Original Research Article

To Study Impact of Problem Based Learning among First MBBS Students in a Medical College of West Bengal

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ABSTRACT

Background: Problem-based learning is a pedagogical practice employed in many medical schools.
Aims: To study impact of Problem based learning among first MBBS students in a medical college of West Bengal.
Materials and methods: This interventional study was conducted in a medical college of eastern India. Approval from the institutional ethics committee and informed consent of the subjects was taken before conduction of this pilot project. In this prospective interventional study 60 MBBS first students were divided in two groups A & B using an online randomizer. Group A consisted of a batch of 30 students who were exposed to audio visual presentation and lecture classes for 8 hours (Topics on control of voluntary movements which included the following: Cerebellum, Basal ganglia, Muscle tone, lateral and medial motor system, Reflexes, Decorticate and decerebrate rigidity, Vestibular apparatus). They were assessed with post exposure questionnaire (EXPOSURE I) immediately after completion. The questions were either MCQ or short objective structured type of question and total marks allotted were 10. There was no negative marking and time allotted for answering was 15 mins.
Audio visual presentation and tutorial classes were repeated after one month on the same topics. The subsequent questionnaire was named (EXPOSURE II)
Group B consisted of another batch of 30 students who were exposed to same audio visual presentation and lecture classes for 8 hours. They were assessed with post exposure questionnaire (EXPOSURE I) immediately after completion.
In the next month they attended 8 sessions of problem based learning on control of voluntary movements on similar topics. The subsequent questionnaire was named (EXPOSURE II)
The same questionnaire was given both Group A and Group B on all exposures.
Another questionnaire was given to both Group A and Group B after another one month without any further demonstration. The subsequent questionnaire was named (EXPOSURE III).
Statistical analysis: Data were analyzed using software SPSS version16; probability values (P Value) <0.05 were considered as statistically significant and P Values <0.01 were considered as statistically highly significant. Unpaired t test was used to compare the two groups of students at different times of exposure.
Results: Questionnaires included 10 questions to test student knowledge regarding voluntary control of movements. There was no significant between the two groups on the first evaluation. The difference became significant between the two groups on second and third evaluation with B group showing better performances. The best responses from the students were observed on the second exposure.

Conclusions: Problem based learning was found to have a better impact on knowledge and memory of first MBBS students as compared to traditional methods of medical education and needs to be implemented in large scale for betterment of medical students.

Keywords: Problem based learning, Medical education, First MBBS students.

INTRODUCTION

Problem-based learning (PBL) is a pedagogical practice employed in many medical schools. The approach includes presentation of an applied problem to a small group of students who engage in discussion over several sessions. A facilitator provides supportive guidance for the students. The discussions of the problem are structured to enable students to create conceptual models to explain the problem presented in the case. As the students discover the limits of their knowledge, they identify learning issues – essentially questions they cannot answer from their fund of knowledge. Between meetings of the group, learners research their learning issues and share results at the next meeting of the group. [1-5]

Faculty members participate as facilitators. They ask questions to assist students with identifying the limits of their knowledge, monitor the group process and provide a framework for constructing models of understanding. Deeper understanding of the topic may allow the facilitator to guide student discussions to be more comprehensive. It also may increase the challenge of maintaining a nondirective role. Problems presented in cases are constructed at a level of complexity to activate students' existing knowledge and require integration and application of new knowledge. Cases contain contextual information so that the patients become more real to the students and therefore more memorable. [1-5]

PBL has become popular in medical schools that have undergone curriculum reforms incorporating multidisciplinary-system-based courses rather than discipline-specific ones. This approach provides relevance, encourages self-directed learning, targets higher-order learning and engages students in ways that result in better long-term retention of content than traditional, lecture-based courses. [1-5]

Students who demonstrate adequate performance in PBL activities are capable of applying their knowledge to think critically. The more self-direction they develop as undergraduates, the more likely it is that they will become independent learners as practicing professionals. Lifelong learning uses a set of skills that develop over time and require practice. Students need opportunities to identify their strengths and weaknesses and figure out what it is that they do not know or thoroughly understand. Students also develop skills necessary for learning in groups. They are able to assist each other in integrating and applying knowledge to a given problem. These skills are acquired through active learning. Students need opportunities to assess their knowledge, identify and remedy knowledge gaps, and integrate and apply knowledge to real-world problems as part of a team and PBL helps the students to achieve these goals. [1-5]

The present learning experience at in MBBS curriculum in West Bengal involves didactic lecture-based formats, which are often supplemented with short, intensive, summary tutorials. This may result in a teaching learning gap in medical education. Problem based learning may help in bridging this gap.

