DOI: 10.47799/pimr.1301.04

Perception of Problem-Based Learning among First Year Medical Undergraduate Students in a Medical College in Manipur

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Date of Submission: 26/06/2024 Date of Review: 05/04/2025 Date of Acceptance: 20/04/2025

ABSTRACT

Background: Problem-Based Learning (PBL) is a student-centred instructional strategy that begins with an open-ended clinical problem to drive self-directed inquiry, critical thinking, and integration of basic and clinical sciences. Its adoption in Indian medical curricula has been encouraged by the National Medical Commission's shift to Competency-Based Medical Education, yet comparative data on PBL versus traditional lectures remain limited. **Objective:** To assess first-year MBBS students' perceptions of a four-week PBL module on pulmonary function tests and to compare these perceptions with those of prior didactic lectures, including evaluation of gender-based differences. **Methods:** A cross-sectional study was conducted between November 2023 and January 2024 among first-year MBBS students at a medical college in Manipur. Of the 100 students invited, 86 (86%) provided informed consent and completed four weeks PBL module and responded to a validated 14-item electronic questionnaire. Responses were recorded on a five-point Likert scale, including three items explicitly comparing PBL to traditional lectures. Descriptive statistics, medians, and interquartile ranges were computed. **Results:** Participants had a mean age of 19 $\pm$ 2.5 years; 52.3% were male. High levels of agreement were noted for PBL in terms of engagement (75.6%), conceptual clarity (72.0%), and enhancement of problem-solving skills (74.4%). However, lower agreement was observed regarding usefulness for examination preparation (26.6%), with a notable proportion expressing neutrality or disagreement regarding retention (48.9%), self-directed learning (48.8%), orientation adequacy (39.6%), and facilitator effectiveness (37.2%). Overall preference for PBL was 59.3%, with no significant gender difference (U = 992.0; p = 0.541; r = 0.07). **Conclusion:** Students perceived PBL positively in terms of engagement and conceptual understanding; however, concerns related to retention, examination readiness, and facilitation quality suggest that PBL, in its current form, may not be sufficient as a standalone instructional method. A blended teaching strategy incorporating structured lectures, formative assessments, and facilitator training is recommended to optimise educational outcomes in competency-based medical education.

INTRODUCTION

Effective medical education demands dynamic, and evidence-based teaching-learning methodologies to prepare competent doctors equipped with clinical expertise, analytical thinking, and lifelong learning skills. Medical institutions employ multiple approaches like traditional lectures for foundational and theoretical knowledge, bedside teaching for clinical skills, and case-based learning to bridge theory with practice.[1, 2] Among these, Problem-Based Learning (PBL) is a student-centric active learning method encouraging collaboration, self-directed research, and problem solving skills essential for lifelong learning and patient care.[3–5]

PBL was first developed at McMaster University in the 1970s as a teaching learning method where students solve real clinical problems using their existing knowledge.[6, 7] In PBL, small groups of students work together to analyze patient cases, identify gaps in their understanding, and conduct self-directed research between sessions. A faculty tutor guides these discussions, helping students connect basic science concepts to clinical practice.[6–8]

In India, the National Medical Commission (NMC) introduced a Competency-Based Undergraduate Curriculum in 2019, emphasising student-centred methods, early clini-

cal exposure, and attainment of specified competencies, including professionalism, communication, and lifelong learning. [9] PBL aligns closely with these CBME objectives. However, the successful implementation of PBL requires adequate infrastructure, including small group discussion rooms, trained faculties, access to clinical cases, and technological tools for virtual PBL. [10, 11] Although a nationwide survey of medical faculties in India highlighted the high student-faculty ratio as a significant barrier to PBL implementation. [12]

Additionally, a systematic review and other studies reported variable experiences with PBL by both medical students and teacher in non-Western countries, leading to inconsistent student engagement and effectiveness in learning, and limited effectiveness for exam preparation. [4, 5, 13]

To address implementation challenges [11–13] of student-centered active learning strategies aligned with competency-based medical education (CBME), sensitizing first-year MBBS students to multiple teaching-learning methods and evaluating their perceptions is important. This cross-sectional study aimed to: (1) assess first-year MBBS students' perceptions of a four-week Problem-Based Learning (PBL) module on pulmonary function tests, (2) compare these perceptions with traditional lecture-based instruction, and (3) analyze gender-based differences in learning preferences.

