Original Article

Comparison of Case Based Learning with Power Point Lectures among Second Year Medical Students with Teaching in Pharmacology: A Cross-sectional, Observational Study

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ABSTRACT

Background: Finding instructional tactics that would help students comprehend and painstakingly memories the material is a problem for teachers. Video is a promising, current, and extensively used form of educational medium capable of raising academic levels. The goal is to compare and contrast how integrating interactive Case-based learning (CBL) techniques alongside Power Point lectures influences learning results, student happiness, and other characteristics.

Materials and Methods: This is a cross-sectional, observational study design. IInd year medical students (n=140) were divided into two groups, Group A and Group B. Further group B was divided into 7 groups of 10 students each. Group A was taught topics of myocardial infarction, diabetes and tuberculosis by PPT method. The other half (group B) was taught same topics by CBL method. Total 3 tutorial classes were taken of each group. After completion of each class Multiple choice questions (MCQs) test was conducted to assess the performance. Students' feedback was also taken.

Results: It was found that performance after teaching with the help of case based learning was better and the difference was statistically significant ($p<0.001$). Student's feedback on the two methodologies of teaching revealed that students preferred CBL way of teaching.

Conclusion: Innovative teaching methods are constantly being explored to keep students engaged and challenge them academically. CBL technique is now used as a teaching strategy to promote clinical problem-solving ability. The CBL technique was found to be more effective when compared to typical tradition teaching methods (TTM) in the form of a didactic lecture. Along with increasing students' topic knowledge, CBL helped them become more adept at diagnosing problems, applying medicinal interventions as best they could, communicating effectively, listening intently, counseling, working in teams, and taking on leadership roles.

Keywords: Case-based teaching, Power Point lectures, Pharmacology, effectiveness, undergraduate student.

INTRODUCTION

Medical education quality is influenced by elements such as curriculum, facilities, patient exposure, faculty expertise, and teaching approach. Over the last decade, medical education has shifted from a teacher-centered to a student-centered model. One of the most important ways to strengthen the medical education at content delivery level is to assess student perception about teaching- learning methodology.[1]

The undergraduate medical curriculum is still divided into pre-clinical and clinical periods, with some integration, in many developing nations like India. Innovative teaching methods are constantly being explored to keep students engaged and challenge them academically. Case-based learning (CBL) has become one of the most significant advances in medical education in recent years. With an emphasis on a specific curricular area, CBL has been used to drive curriculum improvement. It has different resolution, characteristics, and implications in medical education.[2]

CBL encourages students to effectively cooperate, categorize, and apply research concepts and resources to real-world situations. It accomplishes this by providing examples of medical concerns. The use of CBL in clinical pharmacology can help to reconcile theory and practice.[3] Early clinical illustrations and actual clinical experience allow students to correlate basic science with real-world patient issues, which likely improves information retention.

The goal of CBL is for students to become more thoughtful problem-solvers. It encourages active learning practices that last a lifetime because this is the most effective way to learn, relate, integrate, and recall information. It is currently a widely accepted strategy for facilitating basic science education that is suggested for use in healthcare settings.[4,5] Students' perspectives on teaching and learning are influenced by their previous experiences and the current setting. To optimize learning outcomes, it's important to examine both the context and the learner's experiences within it. Educators must use this framework to assess the technique's effectiveness and whether CBL meets the overall learning objectives.[6]

The study aims at capturing insights of students comparing CBL vis-a-vis the traditional methods with respect to determinants of learning like information gathering and skills like teamwork. Students that actively participate in the process are better able to examine and learn how to apply knowledge in a clinical setting to treat patients, as well as reflect on the learning experiences they have had from the

cases and difficulties.[7] The CBL fosters lifelong learning, independent study, and a deeper comprehension of a given subject.[8]

The objectives of the study were as follows:

• To evaluate the effectiveness of the CBL method as compared to the conventional method among the IInd year MBBS students.

• To study the perception of students regarding CBL in pharmacology teaching.

