced and not allowed to offer prayers. This had a negative impact on the perspective users".*

> *"Earlier some men used to opt for male sterilisation probably they were not aware that male sterilisation is not allowed in Islam but now-a-days everybody knows that it is against the principles of Islam so nobody would like to give any ear to the latest advertisements regarding NSV on electronic media launched by the Government."*

Providers also have now considered family planning (FP) a woman's issue. They hardly counsel men or motivate them to use male methods of family planning. This is probably because health workers in the government sector have limited skills to implement male friendly services. The current programme has not been successful in involving men and providing them with both the essential information and skills for this to happen. The following narratives through light on these issues:

> *"Whenever female health workers visit our houses, they hardly bother to talk to men and prefer to talk to women regarding family size, contraception and related issues. Male health workers hardly visit us. If by chance we meet them they shy away from talking and counselling us on these important issues probably they are not fully trained to do so. They assume that men are difficult to motivate and that they are resistant to changes in their reproductive attitudes and behaviours, which we are not. With such a situation how can we get information about family planning and various other aspects related to its use, availability, etc".*

Poor inter-spouse communication and men's attitude are also barriers in involving men in contraception. This emerged from the FGDs in Budgam and Pulwama.

> *"Women do not discuss much about family planning with men. They generally discuss it with their female relatives and friends and also decide about the method to use and convey the decision to men. So when women have taken the responsibility on themselves, why should we bother? We are there to accompany them in case they need it, but finally we have to pay the bill".*

16.5.5 *Men's Attitudes about Contraception*

Men's attitudes about contraception may influence their partner's attitudes and eventual adoption of a contraceptive method. In NFHS-3, all men were asked if they agreed or disagreed with three general statements about contraceptive use. Additionally, they were asked one question to judge their perceptions about the effectiveness of condom use. As shown in Table 16.5, 30 per cent of men in Jammu and Kashmir think that contraception is women's business and that a man should not have to worry about it as compared to 22 per cent in India as a whole. More than one third of men in the State (37 per cent) believe that women who use contraception may become promiscuous as against 16 per cent in India. More men in J&K (53 per cent) than in India (49 per cent) also believe that a woman who is breastfeeding cannot become pregnant. Slightly more than one-third of men perceived that even if a male condom is used correctly it does not protect against pregnancy most of the time; as against 33 per cent in the country. Thus, all indicators of misconceptions related to contraception are higher in J&K than in India. Jammu and Kashmir also has the highest percentage of men who have misconceptions about contraception than any other North Indian State.

Differentials in the responses by background characteristics are substantial. All misconceptions are far higher in Kashmir region than in Jammu region. For example, while only 38 per cent of men in Jammu region believe that a woman who is breastfeeding cannot become pregnant, this percentage is as high as 64 per cent in Kashmir. Similarly, 20 per cent of men in Jammu perceive that women who use contraception may become promiscuous as against 49 per cent in Jammu. Though all indicators of misconception regarding contraception are high in rural areas than in urban areas but differentials are more pronounced in case of third indicator (contraception use leads to promiscuous).

SNO=96

Table 16.5: Percentage of Men by their Contraception Related Perception and Knowledge and Men Having Misconceptions about Contraception By Background Characteristics in Jammu and Kashmir in 2005-2006

Background characteristic		BFWCNBP[1]	Women's Business[2]	Promiscuous[3]	Condom[4]	Highly Misconceived[5]
		%	%	%	%	%
Region	Jammu	37.7	17.7	20.0	28.9	25.2
	Kashmir	63.6	39.6	48.7	40.6	64.7
Residence	Rural	49.2	35.8	39.9	36.9	51.5
	Urban	60.3	17.7	28.6	32.6	39.4
Age in years	15-19	28.3	26.5	28.5	48.4	37.2
	20-29	50.2	30.0	40.7	30.1	48.0
	30-39	66.9	33.4	40.3	31.7	55.1
	40-49	69.4	31.6	35.1	33.7	53.9
	50+	56.0	30.6	33.4	34.9	42.5
Education	Illiterate	62.8	36.4	41.4	48.4	60.7
	<8 years complete	46.6	30.3	43.1	42.5	47.8
	8-9 years complete	43.6	34.1	33.6	40.6	47.5
	10+ years complete	58.0	24.7	33.3	22.7	42.4
Marital status	Unmarried	37.9	29.0	35.3	38.7	43.8
	Married	65.4	32.2	36.9	33.3	51.3
	Other	68.2	6.4	56.7	18.5	56.1
Religion	Hindu	41.6	17.4	21.7	26.2	26.3
	Muslim	59.1	38.3	46.0	41.5	61.4
	Other	50.0	19.0	9.3	22.6	19.0

