

## Research Article

# Problem-based learning versus lecture-based learning in pharmacology in a junior doctor teaching program: a crossover study from northern India

Mohammad Imran<sup>1\*</sup>, Md. Shadab Shamsi<sup>2</sup>, Abhishek Singh<sup>3</sup>, Shewtank Goel<sup>4</sup>,  
Priyamvada Sharma<sup>5</sup>, Sanjeet Panesar<sup>6</sup>

<sup>1</sup>Assistant Professor, Department of Pharmacology, MSDS Medical College, Fatehgarh, U.P., India

<sup>2</sup>Assistant Professor, Department of Microbiology, MSDS Medical College, Fatehgarh, U.P., India

<sup>3</sup>Assistant Professor, Department of Community Medicine, SHKM Govt. Medical College, Mewat, Haryana, India

<sup>4</sup>Assistant Professor, Department of Microbiology, MSDS Medical College, Fatehgarh, U.P., India

<sup>5</sup>Professor and Head, Department of Pharmacology; Co-ordinator MEU, SHKM Govt. Medical College, Mewat, Haryana, India

<sup>6</sup>Senior Resident, Department of Community Medicine, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India

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### \*Correspondence:

Dr. Mohammad Imran,

E-mail: [abhishekparleg@gmail.com](mailto:abhishekparleg@gmail.com)

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## ABSTRACT

**Background:** The undergraduate MBBS training in our country is still in the traditional mode. The main part of the curriculum consists of lecture, tutorial, practical and ward teaching classes with a limited number of problem based session. The objective of the study was undertaken to compare PBL with LBL in terms of students' knowledge retention in the subject of Pharmacology in undergraduate medical training.

**Methods:** The current survey was planned and executed by the Department of Pharmacology in collaboration with Medical Education Unit, MSDS Medical College, Fatehgarh in the batch currently posted in the Department of Pharmacology for practical classes. Fifty MBBS students posted were enrolled for the study and were divided in 2 groups. One of the topics was presented as LBL for the first group and as PBL for the second group. The other topic was presented as PBL for the first group and as LBL for the second group. Intervention and control groups were taken as those used PBL and LBL respectively. T test was used to compare mean scores obtained by students in the intervention and control groups.

**Results:** Mean scores obtained by students in the intervention group (topics learnt with PBL) were higher (3.80 Vs 2.84) than mean scores obtained by students in the control group (topics learnt with LBL). Mean scores obtained by students in the intervention group were higher (3.72 Vs 2.96) than mean scores obtained by students in the control group.

**Conclusions:** The current study indicates usefulness of Problem-based learning (PBL) over Lecture-based Learning (LBL) in terms of retention of knowledge. However further studies involving more number of students are warranted in order to generate stronger evidence on this tool for improving medical education in our setup.

**Keywords:** Problem-based learning, Pharmacology, Teaching, Lecture-based learning

## INTRODUCTION

There is growing concern among medical educators that conventional modes of teaching medical students i.e. Lecture-based Learning (LBL) neither encourage the right qualities in students nor imparts a life-long respect for learning.<sup>1</sup> Problem-based learning (PBL) is one of the most commonly used educational methods in medical schools of different countries. By working through this method, students think critically, generate ideas, and acquire the knowledge and skills required to become a doctor.

The undergraduate MBBS training in our country is still in the traditional mode. Generally it is teacher centred, discipline based, information gathering and hospital based with no options or elective modules. The main part of the curriculum consists of lecture, tutorial, practical and ward teaching classes with a limited number of problem based session. Today's medical students are tomorrow's health care providers and medical educators. So their medical education must be in line with needs and status of the community they serve. This can be brought about only by freeing medical education from some of its present rigidity and uniformity, by reducing classroom overcrowding, and by adapting medical education to more closely meet the educational needs of students.

It has been argued by various studies that PBL is not superior to traditional LBL in terms of learning outcomes. Whereas many studies have shown that students got better scores in PBL method.<sup>2-4</sup> It is important for medical educators to know the superior teaching methodologies in order to ensure better training of their students. Relative paucity of literature on this topic also warrants this study. With this background the present study was undertaken to compare PBL with LBL in terms of students' knowledge retention in the subject of Pharmacology in undergraduate medical training.