Measurement of outcome:

• The knowledge gained by the students before and after the sessions was assessed using validated pre-test and post-test questionnaire.

• The perception of students towards CBL was assessed by a pre-validated questionnaire using a 5-point Likert scale (from strongly disagree to strongly agree).

MATERIALS AND METHODS

Study Design and study sample: This is a cross-sectional, observational study. 140 participants were from second year medical undergraduate (UG) students admitted from a private medical college, India.

Ethical approval: The Institutional Ethics Committee granted approval, and DYP/IECBH/2020/45 was the certificate number.

Inclusion and exclusion criteria: Phase II MBBS students attending pharmacology lecture classes were included while students who refused to provide informed consent and questionnaires with incomplete information or missing data were excluded from the analysis.

Study Procedure: The students were divided into two academically recognized groups: group A and group B. The validation of the groups was done taking into consideration their first sessional marks. The students were arranged in ascending order of marks with alternate students assigned to each group.

The groups were exposed to the following: Group A received three one-hour PPT sessions covering the subjects of diabetes, TB, and myocardial infarction. The taught topic was the subject of a post-test that included multiple choice questions (MCQ) on a Google Form. The other half, known as group B, participated in three one-hour CBL sessions covering the same subjects. Further group B was divided into 7 groups of 10 students each. There was a case discussion, a briefing by the faculty, followed by a post-test.

Feedback by using 5 point Likert scale was obtained for both the teaching methods (PPT and CBL) from the students in the form of pre validated questionnaire that consisted of both closed ended and open ended questions.

Effectiveness assessment: The evaluation of the examination was done by using an answer key that had been prepared during question paper validation. The marks obtained by the two groups were tabulated and analyzed statistically.

The questionnaires were divided into two sections. The first was a MCQ post-test covering the relevant subjects. Questions to assess the approach's efficacy (PPT/CBL). The questionnaire underwent pre-testing and was validated by an expert who was not the study investigator. Final validated questionnaires were used for the study. The study questionnaire shall be filled out by the responders in electronic format. An online link to the survey was sent to the prospective respondents and the respondents were able to complete the survey online on computers and smartphones using Google Form. The pre-tested questionnaire was given out and the data was gathered in a single visit as the study is cross-sectional. The study parameters/indices are incorporated in the survey questionnaires.

Statistical analysis: Data entry and analysis were done using SPSS 16.0. SPSS 16.0 was used for data entry and analysis. $P < 0.05$ was regarded as statistically significant, and the test results were reported as mean ± standard deviation. The pre- and post-test results were compared using a paired t-test, and the results of the two groups were compared using an unpaired t-test. Percentages were used to represent the student feedback.

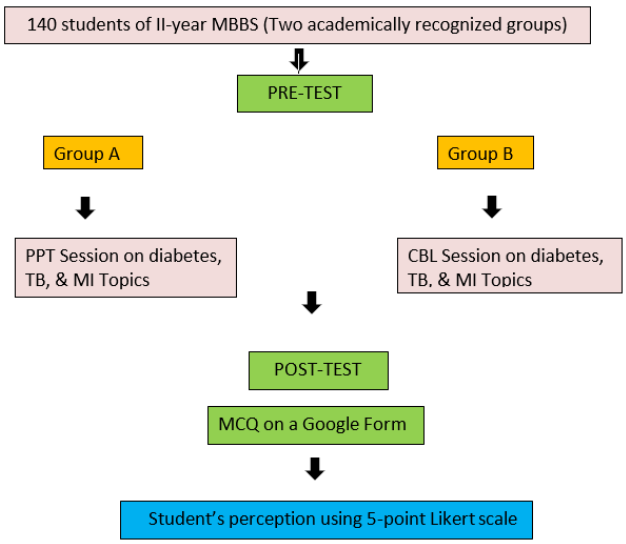

Figure 1: Flowchart depicting the methodology

RESULTS

The study was conducted on 140 students of second year MBBS in pharmacology department. The students were subdivided into 2 groups – PPT sessions (group A) and CBL (group B). Each group had 70 students. All the enrolled students completed the study and were included in the final analysis. The mean scores of the students in pre-test and post-test questionnaire was compared between the 2 modes of teaching and learning by applying paired t test. The mean scores of the students before and after the intervention group are depicted in table 1.