Understanding the concepts of the central nervous system for first MBBS students in lecture classes produces a teaching learning gap. So problem based learning on topics concerned with control of voluntary movements were included in problem based leaning programme in the present study. The present study was targeted to adopt PBL for first MBBS students to enhance the learning ability of

CNS that can be made predictable, consistent, standardized, and reproducible. The purpose of this study was assessment of repeated exposure of a group of students to a specific subject and regarding improvement in this field of knowledge with the help of traditional teaching curriculum and PBL.

MATERIALS AND METHODS

This interventional study was conducted in a medical college of eastern India. Approval from the institutional ethics committee and informed consent of the subjects was taken before conduction of this pilot project.

Inclusion criteria: Medical students in the age group of 17–21 years of first MBBS batch were selected.

Only sixty students out of the 150 students of first MBBS were willing to participate in the study. 60 MBBS first students were divided in two groups A & B using an online randomizer. Age of the subjects who participated in the study was 18.2±1.4 (Group A) vs. 18.03±1.5; P value >0.05. So there was no significant difference in age between the two groups.

Group A consisted of a batch of 30 students who were exposed to audio visual presentation and lecture classes for 8 hours (Topics on control of voluntary movements which included the following: Cerebellum, Basal ganglia, Muscle tone, lateral and medial motor system, Reflexes, Decorticate and decerebrate rigidity, Vestibular apparatus).). They were assessed with post exposure questionnaire (EXPOSURE I) immediately after completion. The questions were either MCQ or short structured type of question and total marks allotted were 10. There was no negative marking and time allotted for answering was 15 mins.

Audio visual presentation and tutorial classes were repeated after one month on the same topics. The subsequent questionnaire was named (EXPOSURE II)

Group B consisted of another batch of 30 students who were exposed to same audio visual presentation and lecture classes for 8 hours. They were assessed with post exposure questionnaire (EXPOSURE I) immediately after completion. During PBL session the thirty students were divided into 6 groups with each group consisting of 5 members. Each day participants of different groups were reshuffled.

In the next month they attended 8 sessions of problem based learning on control of voluntary movements on similar topics. The subsequent questionnaire was named (EXPOSURE II)

A survey conducted in prior studies on students' perceptions of teacher numbers and teacher interaction showed that most of the students thought that one tutor is better than two tutors. Surveying the results of this study we included only one teacher in each PBL group. [1]

Another questionnaire was given to both Group A and Group B after one month without any further demonstration. The subsequent questionnaire was named (EXPOSURE III).

Three sets of questions were prepared for the three tests conducted and the same questionnaire was given both Group A and Group B on all exposures.

The answers to all questions were provided to the teachers correcting the script to avoid any discrepancy during assessment. All teachers who corrected the scripts were unaware of the teaching programme allotted to the two groups of students.

Statistical analysis: Data were analyzed using software SPSS version16; probability values (P Value) <0.05 were considered as statistically significant and P Values <0.01 were considered as statistically highly significant. Unpaired t test was used to compare the two groups of students at different times of exposure.

RESULTS

The present study was conducted in a time span of 4 months on sixty first MBBS students divided into two groups. Questionnaires included 10 questions to test

student knowledge regarding voluntary control of movements. There was no significant between the two groups on the first exposure Group A 4.06±1.06 vs. Group B 4.57±1.45; P value 1 (Table 1 and Fig 1). The difference became significant between the two groups on second Group B 8.2±0.75 vs. Group A 5.8±0.83; P value <0.001 and third evaluation Group B 6.93±0.77 vs. Group A3.73±0.78; P value <0.001 (Table 2, 3; Fig 2-4) with group B showing better performances as compared to group A on second and third exposure. The best responses from the students were observed on the second exposure.

Table 1: Shows comparison of marks of Group A and Group B on Exposure I.

