

Original Research Article

Comparative study on the effectiveness of case-based learning over small group discussion in pediatrics among 8th semester MBBS students

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ABSTRACT

Background: Case based learning (CBL) is a new teaching learning method in medical education. The goal of this method of teaching is to prepare students for clinical practice through the use of authentic clinical cases. It links theory to practice through the application of knowledge to the cases. Hence it is effective for students who have already acquired foundational knowledge. The study was conducted to compare CBL and the traditional method of small group discussion (SGD) in Pediatrics among 8th semester MBBS students.

Method: This quasi-experimental study was done among 8th semester MBBS students (n=83) of Government Medical College in south Kerala. The students were divided into two groups. One group was taught by CBL and the other by SGD. Pre-tests containing 10 multiple choice questions were conducted prior to each session. After three sessions, they were crossed over so that the two groups were exposed to both types of teaching learning methods. Post tests were conducted after 3rd (post test1) and 6th (post test2) sessions and the results were analysed.

Results: There was no statistically significant difference in the post test scores between CBL and SGD groups (p value 0.696 for post test1 and p value 0.908 for post test2). However, the learners agreed that CBL had helped them in making concepts clear, stimulated active learning and improved their skills in case analysis.

Conclusion: CBL can be used as a teaching learning method in Pediatrics to complement the traditional methods of teaching like SGD.

Keywords: Case based learning, Small group discussion, Medical education, Pediatrics

INTRODUCTION

Medical education is currently undergoing a significant change in its structure, content and mode of delivery. As new public health challenges are emerging, the teaching - learning methods must ensure to impart competency among students to face the challenges in the health care system.

8th semester MBBS students during their clinical posting in Pediatrics are conventionally taught by small group discussion. Two or three students will present different

aspects of an assigned topic under the direction of faculty who co-ordinates the presentations, directs audience discussion and summarize the topic. Here the audience remain passive, there is no discussion between the speakers and the gaps between the topics may not be addressed. The students may not be able to analyse a clinical case properly and apply the knowledge they have gained appropriately to solve a real clinical situation.

Case based learning is a modality of small group teaching, which utilises simulated patient cases to solve clinical problems under the guidance of teacher and with specific

learning objectives. It encourages active and deeper learning and helps the students to develop analytical and problem-solving skills. CBL has been shown to enhance the clinical knowledge and skills and improve team work, practice behaviour and patient outcome. It is practical and efficient as a mode of teaching for adult learners. However, CBL requires advanced study and preparation by learners. The role of teacher is to provide cases based on specific learning objectives and guide the students through the learning sessions by providing more inputs and stimulating learning on a deeper level.

Engel et al, in their study on problem solving skills under a CBL model compared with lecture model in Dental under graduate students found that the students developed better problem-solving skills under the CBL model.¹ Another study by Minghong et al, on comparison of CBL and traditional method of teaching first year PG students of medical oncology also found that the CBL group performed better in examination compared to the other group.² However, Pearson et al in their article on integration of case-based series in population-oriented prevention into a problem based medical curriculum concluded that CBL appeared to be an effective adjunct to the traditional lecture format. They were unable to determine if this model of teaching could increase other problem-solving attributes or improve clinical performance.³

In their study on attitudes of faculty and students towards CBL in 3rd year Obstetrics and Gynecology clerkship, Hansen et al observed that faculty favoured conventional format whereas student participants favoured CBL. Student presenters were comfortable with both formats.⁴ The study by Peplow et al, on attitudes and examination performance of female and male medical students in an active CBL program in Anatomy showed that female students in the early part of the program performed better in their examinations compared with male students.⁵

MBBS students in Phase III of their curriculum are posted in Pediatrics during 8th & 9th semesters. During the 4 weeks of 8th semester posting, common Pediatric problems are taught conventionally by small group discussion. In the University examination, the students have to answer one case scenario based modified essay question which carries 10 marks.

Many of the students cannot properly analyse the scenario and answer the questions. This leads to poor performance in the examination and scoring low marks. As a remedial measure, the feasibility of case-based learning is explored in this study. The aim of our study was to compare the effectiveness of case-based learning with that of small group discussion as a teaching-learning method for 8th semester MBBS students in Pediatrics and to evaluate the student's perception regarding case-based learning method.