Table 1: Comparison of pre-test and post-test scores between the PPT and CBL group:

Parameters TL methods	PPT group A (n=70) Mean (SD)	CBL group B (n=70) Mean (SD)
Pre-test	4.33 + 2.62	4.72 + 2.43
Post-test	5.71 + 2.1	7.02 + 2.78

The Group B (CBL) showed significantly increased ($P < 0.001$) test score in knowledge-based and critical thinking (clinical application) as compared to Group 1(PPT). Paired t test was used. Post test scores were significantly higher than the pretest scores in both the groups. Data represented as mean + SD. SD: Standard deviation.

Table 2: Paired t test: Comparison of pre-test and post-test scores of PPT group

Mean Difference (Pre-test minus Post-test)	-1.380
Standard error of differences	0.30
95% CI	-2.67 to -0.08
t- statistic	4.6
Significance level	*P< 0.0442

Table 3: Paired t test: Comparison of pre-test and post-test scores of CBL group

Mean Difference (Pre-test minus Post-test)	-2.30
Standard error of differences	0.2
95% CI	-3.17 to -1.43
t- statistic	11.38
Significance level	**P< 0.0076

Table 4: Unpaired t test: Comparison of Mean differences of scores between PPT and CBL group:

Mean Difference	- 0.92
Standard error of differences	0.187
95% CI	-0.55 to -1.29
t- statistic	4.93
Significance level	** P <0.01

From the normality tests, it is confirmed that, the two groups follow the normal distribution, so we choose parametric method for analyzing the data. Unpaired statistical t tests showed the difference in mean scores between the two groups to be -1.3100 (95% confidence interval: -2.226 to -3.594, p value = 0.0054).

Table 5: Post-test scores of the PPT and CBL group

Mean Difference (PPT minus CBL)	-1.3100
Standard error	0.463
95% CI	-2.226 to -3.594
t- statistic	2.8282
Significance level	P = 0.0054

Analysis of Feedback:

After the completion of session, feedback from the students was taken regarding their perceptions about CBL in pharmacology as a teaching-learning method. Students gave responses to a pre-validated questionnaire on CBL sessions on a 5-point Likert scale, as shown in Figure 2. 70 students participated in this study and gave their feedback for both the teaching methods (Figure 2 and 3). There was significant difference in the knowledge gain of the student as their performance in post-test of CBL was better when compared with traditional teaching methods (TTM) post test score (P = 0.0054).

The perceptions of students were quite positive regarding the CBL as a majority revealed that they have better understanding of concepts (88.57%), self-learning approach (90%) and critical thinking with integration clinical subjects (85.71%) as well as interest in subject (91.42%) through the CBL process. 78.57% students found the TTM to be non-interesting. 84.28% students strongly agreed that CBL motivated them to read more, enhance self-learning, and hence better understanding was achieved. While 65.71% of students found that TTM didn't motivate them to read more and 88.57% strongly agreed that CBL helped them to memorize the facts easily and according to 81.42 % students CBL had increased their group interaction and also made clinical learning easier and enjoyable. While 72.85% students said that TTM doesn't increase any group interaction, neither learn through this method is easier or enjoyable. 78.57% students strongly agreed that CBL method increased their sensitivity towards patient's problem. 91.4% strongly agreed that this method of CBL should be continued and to be regularly implemented, while 77.14% of students suggested to discontinue TTM.