Table 16.5 continue

Table 16.5 continue

Background characteristic		BFWCNBP[1]	Women's Business[2]	Promiscuous[3]	Condom[4]	Highly Misconceived[5]
		%	%	%	%	%
Regular media exposure	No	48.7	34.3	28.2	51.4	51.7
	Yes	53.1	29.7	37.7	33.3	47.3
Occupation	Not working	30.0	24.2	28.2	39.6	35.8
	Agriculture work	53.9	37.2	39.5	46.8	58.4
	Skilled/unskilled	57.1	31.7	42.4	33.1	51.2
	Employees	64.2	30.0	35.3	29.3	48.1
Wealth index	Poor	46.0	32.4	34.3	50.8	45.6
	Rich	54.5	36.7	45.4	36.6	57.2
	Richer	52.2	16.3	19.7	25.4	30.0
Jammu & Kashmir	Total	52.6	30.3	36.5	35.6	47.8
India	Total	48.8	21.6	16.1	34.1	Not calculated

Notes:
[1] Percentage of men who agree that a woman who is breastfeeding cannot become pregnant.
[2] Percentage of men who agree that women who use contraception may become promiscuous.
[3] Percentage of men who agree that contraception is women's business and man should not worry about it.
[4] Percentage of men who believe that correct male condom use can protect pregnancy most of the time.
[5] Percentage of men who are highly misconceived about contraception.

SNO=86(K)

Men aged 30-40 years, illiterate men, unmarried women, Muslims, men not regularly exposed to media have are more likely to have misconceptions. Relationship between wealth index and misconceptions is not clear although men who have highest wealth index are less likely to have these misconceptions.

16.5.6 *Descriptive Analysis*

As mentioned above that men were categorised into two groups (completely misconceived and partially misconceived) based on their perceptions of contraception attitudes. Table 16.5 shows that about half of the men are complete misconceived about contraception. Two third of men in Kashmir Valley are completely misconceived about contraception as compared to one-fourth of men in Jammu region. Men from rural areas also have negative attitudes about contraception. Men from the religious group other than Islam are likely to have lesser degree of misconceptions about contraception. Younger and unmarried men are less likely to be completely misconceived about contraception than other men. A bivariate analysis reveals that as the education level of men increases, the percentage of men having complete misconception about contraception decreases. Men who have access to mass media are more likely to have positive attitude towards contraception. Men engaged in professional/managerial/technical jobs are less likely to show complete misconceptions, while men engaged in agriculture are more likely to have high degree of misconception about contraception than their counterparts.

16.5.7 *Regression Analysis*

A logistic regression model was fitted to identify the determinants of 'degree of husbands' misconception towards contraception. The response variable is coded as completely misconceived and partly misconceived (reference category). All the variables listed in Table 5 were considered in the analysis as independent variables and the results are presented in Table 16.6.

Geographical region is the most important predictor of misconception. Men from Kashmir valley are 5.5 times more likely to have misconceptions about contraception than men belonging to Jammu region. Men who are engaged in agriculture and skilled type of jobs are significantly more likely to have poor degree of awareness about contraception than men who are involved in government/private jobs. Men from rural areas are significantly more likely to have poor degree of awareness of contraception than men from urban areas. Men aged less than 30 are less likely to have misconceptions than men aged 40 years and above. Men who have a medium SLI are significantly more likely to have misconceptions about contraception than men who have a low SLI or High SLI. Men who are regularly exposed to mass media are less likely to have misconceptions than men who are not regularly exposed to mass media.

Table 16.6: Logistic Regression Parameter Estimates for the Effect of Demographic and Socio-economic Characteristics on The Misconception of Contraception Related Attitudes in Jammu and Kashmir-India

Independent variable		B	S.E.	Sig.
Intercept		.164	.373	.000
Region	Jammu*			
	Kashmir	5.541	.154	.000
Residence	Rural*			
	urban	.647	.171	.011
Education	Illiterate*			
	Primary	.910	.234	.687
	Middle	1.009	.228	.969
	High	1.081	.247	.753
Marital status	Married*			
	Unmarried	1.182	.190	.379
Age	< 20*			
	20-29	1.001	.192	.997
	30-39	1.501	.232	.080
	40+	1.509	.263	.118
SLI	Poor*			
	Rich	1.494	.207	.052
	Very rich	1.009	.271	.975
Media exposure	No*			
	Yes	.759	.224	.218
Occupation	Not working*			
	Employed	2.042	.235	.002
	Skilled workers	1.958	.251	.007
	Agriculture workers	2.816	.285	.000

Note: * Denotes reference category.

