

Problem based learning (PBL) in Pakistan: a systematic review

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ABSTRACT

Problem based learning (PBL) is an instruction strategy used in medical education. It is based on principles of adult learning and enhances critical thinking, problem solving skills, deeper understanding of the subjects, team work and communication skills, as against lecture based learning. PBL system is being followed in western countries and is being adopted in the region including Pakistan in order to keep pace with advances being made in medical education in response to advances in diagnostics and treatment to meet the public demand for better care.

This review focuses on PBL system in the region and particularly in Pakistan. It highlights the advantages of implementing PBL in place of traditional system which is lecture based and response of the medical students to this system.

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INTRODUCTION

Health care system has always been a global issue and is no longer considered a right of the health professionals. Public expectation from the health care system has always been high, and becoming higher and higher as advances in science and technology are taking place and the public becomes more and more aware of these developments. Public expects to be treated in modern ways with the use of advanced diagnostic procedures and provided immediate relief from their suffering; they expect that their ailments are communicated to them properly, and they should be treated by health professionals humanely. They also expect to be informed about preventive measures.

All these factors and expectations have put the health care system into spotlight. In turn it has put health education system under pressure. Governments, health regulating authorities, medical schools and health professionals are feeling the pressure and responding to these expectations by bringing about changes in medical education system and medical curriculum especially at undergraduate level. Problems in medical education are being recognized and addressed especially in western countries. These problems include emergence of new diseases, new patterns of diseases, new diagnostic methods, aging

population and their treatment and rehabilitation, chronic disease, maternal and child health problems, socio-economic problems, maternal child health services, communication, and ethical issues.

Following an international conference in 1998, the World Federation for Medical Education (WFME) issued the Edinburgh Declaration based on 12 principles of reforming the medical education. These 12 principles have influenced curriculum development throughout the world. World health regulating authorities including the GMC (UK), issued recommendations for curriculum improvement based on these principles. One of the recommendations was to reduce the curriculum overload by enhancing students attitude to learning and allowing the students to take more responsibilities for their own education. Curriculum is to be organized using core-curriculum plus option. By core curriculum is meant the basic knowledge, skill and attitude required from every doctor. Integration of the disciplines was to be done and problem solving abilities of the students were to be inculcated. Developing critical thinking abilities of students, attitude for continuous professional development and communication abilities are to be facilitated. Students should be provided with opportunities to learn at different places like Outpatient clinics, general practices, Community Health facility and hospitals.

Health education in Pakistan

The curricula and teaching in Asian countries are based on traditional Western Model introduced in these countries centuries ago; it is teacher centered, didactic, discipline based, and lecture based. As the health care of the local communities and the learning needs of students are changing, the Asian are also worried about mismatch between what is taught in medical schools and the actual needs of the society they are going to serve. To overcome the deficiencies many Asian medical schools are following western medical schools in pursuit of medical education reforms. Pakistan is situated in southern part of Asia. Most of the southern countries have inherited their educational system from colonial time. As a result the medical education system is imitation from the West, which

does not correspond to the local culture and socioeconomic conditions and needs of the local community.

In Pakistan the medical curriculum which is being followed is inherited from Britain at the time Partition of India in 1947.¹ Almost all medical colleges both in public and private setup, are following traditional medical curriculum approved by Pakistan Medical and Dental Council (PM&DC). This traditional curriculum is divided into two phases: 1- preclinical phase lasting two years in which basic science subjects are taught and, 2- clinical phase lasting for 3 years in which clinical subjects are taught and students come in contact with patients in outpatients departments and inpatients departments. Every year a large number of doctors are produced but they lack knowledge in recent advances in medicine, they do not have a proper attitude towards their profession, and they lack in clinical skills. The doctors produced are meant to serve elites in big cities rather than the poor patients in rural communities.² Also the medical graduates are not pleased because they feel they have been taught basic sciences subjects too much and they do not see relevance in applying these basic science subjects in their practical life and in solving the patients' problems. The habit of life-long learning is not inculcated and so they do not become knowledgeable about recent developments in their field.