METHODS

Study design

A quasi-experimental design was used for the study.

Study place

This study was done in a government medical college in South Kerala, India. The study was conducted among the 8th semester MBBS students attending clinical posting in Pediatrics in the institution.

Study duration

The study was conducted over a 6 months period from July 2021 to December 2021.

Students who were willing to participate in the study and gave consent were enrolled for the study. Those students who were absent in any teaching – learning session were excluded from the study. Pre-test and post-test evaluation sheets and questionnaire based on Likert scale were used as study tools.

Data collection procedure

The study was done after getting Institutional research committee approval and Ethical committee clearance. The 8th semester MBBS students attending Pediatrics clinical posting were briefed about the two types of teaching methods-conventional small group discussion (SGD) and case-based learning (CBL). From the usual topics selected for SGD, 6 topics were identified for the comparison of the two teaching – learning methods.

Approach to a child with edema, anemia, jaundice, bleeding, acute respiratory infection and fever of unknown origin were the topics selected. The participants were informed about these topics on the day of commencement of their clinical posting, with the instruction to come prepared before attending the class. Students were provided with a participant information sheet and a consent form.

Confidentiality was maintained by allocating numbers to students in place of their names. After obtaining their consent, the students were given a pretest consisting of 10 MCQs or one-word questions to assess their baseline knowledge about the topic of discussion. The students were then allocated into one of the 2 groups by convenient sampling method.

The two groups were exposed to CBL and SGD separately and crossed over after three sessions. A total of 6 sessions on the above topics were conducted.

Post tests were given at the end of 3rd and 6th sessions in the form of case scenario based one word or short answer questions. Both the pretest & post-test were conducted by

another faculty and evaluated based on preset and validated answer keys. Feedback by using 5-point Likert scale was obtained from the students using pre-validated questionnaire.

Mann Whitney U test was used to compare the pre and post test score of the 2 groups. Percentage scores were calculated to evaluate the feedback about the CBL teaching learning method.

RESULTS

Out of the 83 students enrolled for the study, all the students appeared for the pre-tests. But only 78 students wrote the post test, 38 from CBL group and 40 from SGD group. The results were analysed using Mann Whitney U test.

Pre-tests scores of CBL and SGD groups were comparable before switch of batches (Median (IQR) CBL 4.0 (2.0), SGD 5.0 (2.0), p value 0.158) and after switch of batches (Median (IQR) CBL 5.0 (3.0), SGD 5.0 (3.0), p value 0.835).

This shows that both CBL and SGD groups had comparable base line knowledge. Table 1 depicts the pre-test and post test scores before switch and Table 2 depicts the pre-test and post test scores after switch.

Figures 1 and 2 compares the median post test scores of the two groups before and after switch respectively. Post test scores of CBL group was not significantly different from the SGD group before (Median (IQR) CBL 5.3 (4.0), SGD 4.6 (2.0), p value 0.696) and after switch (Median (IQR) CBL 3.8 (3.0), SGD 4.3 (4.0), p value 0.908).

There was no significant difference in the post test score 1 between the intervention group (CBL) and control group (SGD) across the batches. Table 3 and Table 4 shows the mean and median pre-test and post test scores of the intervention and control groups compared across batches.

There was significant difference in the post test score 2 between the intervention group and control group among batches 5 & 6. Post test score 2 was significantly higher in batch 5 in the intervention group compared to the control group ($p=0.048$), whereas post test score 2 was significantly lower in batch 6 in the intervention group compared to the control group ($p=0.005$).

There was no significant difference in the post test score 2 between the intervention group and control group across the batches 1- 4.

The feedback of students comparing CBL with SGD was obtained using a pre validated 5-point Likert scale questionnaire. 73 students gave their perception. The analysis of which is given in Figure 3. Majority of students rated CBL as a better teaching learning method compared to SGD.