(226 = ON5)

Table 16.7: Among men age 15-49 whose youngest living child was age 0-35 months, percentage for whom the youngest child's mother received antenatal care, percentage who were present during at least one antenatal care visit, percentage who were told by a health provider or worker at any time during the pregnancy about specific signs of pregnancy complications - by residence, Jammu and Kashmir, 2005-06

Antenatal/delivery care and information	Urban	Rural	Total
Percentage of men for whom the youngest child's mother received antenatal care	82.4	75.7	77.3
Percentage of men who were present at any antenatal care visit	74.5	65.3	67.5
Percentage who were told by a health provider or health worker about the following signs of pregnancy complications:			
Vaginal bleeding	23.5	16.0	17.8
Convulsion	27.5	18.1	20.3
Prolonged labour	31.4	20.1	22.9
Percentage ever told what to do if mother had any pregnancy complication	39.2	28.5	31.1
Percentage whose youngest child was delivered in a health facility	66.7	48.6	53.0

Source: NFHS-3 (2005-06)

16.6 Male Involvement in Antenatal Care

The Reproductive and Child Health Programme in India envisages the involvement of men in women's reproductive health. Health workers are supposed to provide expectant fathers with information on several aspects of maternal and child care during their contacts with expectant fathers. In NFHS-3, information was collected through the Men's Questionnaire about several aspects of their involvement in antenatal care, including whether the mother of their youngest child had any antenatal check-ups when she was pregnant, whether they were present at any of these antenatal check-ups, and the reason the mother did not have any antenatal check ups if she did not have any. Men were also asked whether at any time during the pregnancy any health provider or health worker told them about the various signs of pregnancy complications (vaginal bleeding, convulsions, and prolonged labour) and what to do if the mother had any of those complications.

Table 16.7 presents information on men's involvement during antenatal care visits and information given to them by a health provider or health worker about signs of pregnancy complications. Two-thirds (68 per cent) of men in J&K with a child under three years said they were present during at least one antenatal check-up received by the child's mother as compared to only 49 per cent at the national level. Presence of men during antenatal care differs slightly by residence in the State. Three fourth of men in urban areas and two-third in rural areas were present during at least one antenatal check-up received by the child's mother. Men under age 25 years at the time of the birth of their youngest child were less likely to be present for antenatal check-ups of the mother than older men. There is a strong negative relationship between the father's number of children ever born and his presence during any antenatal check-up of the mother, and a positive relationship between both the man's educational level and his wealth status and his presence during antenatal check-ups. For example, men with one child ever born are more than twice as likely (62 per cent) to be present during antenatal care than men with four or more children ever born (29 per cent). Similarly, men with 12 or more years of education and men in households in the highest wealth quintile are at least two and a half times as likely to be present during an antenatal check-up as men

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with no education and men in the lowest wealth quintile households. The man's presence is higher in Kashmir division than in Jammu Division. Muslim men are more likely to accompany their partners for ANC than Hindus.

Though higher percentage of husbands in J&K accompanied their wives to avail ANC than at the national level but lower percentage of men (31 per cent) in J&K who were presented during any of the ANC visits were not told what to do if the mother had a major complication of pregnancy as compared to 37 at the national level. The situation is even worse in rural areas where only 28 per cent of men were told what to do if the mother had a major complication of pregnancy. This means that even though a sizeable proportion of men in J&K present themselves during ANC visits but only a minor proportion of them are provided information related to contraception.

As far as type of information provided is concerned, one-fifth of fathers were told about signs of each of the major pregnancy complications: vaginal bleeding (18 per cent), convulsions (20 per cent) and prolonged labour (23 per cent). The percentage of men who were told about the signs of specific pregnancy complications is particularly low among men from Kashmir region than in Jammu region, men who were less than 25 years of age at the time of the birth of child, men with four or more children ever born, men in rural areas, men with no education, Muslim men, and men in households in the lowest wealth quintile. The pattern is similar with respect to information given to men about the action to be taken in case the mother had any pregnancy complication.