Literature review

The most important components of the SPICES model are Problem Based Learning (PBL) and Community Based Learning (CBL) and teaching. PBL is important because it is student centered, is based on integrated curriculum and involves active participation by 6-8 students. So the first three strategies of SPICES model are incorporated in Problem Based Learning.³ The second most important strategy is Community Based Learning because it is quite different from the traditional hospital based teaching and learning. In community based teaching the majority of the patients are seen in their natural environment and in their usual socio-economic condition in contrast to the hospital setting where minority of the patients who are critically ill and need mainly specialist care are seen. So the literature review will mainly focus on Problem Based Learning and Community Based Learning. It will mainly review the literature which is generally regional but specifically local i.e. from Pakistan.

Objectives

- To become familiar with the history and origin of Problem Based Learning.
- To become familiar with its advantages and disadvantages by reviewing the studies comparing the traditional way of learning with Problem Based Learning.
- To analyze the opinion of students about PBL in the studies.
- To assess status of Problem Based Learning in Pakistan.
- To become familiar with Community Based Learning.

MATERIALS & METHODS

A computer based research was conducted using ERIC, PubMed, Pakmedinet.com databases and Google scholar search engine. In addition, Academic Medicine, Medical Education and Medical

Teacher data bases were also searched. The following keywords were used:

'undergraduate medical education', 'undergraduate medical curriculum', 'SPICES model curriculum', 'student centered teaching and learning', 'teacher centered AND student centered teaching', 'problem based learning', 'problem based learning AND information based learning', 'integrated medical curriculum', 'integrated medical curriculum And discipline based curriculum', 'community based learning', 'community based learning AND hospital based learning', 'medical education in Pakistan', 'problem based learning in Pakistan', and 'community based learning in Pakistan'.

Inclusion criteria

Studies were included which were in English language, original, comparative, national or regional, and especially the full text articles, and importantly, were accessible.

RESULTS

The literature review findings will be presented under the following headings: definition of Problem Based Learning, historical background, students' perception of PBL, faculty perception of PBL and PBL in Pakistan, and community based teaching and learning.

Definition of Problem based learning

Problem based learning (PBL) is generally understood to mean an instructional strategy in which students identify issues raised by specific problems to help develop understanding about underlying concepts and principles. The focus is usually a written problem comprising "phenomena that need explanation".⁴

This has important implications for evaluation, research, and comparisons of programs. However, there is no universal definition for problem based learning, and a "conceptual fog" prevails regarding both its philosophy and practice—the term is used, for example, to describe both an educational method and a curricular philosophy.⁵ PBL means differently to different people; Maudsley G⁵ has provided some useful "ground rules" in describing PBL and mentioned that it is both method and philosophy and should be curriculum wide and supported by all curricular elements. The key features are that the problem comes before any formal study or reviewing of the literature, the learning program is student centered, and the learning takes place in small groups of 6 to 8 students. The three key educational objectives of PBL are: (a), to assimilate new knowledge that is integrated from different disciplines and structured to facilitate recall and application into pre-existing conceptual framework, (b), to develop systematic approach for analysis of clinical situation, to develop the ability to evaluate one's performance and that of other and to develop team work ability, and (c), to develop self-directed learning skills. PBL and problem based curriculum are often used interchangeably, the former being applied to isolated method for parts of curricula and individual subjects and guiding philosophy for whole curricula (problem based curricula).

Historical Background of Problem Based Learning

Problem Based Learning (PBL) was started in McMaster University in late 1960 and since then has spread to North America, Europe and other parts of the world. PBL is student centered not teacher centered, integrated not discipline specific and is based on tutorial groups of 5-7 students and not lecture based.⁶ PBL is an active learning strategy which helps student to develop problem solving abilities. It activates the prior knowledge. PBL involves selection of integrated problem, analyzing it, formulating learning objectives by the students, collecting relevant information sharing with fellow students.⁷ PBL is an active learning strategy which helps student to develop problem solving abilities. It activates the prior knowledge. PBL involves selection of integrated problem, analyzing it, formulating learning objectives by the students, collecting relevant information sharing with fellow students. PBL has had a major impact on thinking and practice in medical education for the last many decades. It is based on the principles of adult learning and it gives greater effectiveness for the acquisition of basic knowledge and clinical skills. PBL is challenging, enjoyable way to learn and motivating.⁸ However the PBL superiority is questionable. Colliver J reviewed the literature between 1992 through 1998 about the studies comparing students in PBL curriculum track and comparing with the students in standard track. The research was manual. After detailed statistical analysis he found no convincing evidence for the superiority of the PBL system. He gives the argument that the theory was weak "Its theoretical concepts are imprecise, lacking explicit description of their interrelationship and of their relationship with observable, such as intervention and outcomes".⁸