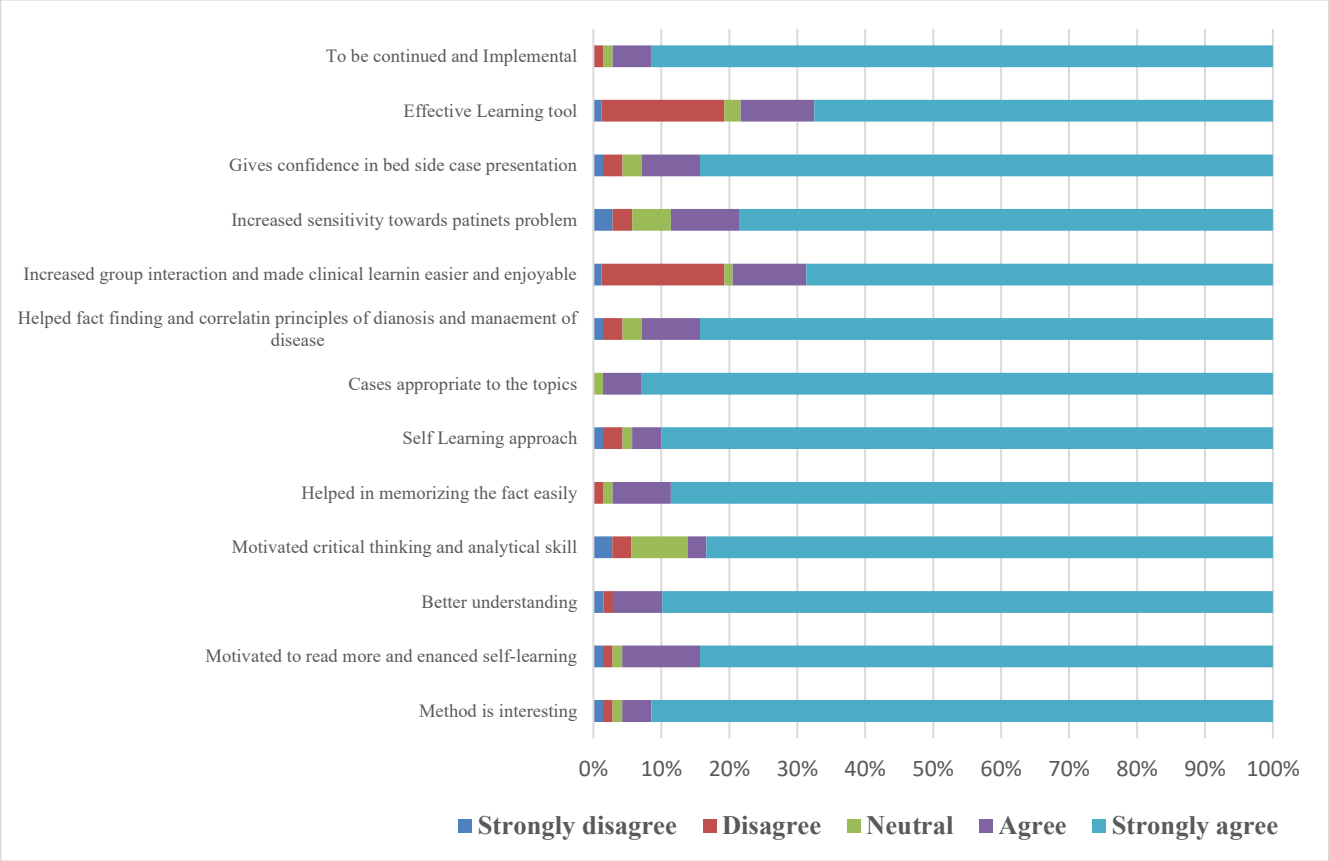

Figure 2: Analysis of the Feedback of students underwent CBL method. Likert scale: 1: Strongly disagree; 2: Disagree; 3: Neutral; 4: Agree; and 5: Strongly agree