## METHODS

The current survey was planned and executed by the Department of Pharmacology in collaboration with Medical Education Unit, MSDS Medical College, Fatehgarh in the batch currently posted in the Department of Pharmacology for practical classes. A total of fifty MBBS students were posted as batch A.

### *Study area*

Department of Pharmacology and General Medicine Ward, MSDS Medical College

### *Study population*

Fifty MBBS students currently posted in the Department of Pharmacology as batch A

*Study design:* Crossover study

*Study period:* Jan-March 2015

*Sample size:* 50

In this study, all the fifty MBBS students posted in the Department of Pharmacology for practical classes as batch A from January to March 2015 were enrolled. They were divided into two groups (A and B) by simple randomization. Two common practical pharmacology topics, which are not taught in theory classes, were chosen in consultation with other faculty members of the department to be covered in LBL and PBL sessions. These topics were 'Drugs used in Cardio Vascular System (CVS)' and 'Drugs used in Respiratory system'. For the purpose of this study, intervention and control groups were taken as those used PBL and LBL respectively.

First group of 25 students (Group A) was exposed to LBL in departmental demo room on the topic- Drugs used in CVS. At the same time, other group of 25 students (Group B) was exposed to PBL on patients admitted in Medicine ward with cardiac problems. After comprehensive discussion on the topic over 2 weeks groups exchanged their learning methodologies. First group of 25 students (Group A) was exposed to PBL on patients admitted in Medicine ward with respiratory problems. At the same time, topic 'Drugs used in Respiratory system' was taught as lecture (LBL) to other group of 25 students (Group B).

For LBL, topics were taught to the students as conventional method, whereas for PBL, educational goals were predetermined. At the beginning of each session, case documents, including patient complaints, presenting illness, and sample questions about the etiology, diagnosis, relevant investigations like drug resistance and treatment were given to the students. The group presented the drugs prescribed/treatment given with rationale from pharmacology point of view. Students discussed and debated various aspects of the case to arrive at an approach to the treatment and rationale of prescribing drugs to the individual patients. After the completion of PBL in both groups, an exam was taken to evaluate the students' knowledge retention.

All the questionnaires were manually checked and edited for completeness and consistency and were then coded for computer entry. After compilation of collected data, analysis was done using Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA). The results were expressed using appropriate statistical methods. T test was used to compare mean scores obtained by students in the intervention and control groups.

## RESULTS

Mean scores obtained by students in the intervention group (topics learnt with PBL) were higher (3.80 Vs

2.84) than mean scores obtained by students in the control group (topics learnt with LBL) (Table 1).

Mean scores obtained by students in the intervention group (topics learnt with PBL) were higher (3.72 Vs 2.96) than mean scores obtained by students in the control group (topics learnt with LBL) (Table 2).

**DISCUSSION**

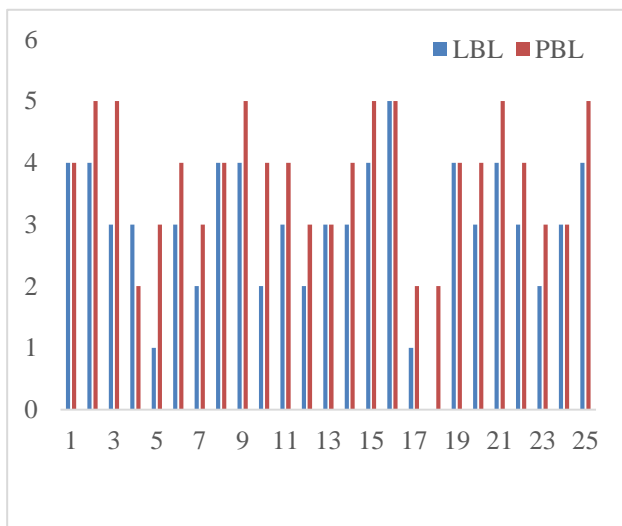
The present compared PBL with LBL in terms of students’ knowledge retention in the subject of Pharmacology in undergraduate medical training. Fifty MBBS students posted in the Department of Pharmacology were enrolled for the study and were divided in 2 groups. They were taught 2 relevant topics using LBL and PBL alternatively. Students’ knowledge retention was observed more in the groups taught with PBL.