On the other hand, Antepohl W, et al⁹ conducted a study on graduates who had qualified from Problem based curriculum at faculty of health sciences, Linkoping University, Sweden. They were asked about the effects of PBL on their performance in practical life, their success in career and research activities. In 1986 the Linkoping University introduced PBL, community oriented and student centered curriculum of five and a half years duration. The students had early contact with the patients, teaching in primary health care, got training in patient communication, critical thinking and problems solving skill. All the graduates who had qualified from new medical curriculum from January 1992 to January 1999 were asked to answer the questionnaire. The questionnaire had 31 questions in 10 different categories. It included open-ended questions, dichotomous questions and 6 points Likert's scale questions. About their professional development after graduation, 201(59.8%) had completed their pre-registration period and 153(77%) of those had obtained a place for specialization; 296 (89%) replied they experienced no difficulty in obtaining pre- registration positions. Graduates rated their contentment with professional development at a mean of 3.85 on a 6-point Likert scale and their contentment with their present working situation at a mean of 3.51; 84 (25.6%) graduates had published research papers and 43(13%) had entered PhD programs. Graduates' retrospective evaluation of their own undergraduate education got a mean rating of 4.02 on Likert's scale. The study also showed that more mature and experienced students were at an advantage. The study showed the

graduate felt prepared to work as doctors and felt confident in areas where PBL approach was considered helpful in situations like critical thinking, problem solving abilities, communication, teamwork and self- study. The study showed the graduate scored low on taking care of acutely ill patient items.⁹

Students satisfaction with Problem based learning

Meo SA¹⁰ evaluated and compared the students perception in respiratory physiology course about teaching and learning, knowledge and skill outcome of course material and their satisfaction in traditional lecture based learning versus Problem based learning curricula in two different medical schools in the Kingdom of Saudi Arabia. It was a comparative cross sectional questionnaire based study, conducted in the department of Physiology, College of Medicine, King Saud university, Riyadh, Saudi Arabia, between July 2009 to January 2011. Students were randomly selected. 30 male students were selected from 2 medical schools. Both the groups were first year students. Both the groups were taught in respiratory physiology, lung function for two weeks. The students from the traditional curriculum school were given lectures; practical and tutorials. This group was selected as control group. Students from PBL based curriculum were presented with various problems, case scenarios and practicals and were facilitated by a trained tutor.

After completion of 2 weeks training the students from both the group were assessed. Knowledge was assessed by twenty one best types of multiple choice questions in respiratory physiology. Skill was assessed by ten objective structured practical assessment (OSPE) methods. The results showed that the students from PBL group did better both in MCQs and OSPE. The study result is unusual in the sense that students from PBL group did better than traditional system in MCQs or knowledge test. The weakness of the study was its small sample size, selection of junior students, male only and selecting only physiology subject for PBL which is usually multidisciplinary.¹⁰

Knowledge Scores

Gurpinar E, et al¹¹ compared the knowledge score of medical students in Problem based learning with traditional curriculum on public health topic. Problem based learning was introduced in Dokuz Eylul university school of Medicine (DEFUSM) in 1997-1998 academic year, in response to local health demands and poor medical education. The curriculum was structured according to the needs of the community. It was modular and spirally integrated. Topics of Public health were taught in PBL session. In the traditional curriculum students were given lectures about public health in first, third and final years by the faculty members. In a cross sectional study, fifth year students who had PBL curriculum since 1997-1998 academic year and sixth year students who were the batch in traditional curriculum were involved in the study. The knowledge about public health topics was assessed; 56 fifth year and 78 sixth year students were involved in the study. The students' knowledge was assessed by 25 MCQs. Mean score achieved were 65 in PBL group and 60.5 in the traditional group. Overall PBL group had higher score in knowledge in 7 out of 9 topics about public health.¹¹

The study did not assess critical thinking, problem solving abilities, attitude and skills.