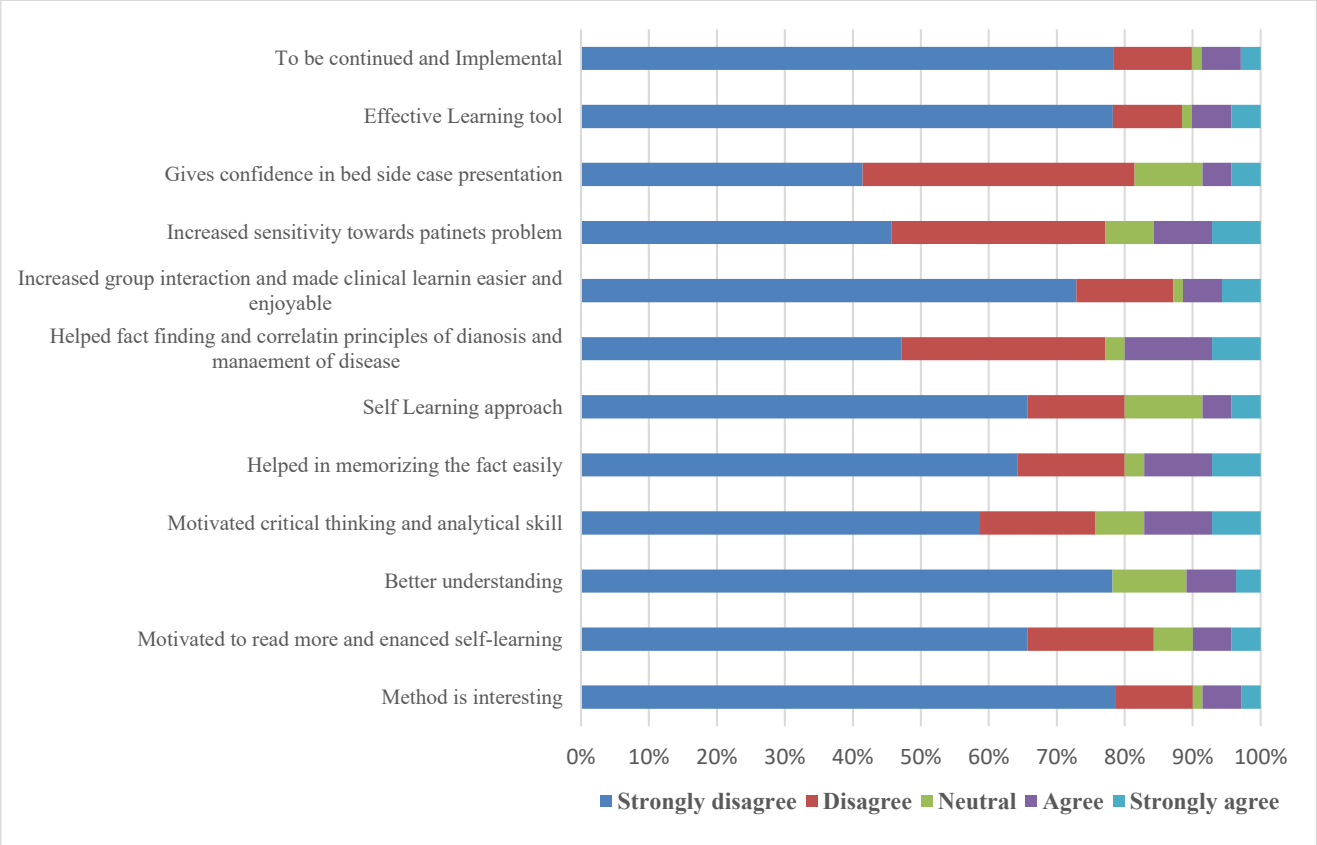

Figure 3: Analysis of the Feedback of students underwent PPT Learning method. Likert scale: 1: Strongly disagree; 2: Disagree; 3: Neutral; 4: Agree; and 5: Strongly agree

DISCUSSION

Competence Based Medical Education (CBME) recommendations published by NMC in 2019 state that in order for students to become more competent and skilled Indian medical graduates, we must transition from didactic lectures to small group teaching methods and give them early clinical exposure. In the present study, CBL was compared with the conventional method for its effectiveness as a teaching/learning tool. CBL is a rigorous approach to managing scenarios from clinical cases. Here, the students, whose views are most important.[9-11]

