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Assessment of Implementation of Case Based Learning Approach in Medical Microbiology.

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ABSTRACT

Essential attributes of Medical education includes critical thinking, clinical reasoning & clinical correlations which are important for proper diagnosis and management. Teaching through conventional methods, there is inadequate retention of Microbiology concepts, inadequate development of skills in laboratory diagnosis and clinical correlation. It has been observed that conventional techniques fail to stimulate students' analytical and reasoning skills and their problem-solving ability. Objectives - To study the effectiveness of CBL as Teaching/Learning (T/L) method in Microbiology as compared to didactic lecture and to study the perception of II MBBS students about the CBL approach as a T/L method in Microbiology. IInd year MBBS students from BAVMC, Pune were the participants of the project. Two batches (A and B) were exposed to Didactic lecture & CBL respectively in 1st week for topic 1 and then cross-over was done in second week for the Topic 2. The students' knowledge before and after both the sessions was assessed by Pre and Post-test questionnaire. Perceptions of students about CBL was assessed by pre-validated questionnaire using a five-point Likert scale. Out of whole batch of IInd MBBS students 77 students had participated in session on Topic 1. Post test scores of both methods of topic 1 were found to be more (statistically significant) compared to pretest scores of each method. In comparison of posttests of both methods; score of CBL method was found to be more and this difference was statistically significant. A total of 69 students had participated in session for topic 2. Post test scores of both methods of topic 2 were found to be more (statistically significant) compared to pretest scores of each method. In comparison of posttests of both methods in topic 2; score of CBL method was found to be more and this difference was statistically significant. Most of the students perceived CBL as an effective T/L method compared to didactic lecture. Our study demonstrates that CBL method is found to be effective compared to didactic lecture method. It can be used in combination with traditional didactic lecture method for more effective teaching learning.

Keywords: Assessment, Case based learning, Medical Microbiology.

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INTRODUCTION

In Medical sciences while learning, critical thinking, clinical reasoning, and clinical correlations are vital attributes for appropriate diagnosis and management of a clinical condition [1,2]. It is crucial for medical students to acquire these required qualities through learning for better diagnosis and patient management.

The first two years in the Medical college are focused on pre-clinical & paraclinical branches (basic sciences) where students learn various basic science subjects with less or no emphasis on how knowledge or skills will be applicable or useful in understanding, diagnosing, and managing real-life clinical cases, later when they progress to clinical years [3].

It has been observed that conventional teaching methods such as didactic lectures, where students act as a passive learner. These traditional methods often fail to stimulate students' analytical and reasoning skills and their problem-solving ability. As a result, there is inadequate retention of knowledge.[1] Much of the knowledge delivered through didactic lecture is focusing on recall (Lower cognitive domain) rather than comprehension and application (higher cognitive domain) [4].

Competency based Medical Education (CBME) adopted by National medical Commission provides an efficient outcome-based strategy; where different domains of teaching including teaching learning methods and assessment form the framework of different competencies [5]. Some classical examples of teaching methods adopted in CBME include problem-based learning (PBL) and case-based learning (CBL). These active and interactive learning methods which evoke students' interest, promote their learning and engage them in active discussion in solving a clinical problem. This helps students to enrich their knowledge and memory, critical and analytical thinking, and to develop their ability to utilize the appropriate knowledge in better understanding and diagnose real-life clinical cases during their clinical practicing years [6-9]. CBL is promoted worldwide because it is learner-centric, interactive and patient-oriented, instead of being teacher-centric, monotonous, and content-driven [10]. Considering all these aspects this study was undertaken to assess implementation of Case based learning approach in Medical Microbiology.

Objectives

- To study the effectiveness of CBL as teaching-learning method in Medical Microbiology as compared to didactic lecture.
- To study the perception of II MBBS students about the CBL approach as a teaching-learning method in Medical Microbiology

METHODOLOGY

Study Design: Interventional study

Study Setting: Bharat Ratna Atal Bihari Vajpayee Medical College, Pune

Study Sample: A whole batch of IInd (100 approx) MBBS students.

Study Duration: 6 months (July 2023 to January 2024)

IRC/IEC approval: Yes

Inclusion Criteria: Students who attended the class and were willing to participate in the study.

Exclusion criteria: Students who didn't attend the class and not willing to participate in the study.

Study procedure

The study was conducted by Department of Microbiology at Bharat Ratna Atal Bihari Vajpayee Medical College, Pune. IInd year MBBS students from BAVMC, Pune were the participants of the project. They were divided into two batches A & B. These two batches (A and B) were exposed to Didactic

lecture & CBL respectively in 1st week for topic 1 and then cross-over was done in second week for the Topic 2. The students' knowledge before and after both the sessions was assessed by Pre and Post-test questionnaire. (Diagram-1) Perceptions of students about CBL were assessed by pre-validated questionnaire using a five-point Likert scale.

