e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(1); 655-658

Original Research Article

Study of Effectiveness of Case Based Learning in Microbiology for 2nd Professional M.B.B.S. Students

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Received: 01-10-2025 / Revised: 15-11-2025 / Accepted: 21-12-2025
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Conflict of interest: Nil

Abstract

Background: Traditional teaching in microbiology is largely lecture-based, leading to passive learning and limited student engagement. To enhance understanding and motivation, active learning strategies such as Case-Based Learning (CBL) can be introduced.

Aim: To evaluate the effectiveness of case-based learning compared to didactic lectures and to assess students' perception toward this method.

Methods: A total of 70 volunteer students from the 2nd Professional M.B.B.S. were enrolled after informed consent and randomly divided into two groups (A and B, 35 each). Group A underwent Case-Based Learning, further divided into smaller groups of 11–12 students, while Group B attended traditional lectures on the same topic. Validated clinical cases, post-test MCQs, and a feedback questionnaire were used for evaluation. Faculty were sensitized and trained for CBL sessions. Learning outcomes were assessed through post-test performance and feedback analysis.

Results: Students exposed to CBL showed higher engagement, improved understanding of microbiology concepts, and better problem-solving skills compared to those attending lectures. Feedback revealed that CBL increased student interest, promoted active learning, and improved teacher–student interaction.

Conclusion: Case-Based Learning is an effective student-centered teaching method in microbiology. It enhances motivation, understanding, and application of concepts and should be incorporated as a regular component of undergraduate medical education.

Keywords: Case-Based Learning, Microbiology, Active Learning, Medical Education, M.B.B.S. Students.

DOI: 10.25258/ijcpr.18.1.109

Introduction

Case-Based Learning (CBL) is a form of small group learning using case scenarios under the guidance of active facilitators. The goal of CBL is to prepare students for clinical practice through the use of authentic clinical cases. It links theory to practice by applying knowledge to cases using inquiry-based learning methods [1].

Medical education aims to develop appropriate professional attitudes and clinical skills, preparing students to handle real-life situations. It should motivate students toward active, self-directed learning rather than making them passive recipients of information [2].

Before the implementation of competency-based medical education, microbiology teaching for second-year medical students was primarily "organism-based" rather than "infection-based." Interactive Case-Based Learning (CBL) aids in better understanding of basic concepts and enhances clinical correlation. Undergraduate teaching in most Indian medical colleges remains theoretical and teacher centered [3]. This method is economical, time-efficient, and covers the syllabus without special arrangements, but it has limitations. Teacher-centered methods encourage passive learning and fail to motivate students [4]. Educators often place little emphasis on the practical utility of knowledge, resulting in students focusing mainly on marks rather than true understanding [5].

Active learning enhances comprehension by requiring students to engage actively with the material, promoting knowledge generation instead of passive absorption through lectures [6–9]. It also improves memory retention through the application

of understanding and prior experiences, leading to deeper learning and recall [5–11].

Thus, adoption of active learning strategies is essential to make microbiology more engaging and clinically relevant. This can be achieved through Case-Based Learning, a student-eccentric approach that promotes active participation and better conceptual understanding.

Materials and Methods

After obtaining permission from the Institutional Human Ethics Committee, both faculty members and students were sensitized about Case-Based Learning. Case scenarios, multiple-choice questions for post-tests, and feedback questionnaires were constructed and validated by faculty experts in the department. The study was conducted among 70 volunteer students of 2nd Professional M.B.B.S. after written informed consent. Students were randomly divided into two groups (A and B, 35 each). For Case-Based Learning, case scenarios were provided one week prior, and sessions were conducted in small subgroups. Two clinical cases were used for CBL. One group received CBL while the other group attended a didactic lecture on the same topic, followed by crossover between groups. A post-test of MCQs was conducted immediately after each session, and feedback was collected at the end of both sessions.