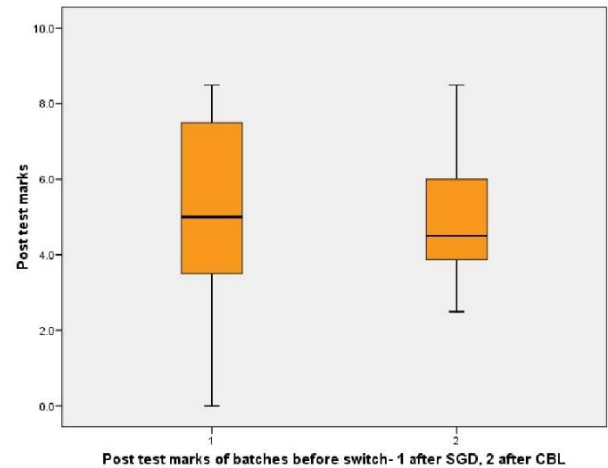


Figure 1: Box plot showing median post-test marks before switch.

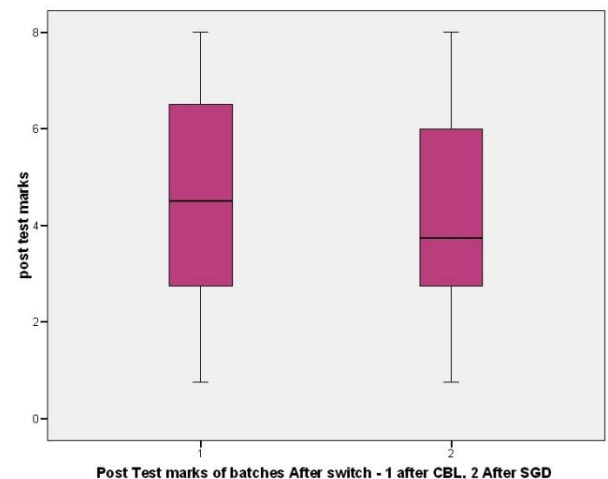


Figure 2: Box plot showing median post-test marks after switch.

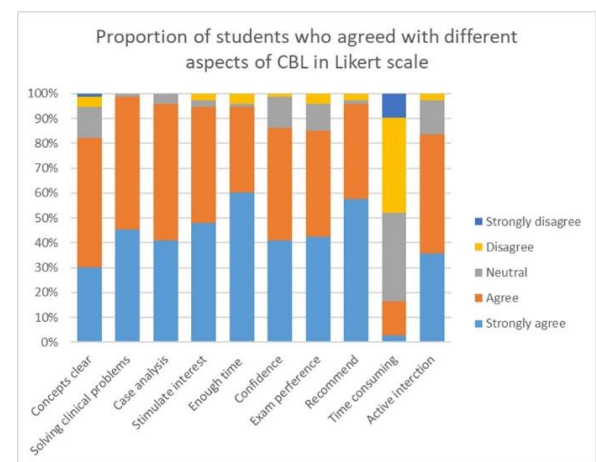


Figure 3: Bar chart showing proportion of students who agreed with different aspects of CBL in Likert scale.

Table 1: Pre test scores and post test scores of CBL and SGD groups before switch.

Pre test scores			
Scores	CBL (n=42)	SGD (n=41)	P value=0.158
Median (IQR)	4.0 (2.0)	5.0 (2.0)	
Mean (SD)	4.5 (1.7)	4.8 (1.8)	
Post test scores			
Scores	CBL (n=38)	SGD (n=40)	P value=0.696
Median (IQR)	5.3 (4.0)	4.6 (2.0)	
Mean (SD)	5.3 (2.3)	5.2 (1.6)	

Table 2: Pre test scores and post test scores of CBL and SGD groups after switch.

Pre test scores			
Scores	CBL (n=41)	SGD (n=42)	P value=0.835
Median (IQR)	5.0 (3.0)	5.0 (3.0)	
Mean (SD)	4.6 (1.7)	4.6 (1.8)	
Post test scores			
Scores	CBL (n=38)	SGD (n=40)	P value=0.908
Median (IQR)	3.8 (3.0)	4.3(4.0)	
Mean (SD)	4.3(2.6)	4.2 (4.0)	

Table 3 Mean and median post test scores (post-test 1) in the intervention (CBL) and control group (SGD) compared across batches.