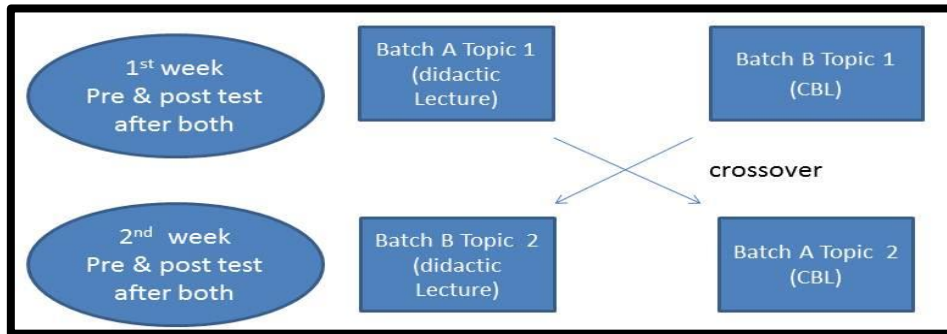


Diagram 1: Study procedure

Data analysis

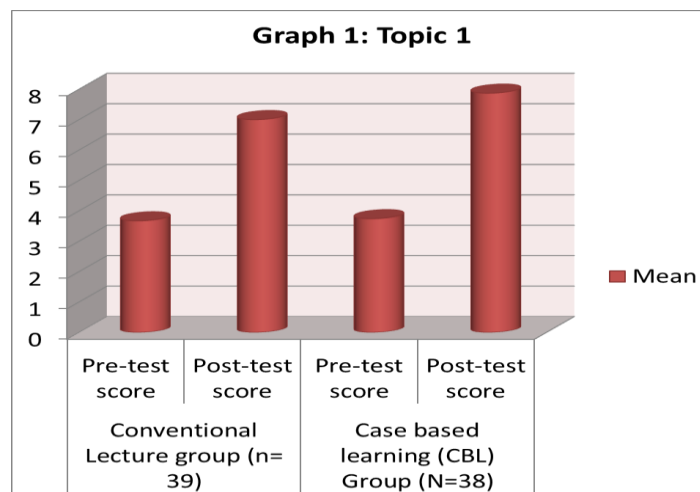
Comparison of Pre-test and Post-test score was done using appropriate statistical method in Both A and B groups in each session separately for topic 1 & Topic 2. Post-test scores in CBL group and Didactic lecture were compared by appropriate statistical method. Student responses on perception about case-based learning on 5-point Likert scales were analyzed using percentages.

RESULTS

Out of whole batch of IInd MBBS students 77 students participated in session on Topic 1. Post test scores of both methods of topic 1 were found to be more (statistically significant) compared to pretest scores of each method. In comparison of posttests of both methods; score of CBL method was found to be more and this difference was statistically significant. (Table: 1, Graph: 1)

Table 1: Comparison of Pre & post test scores of topics 1

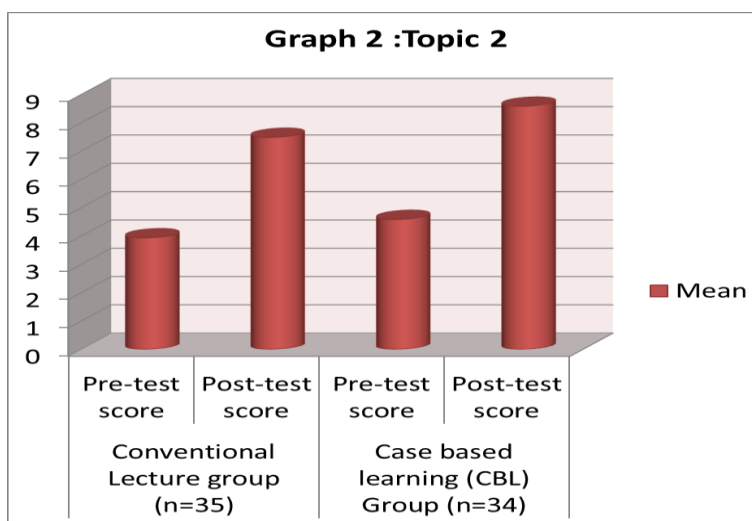
Topic 1 (N=77)	Conventional Lecture group (n= 39)		Case based learning (CBL) Group (N=38)		Lecture	CBL
	Pre-test score	Post-test score	Pre-test score	Post-test score	Post-test score	Post-test score
Mean	3.67	7	3.74	7.87	7	7.87
S.D	1.5	1.82	1.64	1.93	1.82	1.93
P value	<0.0001		<0.0001		0.0453	



A total of 69 students participated in session for topic 2: Post test scores of both methods of topic 2 were found to be more (statistically significant) compared to pretest scores of each method. In comparison of posttests of both methods in topic 2; score of CBL method was found to be more and this difference was statistically significant. (Table: 2, Graph :2)

Table 2: Comparison of Pre & post test scores of topics 2

Topic 2 (69)	Conventional Lecture group (n=35)		Case based learning (CBL) Group (n=34)		Lecture	CBL	
	Pre-test score	Post-test score	Pre-test score	Post-test score	Post-test score	Post-test score	
	Mean	3.94	7.49	4.59	8.59	7.49	8.59
	S. D	1.80	1.95	1.76	1.31	1.95	1.31
P value	<0.0001		<0.0001		0.0078		



Student perception on different revalidated questionnaire about Case Based Learning was recorded and has been shown in detail in Table No.3.