**Table 1: Student's scores for LBL on 'Drugs used in CVS' and PBL on 'Drugs used in Respiratory System'.**

Variables	N	Std. Deviation	Mean	Std. Error	T value	Significance Level
Students’ scores for LBL on 'Drugs used in CVS'	25	1.17	2.84	.23	12.69	<0.001
Students’ scores for PBL on 'Drugs used in Respiratory System'	25	1.00	3.80	.20	19.00	
t-Test						

**Table 2: Student's scores for LBL on 'Drugs used in Respiratory System ' and PBL on 'Drugs used in CVS'.**

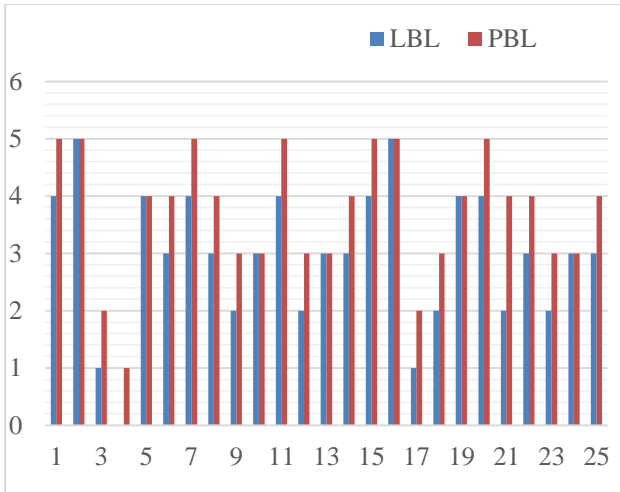
Variables	N	Std. Deviation	Mean	Std. Error	T value	Significance level
Students’ scores for LBL on 'Drugs used in Respiratory System'	25	1.24	2.96	0.25	11.93	<0.001
Students’ scores for PBL on 'Drugs used in CVS'	25	1.10	3.72	0.22	16.91	
t-Test						



**Figure 1: Bar diagram showing each student's scores for LBL on 'Drugs used in CVS' and PBL on 'Drugs used in Respiratory System'.**

The success of PBL depends on the quality of the scenarios.<sup>5</sup> Presenting clinical problems is the starting point for learning in PBL. By working through these problems, students think critically about the nature of the problem, generate ideas, and acquire the knowledge and skills required to become a doctor.<sup>6</sup> It seems that students will have a better knowledge retention with this method, and PBL increases in-depth training, and helps students to perform better in examinations. Although supporters of PBL state that learning motivation is one of the benefits of this method, some mention that it is time-consuming and does not provide a better clinical competence.<sup>7</sup>

In LBL method, students solely receive information from the lecturer and attempt to memorize the content instead of understanding the concepts and using them. Therefore, at the patient’s bedside, they unconsciously and merely satisfy themselves with the routine work, deal passively with new situations, and make no effort toward thinking and innovation to diagnose and meet the existing requirements.<sup>8</sup>



**Figure 2: Bar diagram showing each student's score for LBL on 'Drugs used in Respiratory System' and PBL on 'Drugs used in CVS'.**

It was observed in this study that students preferred PBL over LBL. We found a significant difference in students' scores between control and intervention groups for both the topics. Another study from England is also in concordance with our observations.<sup>9</sup> Researchers concluded that performance of the students holding PBL was better in both multiple choice questions and viva. PBL proved to be less effective at imparting knowledge than customary LBL among Chinese students. This study contradicts the observations on this aspect of the survey from China.<sup>10</sup> Another study from Netherlands showed that both the methods (LBL and PBL) were equally effective in improving the knowledge levels among postgraduate students.<sup>11</sup>

This study has several strengths. First, we have studied LBL and PBL in terms of knowledge retention associated with particular teaching methodology. In-depth analysis of this aspect has not been closely investigated by many experts in the field. Second, we adopted crossover study design. This study design must have eliminated certain factors affecting student scores such as individual characteristics, IQ and memory have been largely. Third, all the investigations were conducted by authors of the study only, which creates a sense of uniformity. The study has some limitations as well. Some may argue that the results obtained may not be applicable to all the medical students. I agree because these findings are based on a single centre study from a western Uttar Pradesh. More multicentric studies need to be carried out among medical students at large to prove superiority of PBL over LBL.

**CONCLUSION**

To conclude, the empirical evidences of the current study indicate usefulness of Problem-based learning (PBL) over

Lecture-based Learning (LBL) in terms of retention of knowledge. However further studies involving more number of students are warranted in order to generate stronger evidence on this tool for improving medical education in our setup.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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