Batch	Number of students (n=38)	CBL		Number of students (n=40)	SGD		P value
		Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	
1	7	6.6 (2.3)	8.3 (5.0)	7	5.4 (0.5)	5.5 (1.5)	0.202
2	7	4.1(2.0)	4.5 (3.0)	7	4.3 (0.9)	4.5 (1.0)	0.831
3	5	5.6 (3.6)	6.3 (7.0)	7	5.7 (1.3)	6.0 (2.0)	0.947
4	7	3.3 (0.9)	3.0 (2.0)	7	3.8 (0.7)	3.8 (1.0)	0.269
5	5	6.9 (0.9)	7.0 (2.0)	6	7.5 (0.9)	7.6 (2.0)	0.299
6	7	5.9 (1.4)	5.5 (3.0)	6	5.1 (1.2)	5.3 (2.0)	0.297

Table 4: Mean and median post test scores (post-test 2) in the intervention and control group compared across batches.

Batch	Number of students (n=35)	CBL		Number of students (n=38)	SGD		P value
		Mean (SD)	Median (IQR)		Mean (SD)	Median (IQR)	
1	6	5.3 (1.7)	5.5 (4.0)	5	6.6 (2.1)	7.5 (3.0)	0.285
2	7	4.4 (2.2)	3.0 (4.0)	6	4.3(2.4)	4.5 (5.0)	0.939
3	6	5.1 (2.0)	5.5 (4.0)	5	2.7 (1.8)	2.3 (3.0)	0.068
4	7	2.9 (1.3)	3.5 (2.0)	7	3.4 (2.5)	3.0 (5.0)	0.647
5	3	6.3(2.2)	7.0 (4.0)	7	3.0 (2.0)	3.3 (4.0)	0.048
6	6	2.9 (1.5)	2.9 (3.0)	6	5.8 (1.3)	6.3 (2.0)	0.005

DISCUSSION

Case based learning is a form of patient oriented, student centered and inquiry-based teaching and learning method that aims to prepare students for clinical practice through the use of authentic clinical cases. These cases link theory to practice, through application of knowledge to the cases and stimulate the student's interest in learning. In

traditional teaching- learning methods at least some of the participants will remain passive and may lose attention in class. In CBL, students will be provided with simulated cases describing clinical history, physical examination findings and lab results. This will motivate and encourage active participation of students, and help them to develop ability in analysing and solving the problems. It also promotes deeper understanding of the subject and high

level of learning in contrast to superficial learning with conventional teaching method. It helps in the integration of knowledge and practice.

Out of the 83 students enrolled for the present study, only 78 students attended post-tests 1 and 2: 38 from CBL group and 40 from SGD group. Analysis of the pre-test scores of the intervention (CBL) and control (SGD) groups were comparable before and after switch of batches. The post test scores of the intervention group were not significantly different from the control group before and after switch. The mean and median scores in the CBL group were higher after post test.¹ These differences were however not statistically significant.

Many of the studies show that on comparison, CBL is more effective than traditional teaching learning methods among undergraduate students in most of the disciplines. Kenchaiah et al, in a comparative study of case-based learning with conventional teaching method in pharmacology among 76 second year MBBS students found that CBL is more effective and it motivated students for fact finding, reasoning and self-learning.⁶

Bijani et al, in a comparative study among 60 nursing students on the effectiveness of case-based learning and lecturing in enhancing their skills in diagnosing cardiac dysrhythmias found that CBL is more effective.⁷ Diwan et al, on comparing CBL and traditional lectures among 26 first year undergraduate students found that CBL can be used as an adjunct to the conventional teaching methods.⁸

Rehna et al, in her study comparing CBL and didactic lecture (DL) for teaching Pediatric infectious diseases among 120 MBBS students divided into two groups found that participants of CBL had acquired better post test scores which was statistically significant compared to DL group. Other important findings related to student's feedback in this study include 'CBL makes the topic interesting, easily understandable, facilitates interactive discussion and the students preferred CBL as a better method of learning.'⁹