Table 3: Student perception about Case Based Learning method

Question/ Response (n=71)	Strongly agree	agree	neutral	disagree	Strongly disagree
CBL sessions held my interest	54.93	42.25	2.82	0	0
CBL sessions improved my critical thinking and problem-solving ability	46.48	50.70	2.82	0	0
CBL sessions motivated me to learn	59.15	39.44	1.41	0	0
CBL has enhanced my communication skills	47.89	46.48	5.63	0	0
CBL increased my analytical skills	42.25	52.11	5.63	0	0
The time allotted for the case studies was adequate	45.07	52.11	1.41	0	1.41
CBL helped me gain skills in working with others	36.62	54.93	8.45	0	0
CBL has facilitated my independent learning abilities	45.07	52.11	2.82	0	0
CBL has improved my learning skills	40.84	56.34	2.82	0	0
CBL helped to focus on key areas and a better understanding of concepts	39.44	53.52	7.04	0	0

CBL will help to make clinical correlation for diagnosis in real clinical practice	43.66	50.70	5.63	0	0
CBL provides benefits in terms of knowledge and long-lasting memory	45.07	52.11	2.82	0	0
CBL sessions are useful to prepare for the exam	52.11	42.25	5.63	0	0
The faculty present during CBL facilitated the whole process	53.52	40.84	5.63	0	0
Explaining information to others (before/during/after CBL) helped me better understand the learning objectives	50.70	49.30	0	0	0

DISCUSSION

Medical education in India has witnessed a paradigm shift after the introduction of Competency Based Medical Education (CBME) in Medical Institutes across the India since 2019. CBME is an outcome-based, student centric strategy which endorse the use of variety of teaching-learning methods to create a competent Indian Medical Graduate (IMG) [11]. Therefore, various teaching learning methods such as Case Based Learning (CBL), small group discussions and bedside teaching are being started across the country, which would ensure sensitization of the faculty and students.

Case-based learning (CBL) is an andragogical approach in which a case or inquiry is used to acquire knowledge, skills, and attitude. It engages students in the discussion of a clinical case that resembles a real-life situation and provides information such as history, physical findings, and laboratory results. Students interact with each other and work together through the team work to solve the case. Here the teacher act as a facilitator [9,12].

In our study, . Post test scores of both methods (didactic lecture & CBL) of both the topics (1 & 2) were found to be more (statistically significant) compared to pretest scores of respective method. In comparison of posttests scores of both methods; score of CBL method was found to be more and this difference was statistically significant in both the sessions. Similar observation was found by Baheti *et al*, Sagwan *et al* [4,12]. But, in another similar study conducted by Kaur G *et al* who found no significant difference in the performance of the participants among the said two groups, but the participants felt the CBL sessions to be more interesting as well as motivating [13]. Since CBL is a learner centric approach where the students collectively address the clinical problems from a perspective that requires critical thinking, analytical reasoning, clinical correlation; it also helps in a longer retention of the concept learned.[9] Therefore, in this way, CBL can help improve a student’s understanding of the applied aspects of Clinical Microbiology.

Different questions were asked to know the perceptions of students about CBL. 54.93% students strongly agreed that CBL held their interest. Similar observation was made by Sannathimmappa, *et al* & Baheti *et al*. [1,4] In the present study, the vast majority of the students felt that CBL was an effective learning method and it strengthened their learning, enhanced their critical and analytical thinking skills, and motivated them for self-directed learning. Multiple studies on CBL in different places and different medical specialties conducted across the globe have reported similar findings [3,9,14-18].

More than half of the percentage of the students felt strongly that CBL has enhanced their communication skills, they have gained skills while working with others. Similar observations also made by Singhal *et al*, Ciraj *et al* & Tayem *et al* [3,9,18]. Most of the participants agreed on the notion that CBL sessions are useful to prepare for the exam. Singhal *et al*, Baheti *et al*, Jain *et al* and Tayem *et al* had also reported the similar observations in their study [3,4,11,18].

Also, in our study more than half of percentages of students have agreed or strongly agreed that CBL has helped to focus on key areas and a better understanding of concepts, it will help to make clinical correlation for diagnosis in real clinical practice and provides benefits in terms of knowledge and long-lasting memory. Sannathimmappa, *et al*, Jain *et al*, Sagwan *et al* had also reported similar findings in their study [1,11,12].

CONCLUSION

Our study demonstrates that CBL method is found to be effective compared to didactic lecture method. It can be used in combination with traditional didactic lecture method for more effective teaching learning. It will provide an excellent opportunity for students to learn better through active participation, critical thinking, and clinical reasoning. It will also enhance their conceptualization, knowledge retention, and better preparedness for examination. It should not replace the didactic lecture method as conduction of CBL requires adequate resources in terms of adequate time and a considerable number of trained faculty for successful execution of conducting CBL sessions as a teaching learning method in Microbiology. Definitely, an attempt should be made to incorporate it along with lectures in clinically important topics, especially in the early phases of undergraduate medical curriculum.

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