Tabatabaee M, et al (2013),¹² evaluated the efficacy of new clerkship curriculum which was based on SPICES model with the view to improve knowledge, skill and attitude of medical students at Tehran University of Medical Sciences, Iran. The study was quasi-experimental, non-randomized comparative, conducted in two consecutive semesters from February 2009 to January 2010. The control group had clerkship in traditional curriculum. In the next semester the student were trained in SPICES model curriculum. At the end of clerkship the students were assessed by written examination in the form of MCQS and practical examination in OSCE form. The control group consisted of 67 students and SPICES model group consisted of 89 students. The students in SPICES curriculum showed higher score in OSCE, whereas in MCQs both groups performed equally. The study showed that interactive teaching, integrated course, and student centered approach is more useful than the traditional method of teaching.¹²

Students preference regarding learning outcome

Ibrahim NK, et al¹³ compared the preference of medical students for PBL or for traditional lectures regarding learning outcomes (knowledge, attitude, skills) gained from both methods. A study was carried out on students of 3rd, 4th and final year students who were following hybrid-PBL system of curriculum in medical school at King Abdul Aziz University Jeddah, KSA in which 460 students participated. The results showed that the students' perception about knowledge gained through either system was same. For application of the basic sciences, the students preferred PBL-hybrid system. Students perceived that PBL encouraged knowledge seeking behaviour, and enhanced motivation and communication. PBL also encouraged self-directed learning, critical thinking, and self assessment. In conclusion, students preferred PBL to lectures.¹³

Problem based learning in Pakistan

Majority of the Pakistani medical students have received lecture based teaching in schools and colleges before joining medical colleges. They have different background and their mother tongues are different. They have language barrier also. They cannot express themselves in English, the medium of instruction in medical schools. The age of admission is less than in North Americas where usually the graduates get admission to medical schools. So the Pakistani students are not mature enough initially to have problem solving skills in the absence of lectures and teacher's assistance. In some medical schools the students numbers runs into hundreds in each class and it would be difficult to divide them into small groups for PBL session because of lack of staff and space.¹⁴

Perception of students about Problem based Learning and Lecture Based Learning

Sultana A, et al (2010)¹⁵ compared Lecture based learning (LBL) with Problem based learning (PBL) at Rawalpindi Medical College, Rawalpindi, Pakistan, and identified deficiencies in both methods. The aim was to compare the perception of MBBS students about LBL and PBL methodologies. It was cross

sectional study and the sample was 2nd year and 3rd year MBBS students because they were taught with both the methods. The duration of study was two months from January to February 2010. Data were collected by filling a questionnaire. Total 198 students participated, of which 69 were from second year and 129 from 3rd year; 54.55% liked PBL, 17.65% liked both LBL and PBL and 16.69% liked LBL. Students favored PBL to LBL in providing better understanding of the subjects, critical analysis and integration of different subjects. More students (44.95%) were satisfied with PBL and availability of resources and 36.4% liked both PBL and LBL together. They recommended both methodologies with more facilities. But the majority of the students liked PBL for better understanding of subject and requirement of self-directed study for PBL. The majority, 75.2% students liked integration of the subjects for better understanding of the subjects; 77.6% of the students appreciated PBL for help in interpreting the cases in examination. The authors conclude that both methods of learning are useful for better understanding of the subjects.¹⁵

Perception of students about PBL-variant and LBL

Sometimes it is difficult to implement totally different curriculum like PBL strategy in traditional system; so one can try a variant of PBL in this transitional period. What do the students think about implementing PBL variant in the transitional period?

