



Case Based Learning as a Teaching Learning Tool for Microbiology

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Medical and health care related education is currently changing. In the present day scenario, didactic lectures are the main stay of teaching Microbiology in most of the medical Colleges. However didactic lecture is a teaching centered method that promotes passive learning. Active learning that integrates the knowledge of basic sciences with clinical conditions is the need of the hour. Case Based learning (CBL) is an interactive student centered approach that engages students in the process of making real world decisions.

Aim: The present study has been planned to assess the effectiveness of case based learning as compared to traditional lecture in teaching Microbiology and also to find out the students and faculty perception on Case based learning.

Materials and Methods: The study was conducted in the Department of Microbiology, ACS Medical College and Hospital, Chennai. Two diseases namely Hepatitis-B and Rabies were selected. Study involved 104 students from II MBBS and they were divided into two groups. Group A underwent a CBL session on Hepatitis-B and Group B had the Didactic lecture session on the same topic and the groups were crossed for the second phase on Rabies. Pre and post-test were conducted for both the groups and the results were analyzed using paired and unpaired t-test. Lastly structured feedback questionnaire on acceptability and usefulness of CBL was obtained from the students and the faculty.

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Results: The performance of the students showed a significant improvement after the CBL sessions when compared to the Didactic lecture. Majority of the students felt that CBL is better in understanding Microbiology topic.

Conclusion: The present study shows that CBL is a better method than Didactic Lectures. Therefore CBL can be used as an adjunct to the lectures to strengthen the traditional T/L methods through active learning.

Keywords: Case based learning; CBL; didactic lecture; active learning.

1. INTRODUCTION

In current medical education, learning relevant to the health requirements of the community is the need of the hour [1]. An ongoing challenge for science educators is to find effective ways to facilitate the successful achievement of learning outcomes by undergraduate students. Beyond the learning of content, there is a general need to develop problem-solving, critical thinking, and communication skills [2]. Medical educators are concerned about the conventional methods of teaching not providing a required impact on student learning [3]. Learning should be closely related to the understanding and solution of real world problem. It has been reported that medical graduates in India generally possesses reasonably sound knowledge of medical science but they are often found deficient in the performance of clinical skills and problem solving, which form the core of clinical competence [4,5]. In most of the medical schools, microbiology is taught in classrooms and practical and clinical exposure is almost negligible, so that is why students could not understand its usefulness in routine practice [6,7]. However current trends in medical education are a move away from teacher-centered passive learning environment to a student centered active learning [8]. Case based learning (CBL), a very well-known teaching learning method, adopted by many especially in medical teaching is very useful. It helps learner to identify what they already know and to restructure, elaborate their knowledge and provide bridge between existing and new information. Moreover CBL is student centered, taken in small groups where teacher acts as facilitator or guide [9]. The method of teaching clinical microbiology based on clinical concepts will facilitate higher order learning, critical thinking and self-directed learning [10]. Further the new competency based curriculum released by the National Medical Council emphasizes the student centered active learning. So the present study was conducted with the aim of evaluating the efficacy and acceptability of CBL as an

effective tool for promoting active learning in Microbiology for undergraduate students.

2. MATERIALS AND METHODS

This study was conducted in the Department of Microbiology, ACS Medical College and Hospital, Chennai, for the II-MBBS students. This study was done as a part of the Advanced Course in Medical Education.

A total of 104 students from II MBBS who volunteered to participate and attended all the sessions of interventions and assessment were included in the study. Students were sensitized about the group dynamics and also about the nature and purpose of the study. Faculty members of the department were sensitized and trained for group dynamics and CBL session. Two topics namely Hepatitis-B and Rabies were selected. Learning modules for the CBL session on the selected two topics were prepared and validated by the faculty members of the Microbiology department and a clinician from the Department of General Medicine. Learning module included case based scenario, learning objectives and few critical thinking questions for discussion. The case scenario included the clinical problem, history of patient (including personal, family history, immunization history), laboratory investigations, provisional diagnosis, and treatment chart.

Two diseases namely Hepatitis-B and Rabies were taught in two phases respectively. Students were divided into two large groups - Group A and B. In the first phase, Group A underwent a CBL session on Hepatitis-B and Group B had the same topic in Didactic lecture form. Cross over of groups was done for the second phase on Rabies.