PARAMETER	GROUP A MEAN±SD	GROUP B MEAN±SD	P VALUE
EXPOSUREI (MARKS)	4.06±1.06	4.57±1.45	1

Results showed no significant difference in marks obtained by the two groups.
P-value <0.05* (significant)
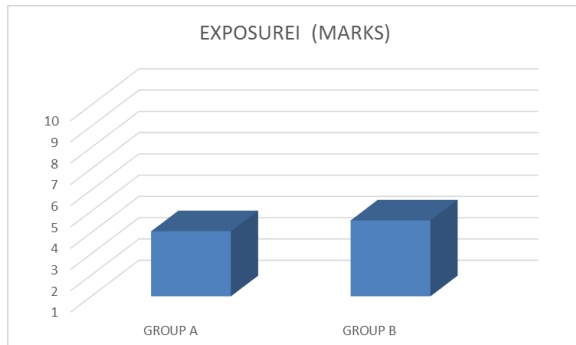P-value <0.01** (highly significant)

Figure 1: Shows comparison of marks of Group A and Group B on Exposure I.

Table 2: Shows comparison of marks of Group A and Group B on Exposure II.

PARAMETER	GROUP B MEAN±SD	GROUP A MEAN±SD	P VALUE
EXPOSURE II (MARKS)	8.2±0.75	5.8±0.83	<0.001**

Results significant difference in marks obtained by the two groups.
P-value <0.05* (significant)
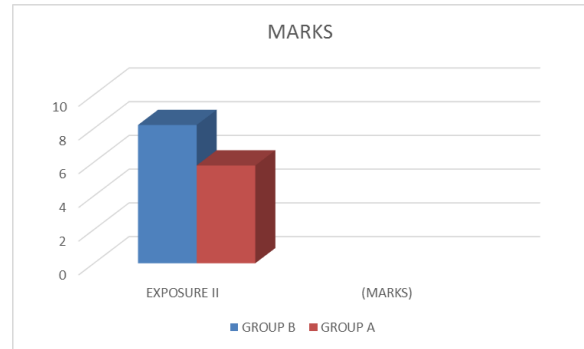P-value <0.01** (highly significant)

Figure 2: Shows comparison of marks of Group A and Group B on Exposure II.

Table 3: Shows comparison of marks of Group A and Group B on Exposure III.

PARAMETER	GROUP B MEAN±SD	GROUP A MEAN±SD	P VALUE
EXPOSURE III (MARKS)	6.93±0.77	3.73±0.78	<0.001**

Results showed significant difference in marks obtained by the two groups.
P-value <0.05* (significant)
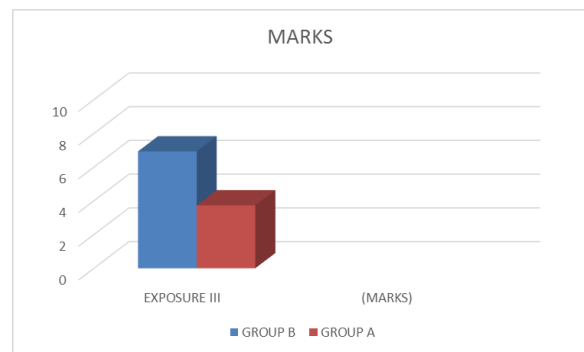P-value <0.01** (highly significant)

Figure 3: Shows comparison of marks of Group A and Group B on Exposure III.

DISCUSSION

The present study was conducted to observe the effects of problem based learning on first MBBS students in a medical college of eastern India. It was seen that the students obtained higher marks on exposure to PBL and their retention capacity was found to be significantly better than the other group exposed to traditional methods of teaching.

Problem-based learning (PBL) is a concept in existence for decades but its implementation in medical student education is still very limited. Harvard's recently redesigned Pathways curriculum has shifted almost exclusively towards PBL

in its one-year preclinical curriculum. An increasingly implemented idea in the realm of medical education is problem-based learning (PBL), sometimes similar to case-based learning (CBL). [1] PBL is an approach to learning that focuses on dissection and discussion of problems or cases in small groups usually supervised by one or more expert tutor(s) or instructor(s). Whereas this pedagogical approach to learning through discussion has infiltrated in some aspect to many U.S. and foreign medical schools, certain medical schools such as Harvard have shifted almost exclusively towards a PBL preclinical curriculum while others have refrained from any PBL integration. [1] But in Indian scenario this method needs yet to be popularized.

PBL curricula generally rely on the premise that students can learn the concepts pertinent to each PBL session independently outside of class time thereby freeing up time for critical analysis and group discussion. Many schools have retained some proportion of lectures to provide an avenue for content delivery to students. On the other hand, select schools such as Harvard have done away with almost all lectures. [1] In India lecture based teaching still remains the mainstay of medical education.