MATERIALS AND METHODS

Study Design and Participants

It was a cross-sectional study conducted at a medical college in Manipur over a three-month period from November 2023 to January 2024. The objective was to explore first-year MBBS students' perceptions of Problem-Based Learning (PBL) and to compare its educational effectiveness with traditional lecture-based instruction. All 100 enrolled first-year MBBS students were invited to participate in the study. A total of 86 students (86%) provided written informed consent, and their responses were included in the final analysis. Ethical approval was obtained from the Institutional Ethics Committee. The remaining 14 students who did not respond were excluded from the study. To assess for potential selection bias, age and gender distributions were compared between responders and non-responders.

Traditional Lecture-Based Instruction

Before introducing the PBL module, students received four 60-minute didactic lectures on pulmonary function testing. These sessions were conducted by the Department of Physiology and covered essential theoretical content including physiological principles, interpretation of pulmonary function parameters, and their clinical applications. These lectures served as the baseline instructional modality and reflected the conventional pedagogy employed in undergraduate medical teaching.

Problem-Based Learning Module

Following the lectures, students participated in a four-week integrated PBL module focused on pulmonary function testing. The first week comprised orientation sessions delivered through four structured one-hour classes- two by Physiology faculties and two by Clinical Medicine faculties. These sessions introduced students to clinical trigger cases, provided background information, and outlined specific learning objectives. In the subsequent three weeks, students were randomly allocated to 12 small groups consisting of 6 students each. Group formation considered gender representation and prior academic performance to ensure balanced participation. Each group conducted two 60-minute PBL sessions weekly, during which they collaboratively analysed clinical cases, identified learning issues, and proposed relevant solutions through self-directed inquiry and discussion. Faculty members acted as facilitators to guide and stimulate critical thinking without providing direct answers. At the end of Week 4, each group presented a 10-minute summary of their case findings and reflective learning insights to their peers and faculty members.

Questionnaire Development and Validation

A structured 14-item questionnaire was developed to evaluate students' perceptions of PBL and to enable direct comparison with traditional lectures. Three items specifically compared PBL and lectures with respect to engagement, understanding, and effectiveness. The instrument used a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Face and content validity were established through expert review by five faculty members with training in medical education. Pilot testing was conducted among 20 second-year MBBS students to assess reliability and item performance. All items demonstrated item–total correlations greater than 0.30, and the overall instrument exhibited good internal consistency with a Cronbach's alpha of 0.81.

Data Collection

At the conclusion of the PBL module in January 2024, the questionnaire was administered electronically using a secure and anonymised digital platform. Students' demographic information, including age and gender, was collected alongside their Likert-scale responses. All data were de-identified prior to statistical analysis to maintain confidentiality and reduce bias.

Statistical Analysis

Data were analysed using SPSS version 21 and Microsoft Excel. Descriptive statistics, including frequencies and percentages, were calculated for each survey item. Continuous variables such as age were summarised using means and standard deviations. Medians and interquartile ranges were reported for the three prespecified comparative items (PBL vs lecture). The Mann–Whitney U test was used to exam-

ine gender differences, with a Bonferroni-adjusted significance level set at α = 0.017 for the three comparisons. Due to the ordinal nature of the data and non-normal distributions, non-parametric statistical methods were applied. A p-value of less than 0.05 was considered statistically significant unless otherwise noted.

RESULTS

Participant Characteristics

A total of 86 first-year MBBS students completed the study. Their mean age was 19 $\pm$ 2.5 years; 45 (52.3%) were male and 41 (47.7%) were female. No significant differences in age or gender distribution were observed between responders and non-responders.

Overall Perceptions of PBL

Item-level responses (Table 1) indicate majority of students **strongly agreed** that PBL was engaging (51%) and improved problem-solving skills (39%), and a majority also considered its use for conceptual clarity (35%) and basic-clinical integration (34%). In contrast, fewer students **strongly agreed** that PBL helped exam preparation (14%), and substantial proportions **strongly disagreed** or were neutral on retention (17%/17%), self-directed learning (16%/19%), orientation adequacy (14%/19%), and universal application (29%/16%).

Responses are grouped by theme. Values indicate percentage of students who agreed or strongly agreed versus those neutral or disagreeing.