CBL was conducted in two sessions. The group which underwent CBL was further divided into small groups of 10 -12 with one facilitator for each group. During the first session, the case based scenario on the selected topic was

introduced. Each clinical scenario was followed by few questions to meet the learning outcomes of the CBL session. Students were given adequate time to solve the problem and try to find out the answers to the questions given at the end of scenario. Subsequently, the students were given the specific learning objectives.

During this session, intra-group discussion was promoted. The facilitators ensured the participation of each and every student by motivating them and guiding them to find out a solution for the problem. Also, students were guided for list of learning material and references for further learning. During the subsequent session the case was discussed in detail ensuring the participation of every student. In this session, intergroup discussion was promoted. Relevant questions were asked by the facilitator to streamline the thought process and ensure that the students don't deviate from the main learning objective. The facilitators encouraged the students in a learner centered environment and encouraged active participation to reach the final conclusion.

Pre and post- test were conducted for both the groups. Lastly structured feedback questionnaire using 5 point Likert scale on acceptability and usefulness of CBL was obtained from all the students and the faculty. Results were tabulated and analyzed.

Statistical analysis was performed using SPSS version 22. Scores were expressed as mean ± standard deviation and a P value of <0.05 was considered to be statistically significant. Using Students' paired and unpaired t- test, the pre and post test scores were analyzed.

3. RESULTS

A total of 104 students from II MBBS voluntarily participated and gave their feedback on both the teaching methods under study. Table 1 shows the comparison of pre and post test scores of CBL and Lecture method. It was observed that the post test scores of both the groups were higher than the pre test scores (P<0.0001) in both types of Teaching-Learning (T/L) method. Table 2 shows the comparison of post test scores of CBL and lecture method.

On comparing the post test score of CBL with the post test score of Lecture, CBL was found to be higher and statistically significant than the lecture (P<0.001). The feedback of students on CBL is shown in Table 3 and Fig. 1. Students perceived CBL as a better teaching method than the traditional lecture method. Majority of the students felt (92%) that CBL was better than conventional lectures in understanding the topic. The feedback analysis on both the students' and faculty perception on CBL gave a positive response for the CBL sessions.

Table 1. Effectiveness of lecture and CBL

Teaching learning method	Topic	Group	Test	N	Mean	SD	t value	p value
Lecture	Rabies	A	Pre test	52	3.58	1.34	12	<0.001
			Post test	52	6.94	1.42		
CBL	Rabies	B	Pre test	52	3.94	1.33	23.4	<0.0001
			Post test	52	9.13	0.77		

Table 2. Effectiveness of intervention with CBL

Topic	Post test score	Mean	SD	t value	p value
Hepatitis-B	CBL	8.51	1.41	2.5	<0.01
	Lecture	7.71	1.52		
Rabies	CBL	9.13	0.77	9.82	<0.001
	Lecture	6.94	1.42		

Table 3. Students' perception on case based learning

S. no	Questions	Strongly Agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly disagree (%)
1.	Clinical case given in today's class was interesting.	86%	10%	2%	1%	1%
2.	CBL stimulated my desire to learn	82%	14%	2%	1%	1%
3.	CBL session was very important in terms of development of critical thinking.	84%	11%	4%	0%	1%
4.	Role of facilitator was important in CBL session.	88%	7%	3%	1%	1%
5.	CBL is better than lecture method in understanding the topic.	89%	8%	0%	1%	2%
6.	Promoted meaningful learning than the didactic lecture.	90%	6%	2%	0%	2%
7.	CBL motivated me to learn Microbiology	82%	12%	4%	1%	1%
8.	CBL improved my communication skill and team work	77%	17%	4%	1%	1%
9.	CBL helped to interpret laboratory results	74%	21%	3%	1%	1%
10.	CBL improved my clinical reasoning ability	84%	13%	2%	0%	1%