Table 16.8 shows the distribution of men aged 15-49 year whose youngest child was less than three years of age at the time of the survey and for whom the mother did not receive any antenatal care by the main reason for not receiving antenatal care. Two out of five men thought it was not necessary for the mother to receive antenatal care. Another 11 per cent of men said that their family did not think it was necessary or did not allow the mother to receive antenatal care. It was also mentioned by 12 per cent of men that the main reason for the mother not receiving antenatal care its high cost. The reasons given by men for the mother not receiving antenatal care are similar in rural and urban areas.

Table 16.8: Reasons Given by Men for Mother not Receiving Antenatal Check Up During Pregnancy in Jammu and Kashmir - by Region and Place of Residence

Reason for mother not receiving antenatal check-up	Total	Region		Residence	
		Jammu	Kashmir	Rural	Urban
	%	%	%	%	%
He did not think it necessary/did not allow	42.3%	47.8%	38.3%	39.1%	62.5%
Family did not think it necessary/did not allow	11.1%	4.4%	16.0%	10.9%	12.5%
Child's mother did not want check-up	11.3%		19.6%	13.0%	
Has had children before	5.6%	13.3%		6.5%	
Cost too much	12.8%	16.9%	9.8%	10.9%	25.0%
Too far/no transportation	9.4%	13.3%	6.5%	10.9%	
Other	7.5%	4.4%	9.8%	8.7%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NFHS-3 (2005-06).

SNO=26 N)

Table 16.9: Reasons Given by Men for not taking Mother for Delivery in a Health Facility at the Time when their Last Child was Delivered in Jammu And Kashmir - By Region and Place of Residence

Reason child's mother did not have antenatal check-up	Total	Region		Residence	
		Jammu	Kashmir	Rural	Urban
	%	%	%	%	%
Cost too much	8.7%	14.4%	3.4%	8.2%	11.8%
Facility closed	.9%	1.8%		1.0%	
Too far/no transportation	16.9%	16.6%	17.2%	19.6%	
Don't trust facility/poor quality service	4.4%	1.8%	6.9%	5.2%	
Not the first child	4.4%	9.2%		5.2%	
Mother did not think necessary	18.2%	12.8%	23.2%	15.5%	35.3%
Respondent did not think necessary	20.8%	28.5%	13.6%	17.5%	41.2%
Family did not think necessary	14.1%	11.1%	17.0%	15.5%	5.9%
Other	11.5%	3.7%	18.7%	12.4%	5.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NFHS-3 (2005-06).

All men aged 15-49 year whose youngest living child was less than three years old were also asked whether their youngest child was delivered in a health facility and, if not, what was the main reason the child was not delivered in a health facility and results are presented in Table 16.9. Roughly half of men (47 per cent) reported that their youngest child was not delivered in a health facility (half of births in rural areas and one-third of births in urban areas). 35 per cent of men who said the child was not delivered in a health facility said that either they or their family did not feel it necessary to have the delivery in a health facility (or did not allow it); 18 per cent reported that mother of the child did not think it was necessary, 17 per cent said that the health facility was too far away or that no transportation was available and 9 per cent reported that it costs too much.

Thus, a substantial proportion of men than women in J&K are not convinced about the need to have an antenatal care or the need to have a delivery in a health facility. These results suggest the need to inform parents and families more about the benefits of delivering in a health facility and to help overcome traditional attitudes and other hurdles that discourage institutional births. In addition, since about one-third of women and men gave reasons dealing with the cost of services and problems of accessibility, utilisation of health facilities for deliveries could also be increased by lowering direct and indirect costs and making services more accessible.

16.6.1 *Information Given to Men*

Men who had a child less than four years of age were asked whether at any time when the mother was pregnant with their youngest child any health provider or health worker spoke to them about family planning or delaying the next children; the importance of delivering the baby in a hospital or health facility; or the importance of proper nutrition for the mother during pregnancy and the information is presented in Table 16.10. Only 38 per cent men were told about the importance of delivering the baby in a health facility. Less than half of men (46 per cent) said they were told about the importance of proper nutrition for the mother during pregnancy. About one out of four men were not given any information related to family planning or spacing of children. If we compare these statistics with the situation

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at the national level, lesser number of men in Jammu and Kashmir were given information related to maternity care indicators. In fact, men in Jammu and Kashmir rank last among all the States so far information related to family planning or spacing is concerned. Another important finding which emerges from the analysis is that men from rural areas who need this information the most are much less likely to be given the above information than urban men. Also a lower percentage of men from Kashmir region than Jammu region were given each type of information. The provision of the three types of information increases with the man's education level and the wealth status of the household. For example, 54 per cent, 51 per cent, and 59 per cent of men with 12 or more years of education were given information on family planning, the importance of institutional delivery, and the importance of proper nutrition for the mother during pregnancy, respectively compared with 19 per cent, 24 per cent, and 26 per cent of men with no education. By religion, Muslim men are least likely to be given each type of information.