Khan I, & Fareed A (2001)¹⁶ compared students' test scores and perception of PBL and LBL by applying PBL-variant (applied to one discipline only and for a large group). The sample was 249 students of 2nd year. Initially they were taught by traditional Lecture based method in 10 sessions. Each session was of one hour. An MCQ test was given at the end to assess their core knowledge. Later the students' number dropped to 141 who were attending the classes. These students were taught by PBL-variant method. In this, students actively participated and were guided by the facilitator. Later 50 students were asked to give their perception of both methods used for teaching purposes. The students performed equally well in both methods of teaching and there was no significant difference in the marks obtained by students by PBL or LBL. But the observation they made was that it took longer to complete the topic than it did in LBL. The students showed enthusiasm for PBL variant. The study was performed on different number of students sample during LBL phase, PBL-variant phase and during questionnaire phase. The other problem with the study was that it was performed on the PBL-variant rather on pure PBL strategic method.¹⁶

Changes in attitudes /learning abilities by PBL

Baig LA & Asad F⁷ evaluated the effects of PBL in a group of students accustomed to conventional teaching and assessed any changes in the attitude / learning abilities after repeated PBL intervention. It was interventional study and the sample was 44 students of 4th year MBBS of Karachi Medical and Dental College; 12 students were excluded from the study because of lack of information or response. Diarrhea and drug addiction were taught to students by PBL method. The students used the seven jump approach. The students identified their learning objectives in the first session and discussion were arranged with the faculty of Pathology and Medicine afterwards. Four scenarios

were developed for four groups in the first problem on Drug Addiction. The second problem was about management and prevention of diarrhea. Four scenarios were developed for four groups of students. The students were given six hours of self-directed study during college hours. One problem per week was given and teaching related to the problem was given through lectures / tutorials. The students were asked to fill questionnaires before and after problem resolution. The questionnaire was about thought process, study trend, analytic ability and liking for PBL. The result showed frequent visit to the library, self-directed learning and use of medical journals by the students. Problem solving ability improved. The study showed positive effects of PBL strategy on thought process, study trend, analytic abilities and self- directed learning.⁷ Objection to the study is that only one discipline was selected for PBL methods of study and whether the validated questionnaire was used.

Attitude and interpersonal skill and teamwork

Habib F, et al¹⁷ assessed students' perception of the process of working in groups while doing PBL and assessed their opinion regarding PBL design and its effects on their attitudes and interpersonal skills. A study involving 104 medical students of 4th year from Karachi Medical and Dental College, was conducted during 2004-2005. Two batches of 4th year were selected for the study because they had PBL right from first year. Data were collected through closed ended questionnaire having two parts. The first part dealt with the assessment process of PBL and the second part dealt with opinion of student about PBL. Result showed 79% (82 out of 104) liked PBL session, 74% (61 out of 84) were motivated for self-learning, 76% (62 out of 82) were stimulated to do research, 77% (63 out of 82) felt they needed to improve communication skills, and 78% (64 out of 82) were able to identify gaps in their knowledge through PBL. Quite a few students, 40.4% (42 out of 104) agreed that awarding an individual mark to each would be a good quality for reflection of individual performance while 31.7% (33 out of 104) disagreed for including the PBL in semester. Half of the students were of the opinion that the assessment was the job of tutor and not of the student. Overall, they liked group learning, maybe because of motivation and interpersonal relation. But the students did not like peer assessment, and they were less inclined towards self-study.¹⁷

Attitude and knowledge about health research

Khan H, et al¹⁸ compared the knowledge and attitude towards health research between students from Problem Based Learning system and students from Lecture based learning or traditional system to assess the influence of mode of curriculum on the knowledge and attitude of medical students towards health research. Agha Khan University started using PBL in October 2002. During June-July 2005, a cross sectional study about knowledge and attitude was conducted among the last batches of 4th year and 5th year medical students who were following traditional lecture Based Learning curriculum. Two years later in March 2007, the study was repeated on the 4th year and 5th year medical students who were following PBL strategy. The information was collected on pretested and structured questionnaire. Knowledge was assessed by 10 MCQs; six

questions were asked about the attitude towards health research. The final sample consisted of 66 (77%) students from LBL and 84 (98%) from PBL. The mean knowledge score for LBL students was 55.5% as compared to 54% score of PBL students. The mean score of attitude of the LBL students was 66.7% against 75.5% score of PBL students. PBL students were more likely to have participated in research activity. It shows the positive impact of PBL curriculum on research activities.¹⁸