Students found PBL highly engaging and useful for understanding core concepts. Nearly 70% agreed it was engaging, and 72% said it improved concept clarity. More than half (57%) also felt it linked basic science with clinical practice, although 43% were neutral or disagreed (Table 2).

Views on delivery and broader benefits were more mixed. About 60% agreed the orientation, facilitators, and session structure were adequate. While 74% reported improved problem-solving skills, only 51% felt PBL promoted self-directed learning. Even fewer believed it would help with exam preparation (27%) or should be applied to every topic (30%), indicating reservations about its practicality and assessment alignment (Table 2).

PBL versus Traditional Lectures

Analysis of the three comparative items (Table 3) shows that students rated PBL's engagement very highly, with a median score of 5 (IQR 4–5), indicating strong agreement that PBL is more engaging than lectures. In contrast, the exam-preparation item had a median of 2 (IQR 2–3), reflecting general disagreement that PBL aids in preparing for examinations. Overall preference for PBL over traditional methods was moderate, with a median of 4 (IQR 2–4).

Gender-wise Comparison of Overall Preference

Mann–Whitney U test for Item 3 ("Overall, PBL is better than traditional methods") showed no significant gender difference (U = 992.0; Z = 0.611; p = 0.541; r = 0.07).

DISCUSSION

This study evaluated first-year MBBS students' perceptions of a four-week PBL module on pulmonary function tests and compared these with traditional lectures. In line with the NMC's Competency-Based Undergraduate Curriculum for Indian Medical Graduates [9], which emphasises learner-centred methods and early clinical exposure, 70% of our students found PBL engaging and 72% reported improved concept clarity. Gadicherla et al. [14] similarly found 68% of first-year MBBS students in India perceived PBL as an effective learning tool, and Parekh et al. [15] reported a mean satisfaction of 3.8 out of 5 (≈76%) with PBL in physiology.

Outcome research spanning 22 years confirms that PBL enhances critical thinking and knowledge integration in preclinical settings [3], and scoping reviews report similar gains in problem-solving skills and application of basic science to patient care. [4] Similar observations were made in the current study where 74% reported improved problem-solving skills, and 57% felt PBL effectively linked basic science with clinical practice. These results were consistent with those of a study by Ibrahim et al. [16], where students expressed a preference for PBL over lectures in enhancing the integration of basic and clinical sciences.

Despite these benefits, many students expressed about PBL's broader utility. Only 26.6% believed PBL would help in examination preparation, comparable to 40% in a Saudi cohort [16] and 45% among Indian dental students. [17] Approximately 62.8% of our cohort found facilitators helpful, a figure similar to 79% approval rates of students for PBL implementation reported by Usmani et al. [18] in Pakistan. High neutrality and disagreement regarding orientation (39.6%) and facilitation (37.2%) in this study is consistent with Solano et al. [5], who noted that over 80% of respondents in developing countries cited inconsistent facilitator training and resource constraints as important barriers of effective PBL implementation. In contrast, Wondie et al. [19] found that 82% of students in Ethiopia still perceived PBL as effective despite limited resources. Chan et al. [13] reported 78% adoption of PBL methodologies in non-Western medical schools, reflecting a growing preference that parallels our 59.3% overall PBL preference. However, Epstein et al. [20] and Vanishree & Tegginamani [21] found that PBL alone may not address all learning objectives or knowledge breadth without complementary strategies.

To address these gaps, blended or hybrid models have proven effective. Bukumiric et al. [22] and Zhou et al. [23] showed that integrating PBL modules improve exam performance in a randomized pilot study and improve clinical thinking respectively.