Men whose child was not delivered in a health facility were also asked whether anyone explained to them the importance of the mother breastfeeding the baby immediately after delivery, of keeping the baby warm immediately after birth, of cleanliness at the time of delivery, and of using a new or unused blade to cut the cord. It can be seen that higher percentage of men in Jammu and Kashmir had received information on all these four indicators than the country as a whole. For example, while 45 per cent of men were told about the importance of breastfeeding the baby and keeping the baby warm immediately after birth in Jammu and Kashmir, this percentage was only 33-36 per cent in India as a whole. Similarly, 54 per cent were told about the importance of cleanliness at the time of delivery in the State as compared to 44 per cent in India. The percentage of men who were told about the importance of using a new or unused blade to cut the cord was 53 per cent in J&K but only 48 per cent in India. The pattern of differentials in these four Indicators by background characteristics is similar to the earlier pattern.

Table 16.10: Percentage of Men to Whom a Health Provider or Worker Spoke about Specific Aspects of Maternal Care at Any Time During Pregnancy and Percentage of Men Whose Youngest Living Child was not Delivered in a Health Facility were Given Specific Home Delivery Related Information - By Residence, Jammu And Kashmir, 2005-06

	Urban	Rural	Total
Percentage to whom a health provider or worker spoke about the following aspects of maternal care:			
The importance of delivering in a health facility	51.0	33.3	37.6
The importance of proper nutrition for the mother during pregnancy	52.9	43.8	46.0
Family planning or delaying his next child	31.4	24.3	26.0
Number of men with a child age 0-35 months	48	148	196
Among men whose last child aged 0-35 months and was not delivered in a health facility, percentage of those who were told the importance of:			
Breastfeeding the baby immediately after birth			44.0
Keeping the baby warm immediately after birth			45.9
Cleanliness at the time of delivery			53.8
Using a new or unused blade to cut the cord			52.7

Source: NFHS-3 (2005-06).

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16.7 Results from Focus Group Discussions

Husbands' awareness about maternal care: During the focus discussions majority of husbands reported that women need care during pregnancy and were also aware of the fact that problems can arise any time during pregnancy, but they did not know the danger signs of pregnancy. Men also lack adequate knowledge about various aspects of antenatal and postnatal care. It was, however, established that even though they do not know the medical details, they help their wives in following treatment advice, and are concerned about nutrition and other care within the home environment. Men in Budgam and Pulwama proved this point.

> *"Everybody now-a-days knows that pregnant women need special care during pregnancy so that delivery is normal and there are no problems. Though they should not carry heavy load and or do much manual work but they should not take much rest also otherwise their delivery would not be normal. In case they take only rest and do not work they will have to deliver by big operation (C-section)'.*

Husbands' responsibility and participation in wives' care: Discussions with men revealed that most young husbands encourage their wives to go for antenatal and delivery care and a good proportion feel responsible for accompanying their wives for routine care and treatment of problems. But large majority of the men indicated that health care providers, lady doctors and even gynaecologists discourage them to do so. The structure of antenatal clinics in the public sector does not promote attendance as a couple. Lady doctors think that husbands should accompany their wives just to pay for treatment of the problems or for security. This is one of the reasons that in both routine care and treatment of problems, husbands have participated more often by paying for care during ANC and delivery than accompanying their wives. One of the husbands whose wife recently delivered a child in the most famous maternity hospital in Srinagar had to reveal this story.