At Harvard, PBL sessions consist of problem presentation and small group discussion followed by large group discussion. This schematic allows for individuals to take a moment to analyze the problem alone (in groups) followed by dissection and discussion amongst a small group of four that can challenge and support each individual's thoughts. This dynamic processing of ideas and feedback provides quick, robust insight into a problem. Students are allowed the freedom to not only discuss "correct" answers but also an opportunity to knowingly challenge "correct" answers to foster deeper understanding of the question and topic at hand. Team members build comradery and develop an appreciation for the breadth of views on the simplest of topics. Notably,

student participation dictates that students are more engaged. [1] The present study also demonstrates similar findings. We had five members in each group instead of four as practiced in Harvard.

PBL was first introduced to the Department of Physiology at the University of Hong Kong in the academic year 1992/93 following a department retreat, in which the call for reform in teaching and learning of Physiology was collectively recognized. [6] We are also trying to implement problem based learning in the department of Physiology of our institution.

In 1994/95, with the support of an Action Learning Project (ALP) Grant, R.M.K.W. Lee from the Department of Anesthesia of the McMaster University was invited as a teaching consultant, to go to the Departments of Physiology and Pathology to introduce the PBL approach in medical education. Workshops on PBL and small group tutorials were organized and accompanied by a number of consultation group discussions and meetings with medical students as well as teachers. The overall progress has been presented and included in an interim report of ALP. The major observations and assessment by the teaching consultant revealed that when given appropriate guidance and encouragement, the first year medical students at the University of Hong Kong can perform very well using a PBL approach in a small group tutorial setting. Most of the students were able to arrange their materials in a logical sequence, and to provide a well-organized, clear presentation of their materials, demonstrating both breadth and depth, and integration of the materials. [6-9] Our study also demonstrates similar findings.

Problem-based learning (PBL) was first introduced to Kaohsiung Medical University in 1997 and was incorporated into the reform of the medical curriculum in 2005. An action committee was organized to manage PBL activities at Kaohsiung Medical University. A 2-year PBL curriculum with 14 blocks was delivered

both in the School of Medicine and School of Post-Baccalaureate Medicine. Each block consists of lectures of basic and clinical science, clinical skills, and three PBL tutorials. Fifty-three well-edited PBL cases were created during the past 4 years. Some issues have arisen from the PBL curriculum including lack of tutors, low tutor numbers in tutorials, tutor training, and adequacy of assessment. [9]

Faculty development and a better system of evaluation and assessment were problems faced in the study. [9] We also had to cope up with similar problems in the present study.

Since the introduction of a problem - based learning (PBL) curriculum at the McMaster University School of Medicine in 1969, many medical schools in different regions of the world have adopted this approach, usually with some variations to suit their local needs. The aims of a review [10] were to report some of experiences at McMaster, to discuss some of the concerns which are associated with the introduction of PBL in a traditional medical school, and to review recent experience in the introduction of PBL in Physiology in a traditional medical school. Some of the advantages of PBL are: early exposure of students to clinical settings and patients; motivation .to learn is self-imposed, because students can see the practical application of the knowledge they are acquiring during their studies; and the acquisition of various learning skills, which will assist them to become lifelong learners.

There are also some perceived weaknesses to PBL, which include a lack of traditional structure. Specific evaluative tools have now been developed, which will provide better measures of the learning behaviour, knowledge and clinical skills. A recent experience in the introduction of PBL in the teaching of physiology at the University of Hong Kong showed that with appropriate training of the students and teachers, high school students entering first year university were capable of benefiting from the PBL approach. [10] Teachers

training programmes are also in progress in India for betterment of medical education.

Modification or improvement in the medical curriculum needs to be based on sound reasoning and upon experimental evidence. We have gained a significant amount of knowledge about the use of PBL in medical education since 1969, but further improvements and refinements are still necessary in order to meet the needs of the students, and that of the society[10]. The medical curriculum at India is at present undergoing a substantial change to incorporate PBL into the curriculum. Despite ongoing improvements, there are still many problems. Faculty development and a better system of evaluation and assessment are now remains the major tasks. Efforts to improve the PBL curriculum will provide students with a better education system.