Acquisition of knowledge, critical thinking and problem solving

Tayyab R¹⁹ assessed the effectiveness of PBL as an instructional tool in clinical years to improve learning of undergraduate students in terms of acquisition of content knowledge, critical thinking, and problem solving skills through problem based learning and traditional way of thinking. A total of 200 final year students who were in Obstetrics & Gynecology and surgical rotation were included in study. They were divided into 4 batches, two batches attended Gynecology rotation and two batches attended surgical rotation for 3 months. Each batch of 50 students was divided into two groups A and B each of 25 students. Non-probability purposive sampling technique was used to distribute students into A and B groups. Group A was taught in traditional way like bedside teaching, and lectures, while group B learnt through modified PBL process. They were assessed by MCQs for recall and clinical reasoning and critical thinking was assessed through one best type of MCQs. Intragroup comparison of mean score of pre- and post- test score was done using Paired Sample T-test while for intergroup comparison of mean score was done through Independent Samples T-test. For Group A who was taught through traditional way, a significant difference was observed in pre- and post- instruction in recall tests while group B who were taught through PBL showed insignificant differences. Intra group comparison between the groups for critical thinking assessed through C3 level MCQs showed insignificant difference in Group A while in Group B highly significant difference was found before and after instruction. The study showed that students who were taught through traditional way had significant increase in their knowledge in post instruction assessments test as compared to those taught through PBL, while the students taught through PBL showed better problem solving skill and critical thinking skills.¹⁹

Systematic review

Waqas M and Hyder O (2012)²⁰ did systematic review of the studies done on Problem based learning programs in Pakistan to evaluate these programs, examine the outcomes and competencies influenced by PBL and compare these with lecture based learning. The studies selected mainly used undergraduate medical students as study population and the competencies reported as primary outcome were considered. Content analysis of the studies were done and the studies were classified according to methods of assessment used in the study; 11 studies were selected. Most studies were from Karachi Medical Colleges, These studies assessed the attitude and competencies of the studies and compared with lecture based learning. The competencies assessed in the studies were cognition, social skills, knowledge and research. Outcomes considered were self directed

learning, communication skills, use of library and online resources, group discussion and team work, knowledge acquisition, confidence, problem solving skills and research conducted. Almost all the studies reported beneficial effects of PBL. Different forms of PBL strategies were used like hybrid form and variant form of PBL. It was used either for a single course or whole curriculum. The review concluded that the students gave high rating for PBL in social, cognitive and research dimensions.

The systematic review also highlighted the deficiencies in the selected studies like being heterogeneous, unclear meanings of PBL, and lack of validity. It mentioned that the studies were mainly conducted in private medical colleges.

DISCUSSION

Problem based learning (PBL) is a learning and teaching strategy being adopted by different medical schools all over the world in response to pressure from different quarters for reforms in educational system and curriculum. However, PBL means different things to different people. To some it is teaching and learning strategy while to others it is philosophy and to some it is both philosophy and strategy.

In the West, studies were conducted comparing traditional methods of teaching and PBL and questions were raised over the superiority of PBL over traditional methods of teaching. Colliver J reviewed the literature between 1992 through 1999 about the students taught in PBL curriculum and students taught in traditional curriculum and found no superiority of PBL system over the traditional way of teaching.

On the other hand Antepohl W, et al, conducted a study on graduated who had qualified in PBL curriculum, in faculty of health sciences Linkoping University Sweden. They found the graduates to be satisfied with their training in PBL system.