> *'I gave company to my wife for all the 6 antenatal checkups but was never allowed to enter the consultation/examination room. I always used to wait outside the hospital for hours. I had the expectation that the doctors will also interact with me related to health of my wife and the expectant baby and I would be given some information related to delivery care, but our health system thinks that pregnancy, delivery, child care is women's affair and men have no business to be in the maternity hospitals. My only role during the delivery was to give chai (Bribe) to various paramedical staff mainly women and the amount is also fixed by the women. Men seem to be barriers in stopping this corrupt practice. That is the reasons why health staff does not want men in the maternity hospital'.*

Focus group also suggested that another reasons for men to play limited role during delivery is the traditional practice of women going to their natal home for delivery. Participants from Kupwara cited this as a reason for their lower involvement

> *"Younger women normally go for their delivery to their natal homes. This way the parents of women restrict the involvement of in-laws and the husbands in the delivery care. In case of home delivery, in-laws are informed about delivery after child birth and in case of institutional delivery, they are informed either after the women is admitted in the hospital or after delivery. Parents of the women think it disgraceful to involve in-laws in matters related to delivery care and payments. Thus husbands cannot be blamed for this."*

Though NFHS-3 has shown that about two-third of men accompanied their wives when they visited any ANC clinics, however, FGDs revealed that this increasing trend of men accompanying women is not the result of any perceptible change in the attitudes towards maternity care but was a compulsion arising due to the deteriorating security conditions in the State. Therefore, militancy which otherwise shattered the peaceful atmosphere and almost all aspects of life in the State, however, compelled the men to accompany their women to visit different places including health care facilities. The views expressed by almost all the FGD participants supported this view.

> *'Before militancy, Kashmir was perhaps the most peaceful place in the world and a woman would never fear even travelling during night hours alone without any problems. Large majority of the pregnant women used to seek treatment or advice during pregnancy from the local dai (Traditional Birth Attendant) or any elderly women in the neighbourhood called 'Warein' (a traditional woman who normally would assist in delivery). She could be even reached/called during night time. Only a few women who had complications at the time of delivery*

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> *used to be rushed to a hospital and generally women used to accompany women, because situation was normal and there was no fear either from the security forces or militants. But after militancy erupted in the State everything changed. Security of life was the main issue. Mobility got restricted and there were times when after five not a bird would move, what to talk of human beings especially women. In such a situation, if there was a delivery in a village, nobody would dare to call a TBA, "Warein" or any other assistance who can manage the delivery. If somehow a TBA was approached, she would not like to risk her life'. So pregnant women used to be left at the mercy of God to cry and die. However, with the passage of time men and women learnt to negotiate with this type of situation by planning their deliveries in advance. In the initial phase of militancy, women would visit a health facility for delivery in advance during day time. Subsequently, this contact with the doctors at the maternity hospitals both promoted as well as compelled the women to come for ANC care before delivery. However, due to the insecurity, nobody would like their women to visit a health facility without the company of a man. The best person to accompany a woman under such circumstances is none but her husband.*

Thus, it is obvious that the abnormal situation through which J&K passes created a window of opportunity for the men to accompany their spouses to avail health care services, but unfortunately our health care system has not taken advantage of this opportunity. This is evident from the NFHS-3 findings that despite 66 percent of men mentioned to have visited a health facility with their spouses for ANC but less than one-third were given any information related to pregnancy complications, maternal care and child care. However, men seem to be interested in being involved than previously believed, but our health care system is not geared to encourage the male participation in maternity. Most of the FGD participants mentioned that lady doctors neither have time nor do they feel it necessary to discuss issues related to maternity and child care with the men. They do not allow the men to come inside. Large majority of the participants at all the 9 FGDs sites shared this view. The following experience of a newly father testifies the above finding.

> *"We are ready to get involved in accessing maternity care to our women. Men do accompany women, pay for their medical expenses, allow them to take rest and even help them in sharing the household chores during pregnancy. However, when we accompany them to hospitals during their pregnancy or delivery, our maternity care hospitals have little to offer to men. Neither are we allowed to accompany our spouses in the OPD, nor is there any waiting room for men. Men have no option but to stand outside the main entrances of the hospitals and create hurdles in the movement of patients and staff. When lady hospitals or maternity wards are out of bound for men, how can you expect them to interact with men?"*

Another participant has this tale to narrate to support his involvement.

> *"Like other responsible husbands I also visited the local hospital a number of times with my wife. After all, shewas nurturing the pregnancy and the expectant child belong to both of us. True I cannot share the pain of pregnancy but I have to support my wife during pregnancy, child birth and even in child rearing and caring. Though I had the impression that lady doctor would talk to both of us but during these ANC visits, I was never called by the doctor to come inside OPD and share information about the progress of pregnancy, any advice and precautions for safe pregnancy, information related to medicines, diet and other such issues. I do not know whether any government hospital in this State has a system to provide any education to male members. Staff working in these hospitals has a negative attitude towards men and they generally say us that men have no business in maternity hospitals".*

It can be concluded that men are interested in playing a more active role during pregnancy, delivery and infant care, but our health care system is not well equipped to meet this demand.