The standards of medical education and health care have been deteriorating with passing time in India. The National Medical Commission is about to replace MCI very shortly. A review article by Sahani A in 2016 highlighted some of the major evils in the present system with suggested reforms keeping in mind the Golden Philosophy which could be embodied in the new system for better results. [11]

The Indian medical education system, one of the largest in the world, produces many physicians who emigrate to the United States, the United Kingdom, and several other countries. The quality of these physicians, therefore, has a broad global impact. Accreditation by the Medical Council of India (MCI) emphasizes documentation of infrastructure and resources and does not include self-study. Curriculum reform has been advocated for over 30 years, with calls for greater relevance of the curriculum to the needs of the community. [12] Presently new curriculum has cum up and will be implemented from 2019 onwards.

Medical education is facing problems and challenges for quality education in the countries. Cross-sectional

data collected over a period of three months from September 2015 to December 2015 from various sources including medical colleges regarding problems of medical education were analyzed and discussed in details to find out the possible solutions and actions required at regulatory authority including Government, institutions, administration, faculty and medical students by Deswal BS et al. [13] Results showed that to achieve doctor- patient ratio, Indian Government is emphasizing to increase admission and training of medical students. One third of these doctors leave India every year for residency training and/or practice abroad. The quality of Indian medical education and of physicians it produces therefore has implications for entire world. An exploding number of medical colleges; a skewed distribution of these around the country; devaluation of merit in admission, particularly in private institutions; increasing capitation fees; admission of suboptimal quality of students with poor motivation; an alarming shortage of medical teachers, with those who exist being untrained in modern teaching learning technology; great shortage of patients/ clinical materials in many institutions; outdated curriculum; a less than desirable evaluation system and poor internship supervision all contribute to this downhill trend. Accreditation by Medical Council of India (MCI) emphasizes documentation of infrastructures and resources with doubtful assessment system.

To assess students' opinion and perception regarding education environment in a government medical college of Delhi, India Sachdeva S et al conducted a study. [14] Dundee Ready Educational Environment Measure (DREEM), a universal, culturally nonspecific, generic 50-item inventory tool was used. Each item is rated on a five-point Likert scale with score ranging from 0 to 4 where $0 =$ strongly disagree, $1 =$ disagree, $2 =$ unsure, $3 =$ agree, and $4 =$ strongly agree. MBBS students of three batches (2nd, 3rd, and 4th year) were considered in this cross-sectional study. A total of 117 (84.1%)

available students could be contacted in person. 88 (75.2%) students opined that administration is student-supportive; and 111 (94.8%) were in self-assessment state of "happiness." The overall mean DREEM inventory score (range, 0–200) among all the respondents was 130.34 ($\pm$15.76), which is suggestive of "more positive than negative." Statistically ($P < 0.05$) higher DREEM score was found among senior medical students [score, 136.5 (4th year) vs. 131.9 (3rd year) vs. 123.6 (2nd year)]; those medical students who were globally satisfied (score, 131.2 vs. 119.3); satisfied getting admitted in current medical college (score, 133.0 vs. 115.7); and who opined that administration is student-supportive (score, 133.4 vs. 120.9). Gender, type of school, marks in 12th class, native place, current residence, supplementary (extra attempt) in university exam, current mental state (sad/happy), and professional satisfaction had no statistical bearing on overall DREEM score. Overall, none of the inventory item (score range, 0–4) had an avg. score more than 3.5, but the score of the majority (42/50, 84.0%) of question items in the present study was in the range of 2–3 points indicating the aspects of the environment that could be improved or enhanced.

Medical education in India is suffering from various shortcomings at conceptual as well as implementation level. To address this issue, a comprehensive analysis of various associated factors is essential. Indian medical education is suffering from a misdistribution of resources, unregulated growth in the private sector, lack of uniform admission procedures and traditional curricula lacking innovative approaches. To achieve higher standards of medical education, our goal should be to re-evaluate each and every aspect; create an efficient accreditation system; promote an equal distribution of resources, redesign curricula with stricter implementation and improved assessment methodologies; all of which will generate efficient medical graduates and

consequently better health care delivery, and resulting in desired change within the system. [15]

Limitations and future scope: Only sixty students of first MBBS batch were included in this short term project and physiology department was only involved in the study. Future studies with larger groups and with multidisciplinary approach are on the way.

CONCLUSIONS

Problem based learning was found to have a better impact on knowledge and memory of first MBBS students as compared to traditional methods of medical education and needs to be implemented in large scale for betterment of medical students.

Conflict of interest: Declared None.

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