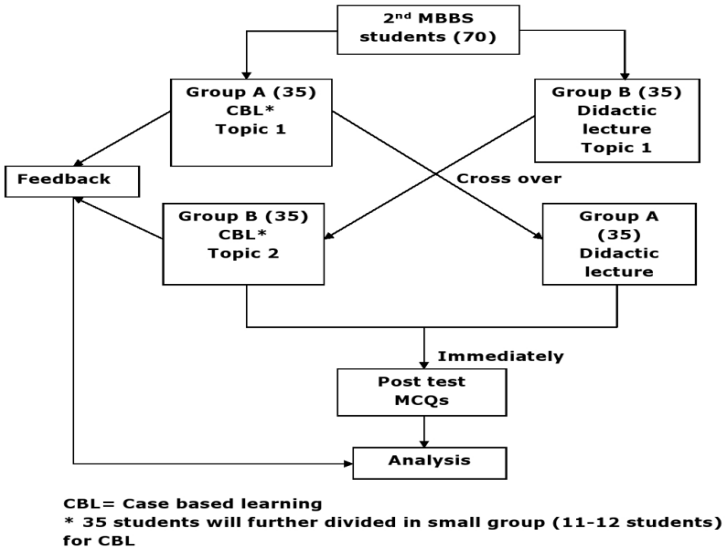

Figure 1: Flowchart of methodology for conducting CBL and didactic lectures for Group A and B.

Results

The scores obtained by students in the CBL session were significantly higher than those in didactic lectures ($P < 0.001$).

Out of 70 students, 69 (98.5%) were satisfied with the CBL approach. A majority—60 (85.7%) and 68 (97.14%)—reported that CBL improved communication among students and encouraged self-directed learning, respectively. All students agreed that CBL improved student–teacher communication, enhanced understanding of basic and applied aspects of microbiology, and aided performance in oral and practical examinations. Additionally, 67 (95.71%) requested more frequent CBL sessions.

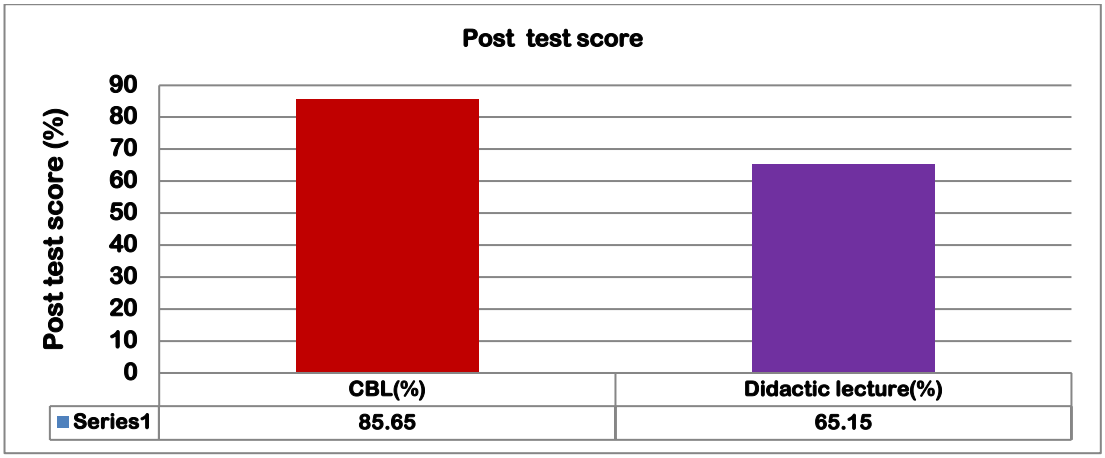

Figure 1: Post test score

Table 1: Statistical analysis of study

T-L method	No. of student	Mean test score (12)	Mean difference	Z score	P value
CBL	35	10.41	2.6	8.64	<0.001
Didactic lecture	35	7.81			