Kireeti et al in their study comparing CBL and traditional DL method in teaching dengue fever among 56 undergraduate students posted in pediatrics noted that the CBL group performed better in post-test by scoring average of 34.71 marks compared to DL group who got only 26.36 marks as average. The study also showed that CBL method creates interest in the students to learn better than the traditional DL method. 80% of students were more satisfied with CBL method.¹⁰

A similar study by Ciraj et al, among 166 second year MBBS students in Microbiology comparing CBL and DL found that in the post test scores, the average marks obtained in the CBL group was significantly higher than that in the DL group which was statistically significant (p value <0.001).¹¹ Another study by Mahdi Shahriari comparing CBL and bedside teaching among 30

undergraduate and 20 residents in Pediatrics noticed that 93.33% of undergraduates and 100% of residents had evaluated that CBL is superior to bedside teaching. The post test score was better with CBL group. Many of the students opined that they were more relaxed during the CBL sessions.¹²

Nair et al in their study comparing CBL with DL among 100 first year MBBS students in Biochemistry concluded that there is a significant increase in the post test score in CBL group. 98% students rated that CBL motivated them to study and there was more interaction between facilitators and learners.¹³

Massonetto et al, in their study on student responses to CBL in Obstetrics and Gynecology teaching programme for 4th year undergraduate students conclude that in the CBL group, the knowledge assessment test showed statistically significant increase in post test score compared to traditional teaching method.¹⁴

In the present study, we could not find a statistically significant difference between the two study groups. But in a study by Diwan et al it was found that CBL was a better teaching method in only one of the two groups of students.⁸ They infer that the difference in the intelligence between the 2 groups of students, their interest in the topic and the teaching style of the tutor might have contributed to the above observation.

Similarly in the present study, though a marginal improvement of marks was seen in the post tests of CBL group, it was statistically not significant. Pearson et al and Diwan et al, are of the opinion that CBL can only be used as an adjunct to conventional methods of teaching to improve the student performance.^{3,8}

Only 73 out of 83 students submitted feedback form. On analysing the student's feedback, it was found that majority of students agreed that CBL is more effective in making the concepts clear (82.19%), improved their skills in case analysis (95.89%), stimulated active learning (94.52%), enhanced their confidence in analysing cases (86.31%) and helped them in solving clinical problems (98.63%).

84.94% of students agreed that CBL has given them confidence in performing better in analysing case based modified essay questions and thus performing better in examinations. These findings were in agreement with the previous studies on this topic.^{8-11,14,15} Majority of the students were of the opinion that the teacher spent enough time on discussion (94.52%), there was more active interaction in CBL classes (83.67%) and they will recommend CBL as a better teaching learning method compared to SGD (95.89%).

The small sample size, inadequate foundational knowledge of students, lack of interest of students in the topics, and paucity of effort in effective learning might have contributed to the results in the present study.

CONCLUSION

The CBME curriculum demands the introduction of newer teaching learning methods to facilitate student centred learning. There is no single method of teaching that ensures optimum learning among undergraduate students. Based on literature review showing the effectiveness of CBL as a good teaching learning method, this study was conducted with the above objective. But the present study could not find a statistically significant improvement in post-test with CBL method.

Based on student's feedback we could infer that case-based learning was more effective than small group discussion in making the concepts clear. CBL also stimulated active learning, improved the student's skills and confidence in case analysis and solving clinical problems. The students expressed confidence in performing better in the examination where they have to answer case based modified essay questions. They were also of the opinion that there was more active interaction in CBL classes and recommended CBL as a better teaching learning method compared to SGD.

Recommendations

CBL is effective for students who have already acquired foundational knowledge in the subject. So, this teaching learning method will be more effective for 9th semester students in Pediatrics during their review posting. During this period, learning through CBL is expected to help the students to build on prior knowledge, integrate knowledge and apply the knowledge to future clinical situations. Hence CBL can be used as an adjunct to conventional method of teaching in Pediatrics among undergraduate students. This method will stimulate the students in active learning, improve their skills in clinical analysis and problem solving and help them to face examination with confidence and score better marks

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