SL no	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1	PBL is interesting and interactive method of learning	14(16.2%)	8(9.3%)	4(4.6%)	16(18.6%)	44(51.1%)
2	PBL has helped in understanding the concept clearly	10(11.6)	5(5.8%)	9(10.4%)	32(37.2%)	30(34.8%)
3	proper orientation was given to students before starting PBL session	12(13.9%)	6(6.9%)	16(18.6%)	34(39.5%)	18(20.9%)
4	PBL helps in retention of the concept	15(17.4%)	12(13.9%)	15(17.4%)	19(22.0%)	25(29.1%)
5	PBL helps in identifying areas of weakness	16(18.6%)	11(12.7)	18(20.9%)	17(19.7%)	24(27.9%)
6	PBL takes more time than traditional Lectures	12(13.9%)	10(11.6%)	15(17.4%)	30(34.8%)	19(22.0%)
7	PBL promotes self-Learning	14(16.2%)	12(13.9%)	16(18.6%)	18(20.9%)	26(30.23%)
8	Should PBL be applied to all topics	25(29.1%)	21(24.4%)	14(16.2%)	10(11.6)	16(18.6%)
9	Will PBL help in preparing for Examinations	24(27.9%)	23(26.7)	16(18.6%)	11(12.7)	12(13.9%)
10	PBL Methods provides better linkage between Basic and Clinical sciences	17(19.7%)	13(15.1%)	7(8.1%)	20(23.2%)	29(33.7%)
11	PBL was conducted in a systematic manner	14(16.2%)	13(15.1%)	5(5.8%)	22(25.5%)	32(37.2%)
12	Role of the facilitator was helpful	12(13.9%)	14(16.2%)	6(6.9%)	25(29.1%)	29(33.7%)
13	Does PBL improve the problem-solving skills	10(11.6)	9(10.4%)	3(3.4%)	31(36.04%)	33(38.7%)
14	Is PBL better than traditional methods	16(18.6%)	15(17.4%)	4(4.6%)	20(23.2%)	32(37.2%)

Table 1: Perception of students on Problem-Based Learning (PBL)

Theme	Perception Item	Agree + Strongly Agree (%)	Neutral/Disagree (%)
Engagement and Interactivity	PBL was engaging	69.7	30.3
	More time-consuming than lectures	56.8	43.2
Conceptual Understanding	Improved concept clarity	72.0	28.0
	Linked basic and clinical sciences	56.9	43.1
Instructional Design	Orientation was adequate	60.4	39.6
	Facilitators were helpful	62.8	37.2
	Sessions were well-structured	62.8	37.2
Self-Directed and Analytical Learning	Promoted self-directed learning	51.2	48.8
	Improved problem-solving	74.4	25.6
Utility and Application	Useful for exam preparation	26.6	73.4
	Should be used for all topics	30.2	69.8

Table 2: Thematic categorisation of MBBS students' perceptions of Problem-Based Learning (PBL) (N = 86)

Item	Median (IQR)
1. PBL is more engaging than traditional lectures	5 (4–5)
2. PBL better prepares me for examinations than lectures	2 (2–3)
3. Overall, PBL is better than traditional teaching methods	4 (2–4)

Table 3: Medians (IQR) for PBL-versus-Lecture Items

Taken together, these studies suggest that while PBL offers clear advantages, its alignment with CBME assessment practices and consistent facilitation are critical to maximise its impact.

Strengths of this study include high response rate and use of a validated instrument. **Limitations** include reliance on self-report, absence of objective post-PBL assessments, and single-centre and single-topic design. To optimise PBL's impact, we recommend a blended curriculum that pairs PBL modules with targeted formative assessments, periodic facilitator training, and regular feedback. Such a model can preserve PBL's engagement and problem-solving advantages while aligning more closely with examination requirements and competency outcomes.

CONCLUSION

The findings of this study highlight that Problem-Based Learning (PBL) is perceived by a majority of first-year MBBS students as an engaging and effective method for enhancing conceptual understanding, problem-solving abilities, and clinical integration. However, the variability in perceptions regarding examination preparedness and facilitator effectiveness indicates the need for better orientation, structured implementation, and alignment with assessment strategies. While PBL cannot entirely replace traditional lectures, it can significantly complement them when implemented thoughtfully. PBL can be incorporated as core component of the undergraduate curriculum under the Competency-Based Medical Education (CBME) framework, supported by adequate training, resources, and curricular alignment, will help in development of critical thinking, self-directed learning, and competency-based outcomes in future medical professionals.

DISCLOSURE

Funding: None

Conflict of Interest: None Declared

Author Contribution: All the authors involved in study have contributed equally at all stages of work

Acknowledgements: I would like to express my appreciation to all those who have supported and contributed to the completion of this project

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How to cite this article: Singh RA, Rajkumar RS, Srivastava A, Singh HB. Perception of Problem-Based Learning among First Year Medical Undergraduate Students in a Medical College in Manipur. Perspectives in Medical Research. 2025;13(1):12-17
DOI: 10.47799/pimr.1301.04