CBL = Case – based learning, T- L Method = Teaching learning, method

Table 2: Perception of the students regarding Case based learning

Sr. No.	Description	Response (Yes, %)
1	Are you satisfied with this teaching program?	98.57
2	Are the method encouraging the understanding of applied aspect of topic?	100
3	Is this method promotes understanding of basics rather than rote memorization?	100
4	Improve communication between student - student.	85
5	Improve communication between student – teacher.	100
6	Is this method helps in self-directed learning?	97.14
7	Would like to have more session on CBL. ?	95.71
8	Is it helpful for oral - practical examination?	100
9	I maintain interest in topic throughout session.	95.71

Discussion

Introducing student-centered teaching–learning methods in microbiology can enhance understanding of both basic and applied aspects. The present study showed a significant difference between the mean post-test scores of CBL and didactic lectures, indicating that CBL improves comprehension and motivation. This may be attributed to greater interaction among students and between students and teachers, along with increased self-directed learning. Students' perceptions revealed that CBL was well-accepted. Most students reported enhanced communication skills, improved self-directed learning, and better conceptual clarity (Table 2). CBL encourages self-learning, strengthens clinical reasoning, and develops decision-making abilities in a collaborative environment. Similar findings were reported by Tathe and Singh [9], Chamberlain et al. [13], and Blewett and Kisamore [14], who also demonstrated superior learning outcomes with CBL. All students in the present study agreed that CBL improved communication, understanding of microbiology, and exam preparedness.

These findings are consistent with studies by Anila A. Mathews et al. [3] and Ritu Garg et al. [4], which also reported enhanced learning motivation and conceptual understanding through CBL. Faculty facilitators in the current study agreed that well-prepared case materials and faculty orientation contributed to successful sessions, consistent with Gade and Chari [18].

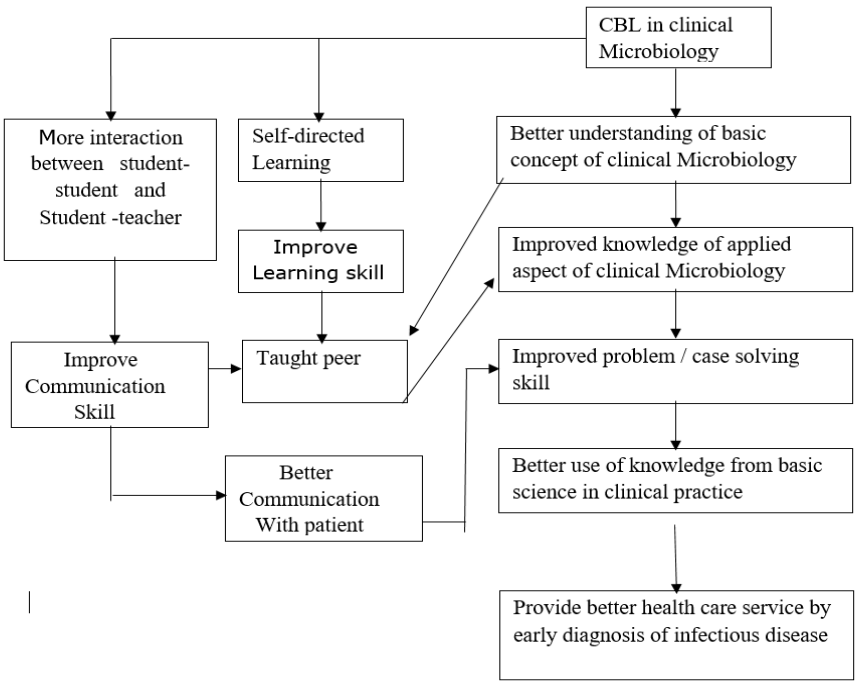

Figure 3: Outcome chain (concept map):

Similar types of studies have been introduced in some medical colleges in India, and the results have been encouraging.

Conclusion

This study demonstrated that Case-Based Learning (CBL) effectively motivates students to engage in active learning by sparking interest, enhancing problem-solving skills, and improving interaction with peers and instructors.

CBL fosters better learning outcomes and has been widely accepted by students as a valuable and engaging teaching strategy. Incorporating CBL into the microbiology curriculum can significantly improve understanding and application of knowledge.

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