In this study, after the end of the CBL progression the students commented favorably upon development of interest, motivation to read more, diagnosis and treatment planning. Instructors were supposed to facilitate students 'discussion, guide their clinical reasoning method, and help them to summarize key learning objectives. In the educational system traditional teaching methods have been replaced with student- directed learning and active student participation CBL originated from Harvard University in the 20th century. Unlike the traditional method, CBL needs some advanced preparation by the learners and provides a more structural strategy for learning. It is based on concrete cases and characterized by effective and interactive teaching.[11,12] Case-based learning methods have been widely used in a variety of applied disciplines, such as medicine, law, management, and so on.[13, 14]

The mean marks of the students in the post test taught using traditional method was 5.41 while for the CBL method was 8.72. Students scored higher marks in CBL method than in conventional method of teaching using presentations. A comparable study conducted in Pravara found that the mean test marks were 57.395% using the conventional approach and 10.320% using the CBL, with the difference being statistically significant.[11]

Our study's 80% of participants thought that CBL was a beneficial learning technique, and 88.57% said it improved their comprehension. These findings are similar to Tayem's study, which found that 82% of participants considered CBL was an effective learning aid. [15] 92.85% of students believed the occurrences were linked to the lecture subject, which is consistent with the 93% of students who participated in the Kaur et al study. [16] 84.28% of students said CBL helped them correlate pharmacology with clinical cases. Several other investigations have shown similar results.[17, 18]

90% of the students were of the view that CBL motivates them toward self-directed learning. They feel encouraged to seek out additional resources. The same has been demonstrated by Gupta et al. in their study.[2] 81.42% students have shown that case-based approach engages them in discussion of specific situations and thus can be perceived challenging, interesting and helpful towards learning. However, studies done by Curran[19] et al 2008 and Joseph A et.al.[20] reported the same findings. Our experience leads us to conclude that CBL has good student acceptance and recognition together with high instructor satisfaction. In a cross-sectional study by Mani et al. and Chiranjeevi UK et al., importance of learning by visual, auditory, and kinesthetic modalities is emphasized.[21,22] Similarly, CBL uses different modalities for students to study a subject. This study highlights the urgent necessity to incorporate CBL as an effective teaching-learning approach into the curriculum alongside traditional teaching methods for the betterment of medical undergraduate students. This study emphasizes the need of using CBL as an effective teaching tool alongside traditional ways to assist students.

Limitations and further recommendations: The current study was designed to assess the perception of students towards CBL on diabetes, TB, & MI Topics in Pharmacology. There are a few limitations to the study in that it was conducted in only one organization and pertained to only one subject, i.e., Pharmacology. The long-term benefits of CBL, such as improved health care delivery and clinical acumen in practice, can be measured by student follow-up, which was another limitation of this study. Since the teaching faculty is another important group involved in the CBL implementation, future evaluations of faculty members' perceptions should also be conducted.

CONCLUSION

It was revealed that the CBL approach outperformed the TTM, which was presented as a didactic lecture. Along with increasing students' topic knowledge, CBL helped them become more skilled at diagnosing problems, giving medical solutions as best they could, speaking effectively, listening carefully, counseling, working in groups, and accepting leadership duties. More training sessions on specific CBL-related subjects will greatly assist students in undergraduate pharmacology training.

The enthusiastic and positive feedback, we received suggested that case based study provides multiple advantages: First, CBL fosters students' clinical problem-solving skills by assisting them in analyzing fact-based material, using analytical tools, and expressing their concerns. It provides students more opportunities to learn pharmacology in an interactive and case-based format to enhance their skills of self-directed and collaborative learning. CBL enhances their capacity to address clinical issues by emphasizing the application of fundamental knowledge to clinical practice within the framework of a case study. To address the question of whether CBL yields better educational outcomes as compared to alternative teaching approaches, more multi-center, large-sample studies with rigorous methodology are necessary to guide curriculum integration and instructional design.

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