16.8 Conclusion

Men's involvement in Reproductive Health is a priority of the ongoing the NRHM Programme. But not much has been achieved to involve men in the pregnancy care, in terms of their perception, attitude and over all awareness. The programme to disseminate information regarding various aspect of pregnancy care but the effectiveness of these interventions has not been examined properly.

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Since gender inequalities favour men in our society and sexual and reproductive health decisions are made by them, therefore, unless men are reached, programme efforts will have limited impact while focusing on women and addressing their reproductive health needs. Again, men's performance against individual programme component may not necessarily ensure their good motivation/involvement, because absence of one component may result in ineffective practice. For example, if a husband knows all the methods of contraception but disapproves its use has little impact from the programme point of view. Similarly, if a husband knows all the complications of pregnancy but disapproves pregnant women of antenatal check and also does not think it necessary that women should deliver in a health facility, his motivation and subsequent practice will end up with unfavourable pregnancy outcome. Therefore, special efforts should be made to encourage men to take responsibility for reproductive health as responsible sexual partners, husbands and fathers.

This chapter goes beyond the traditional approach of measuring men's awareness of pregnancy care and considers combining some of the information collected by NFHS to generate a composite indicator named 'Degree of misconception related to contraception" to better understand men's attitudes towards contraception. Though men's involvement in RH and delivery care is still not satisfactory in the state but men from Kashmir division, rural areas, those not regularly exposed to media, and Muslims are lagging far behind than their counter parts.

The results, also, show that an increasing number of husbands are accompanying their wives to utilise ANC services during delivery care, but, FGDs have shown that this increasing trend of men accompanying women to health care institutions was initially due to the result of insecure conditions in the State. However, with an improvement in the security scenario in the State, this trend of men accompanying their women has continued and men are now increasingly taking part in the maternity matters of their partners. But, our public health care system is not taking the advantage of the presence of men during ANC and delivery care and fails impart them any information related to family planning, spacing, pregnancy care, delivery care, child care and other aspects related to Reproductive and Child Health. The results, therefore, highlight the need for

appropriate intervention at the hospital level to improve men's involvement in maternity. So far as Kashmir valley is concerned, it is feasible and potentially effective to have couple counselling in public sector clinics, even if only a proportion of men will be able to participate and our public health care system should devise a mechanism to interact with accompanying men during maternity.

In addressing men's involvement in reproductive health, it is important to consider how to frame their contact with the health system so that it will encourage their future and continued involvement. The rationale behind choosing the pre- and post-natal periods as good times to encourage male participation is that evidence suggests that men may be more interested in their partners' well-being than is usually the case because of their shared role in producing a healthy child (Ali and Cleland 2001). Therefore, the best way to interact with men is to have counselling/information sessions at the Hospitals for the men who accompany their spouses during ANC and delivery care. It is felt that such an intervention can be introduced successfully in the State's largest maternity Hospital (Lal Ded Hospital), which provides services to almost 60 percent of the State.

In order for male involvement in the maternity care of their partners to be a success the following challenges also need to be addressed:

- ➢ Train more health provider to serve couples and to conduct couple counselling.
- ➢ Integrate other reproductive health services such as STI, Family Planning, voluntary counselling and testing, and prevention of mother to child transmission with antenatal and postnatal care.
- ➢ Involve hospital staff to support men who may want to be with their partners during delivery.
- ➢ Work within the health system should improve conditions such as lack of privacy that make it difficult for husbands to participate in maternity care.
- ➢ Other ways should be identified so that the health staff encourages husbands to be present for maternity services
- ➢ Make public services friendly and flexible to both men and women who are working during the day.

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- Strengthen monitoring and supportive supervision for all health services.
- Mass media can be involved to improve men's awareness of pregnancy and change their attitudes towards pregnancy. For this, we need to develop information that is acceptable and appropriate for the target group, both men and women. Such educational efforts on maternal care with men should go beyond basic information to also include specifics of maternal services, precautions, and problems.
- Undertake wider community outreach so that more men can be persuaded to participate in their partners' maternity care.

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