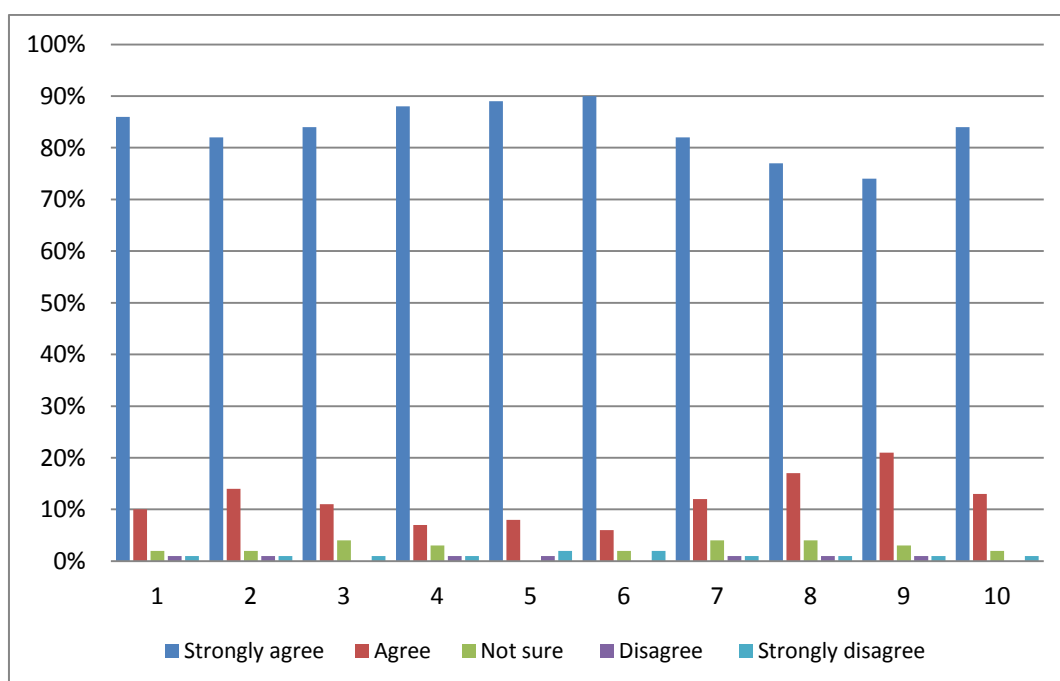


Fig. 1. Students' perception on case based learning session

4. DISCUSSION

Recent decades witnessed an increase in the efforts to enhance the traditional methods of teaching, including those utilized in institutions of higher education [11,12]. Various teaching-learning methods have come into play for better teaching that benefit the students and in turn help in improvement of patient care. Lecture is probably the oldest and most widely used method of teaching used throughout the world. However, it has some limitations because the students are mostly passive during a lecture, which results in their attention waning quickly [13]. Unlike the traditional learning, active learning requires the students to take part in activities that involve higher-order thinking. It is generally accepted that the chances of retaining the learned material will be better if the learning occurs around a realistic problem. Case-based learning (CBL) is an interactive student-centered exploration of real life situations. Considering this the present study was conducted to assess the efficacy and acceptability of CBL as an effective tool for promoting active learning in Microbiology for undergraduate students.

The utility and the effectiveness of this newer teaching methodology were assessed by analyzing the students' performance in the pretest and post test scores. In the current study, the difference of mean pretest-post-test scores has showed significant improvement in knowledge in both CBL and DL groups, proving both as effective TL methods. However the study showed a significant increase in the post test scores of the students taught by CBL compared to the traditional lecture method. During the CBL session, it was observed that all the students were curious and attentive and showed their enthusiastic participation in case discussion.

Students' perception on the Case Base Learning was analyzed using structured questionnaire focusing on the different teaching learning aspects. The analysis has shown a positive response of the students for CBL.

Even the faculty feedback on CBL was positive and almost all the faculty felt CBL as an interesting and innovative teaching learning method. CBL is the best method that helps in the clinical application of the knowledge obtained from basic sciences.

5. CONCLUSION

The study revealed that the interactive case based learning helped the students to understand the basic microbiological concepts better. There was a positive response shown by both faculty and students to hold CBL sessions in future. Therefore CBL can be used as an adjunct to the lectures to strengthen the traditional T/L methods through active learning.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was conducted after getting approval from the Institutional Ethics Committee, ACS Medical College and Hospital, Chennai.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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