A number of studies were also conducted in South Asia region comparing PBL and traditional lecture based teaching. Moe SA compared the students' perception in respiratory physiology in teaching and learning, knowledge and skill in both PBL system and traditional lecture based teaching. After two weeks of training both the group were assessed for knowledge and skill. In both fields the students trained in PBL performed better. Though the study sample was small, students selected were of junior class and they were trained and assessed only in one subject i.e. physiology. Gupinar E, et al, compared the knowledge score of students in PBL system compared with students from traditional system in public health domain. Students from PBL system scored higher than the students from traditional system, though the study did not compare the critical thinking problem solving abilities, attitude and skills. Tabatabaee M, et al, evaluated the efficacy of new clerkship curriculum which was based on SPICES model with the view to improve knowledge skill and attitude of medical school in Tehran University, Iran. The control group had clerkship in traditional curriculum in the next semester the students were trained in SPICES model curriculum. At the end of clerkship were assessed both in written form and in practices. The students in SPICES model obtained high marks in both fields.

Ibrahim NK et al compared students' preference between PBL system and traditional lecture based teaching for learning outcome gained from both systems at King Abdul Aziz University Jeddah, Saudi Arabia. The results showed the knowledge gained through either system was same. For application of basic sciences knowledge the students preferred PBL over traditional system. Students also preferred PBL for seeking more knowledge, for increased motivation and communication.

Majority of medical schools in Pakistan are following the traditional lecture based system of teaching. Besides there are other issues like resource constraints, limited space, large number of students per class, and lack of trained faculty in PBL system. Pakistani students also have handicap. They receive lectures based education before joining medical colleges. However, PBL is being tried and implemented in different medical colleges especially in private colleges. Several studies comparing PBL with traditional system in various aspect in Pakistan have been published. Sultana A, et al, compared traditional method of teaching with PBL in Rawalpindi Medical College. Results showed students preferred PBL to traditional method for better understanding of the subject, critical analysis, self-directed learning and integration of the disciplines. The drawback of the study is that the study was observational, of short duration, convenience sampling was done, and there was no triangulation.

Because of difficulty in implementing total PBL due to different factors, variants of PBL has been tried in medical schools in Pakistan. Khan I, et al, compared test score and perception of PBL-variant and lecture based learning in one discipline. The study did not find any difference in test scores in either system of teaching, though the students liked PBL-variant system. Habib F, et al, assessed students' perception of the process of working in groups while doing PBL and assessed their opinion regarding PBL design and its effect on their attitude and interpersonal skills. They found majority of the students liked PBL. The students were motivated for self-learning and performing research. In the study the students did not like assessment by peers. Khan H, et al, compared the knowledge and attitude towards health research between students from PBL system and students from traditional lecture based teaching system. This study was done in Aga Khan University, Karachi. The knowledge score of students from traditional system was better than score of students from PBL system, though the score for attitude for students from PBL system was better than score of students from traditional system. Students from PBL system were more likely to have participated in research activities. Tayyab R assessed the effectiveness of PBL as an instructional tool in clinical years to improve undergraduate students' learnings, critical thinking, and problem solving skills, and compared these attributes of students from traditional teaching system. It was found that students from traditional system had more score in knowledge part of the assessment as compared to students from PBL but the Students from PBL system had better problem solving skills and critical thinking. Waqas M, et al, did systematic review of studies done on PBL in Pakistan to evaluate these programs, examine the outcomes and students competencies influenced by PBL system and compare these with students' from traditional system of learning. Most of

the 11 studies selected were done in medical colleges of Karachi. The competencies assessed were cognition, social skills, knowledge and research. Outcome considered were self- directed learning, communication skills, use of library group discussion and teamwork. Almost all studies showed beneficial effect of PBL system on the students. The systematic review highlighted the deficiencies in the studies. PBL was not defined in this review and methodology of the review itself was not clear.

CONCLUSION

In the South Asia region and in Pakistan PBL system is not being followed in many medical schools as compared to traditional

systems. So there are not many research studies about usefulness of PBL system. The studies which are done have shown beneficial effects on students in improving critical thinking, problem solving abilities, attitudes towards self - directed learning, teamwork and communications skills. It provides independence and is based on principles of andragogy. It provides deep understanding of the subjects as against rote learning, the main feature of lecture based learning, though it does not influence the acquisition of content knowledge.

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