



Original Research Article

Impact of case-based learning approach in clinical microbiology on second-year students: A prospective observational study

M Wajid¹, Saranya M², Shazia Naaz¹, Lakshmi Jyothi T^{3*}, Vivek Hada⁴, Usha Rani⁵, Swathi Suravaram¹, Ariyanachi K³

¹Dept. of Microbiology, ESIC Medical College & Hospital, India

²Dept. of Microbiology, Government Medical College, Kurnool, Andhra Pradesh, India

³Dept. of Microbiology, All India Institute of Medical Sciences, Bibinagar, Telangana, India

⁴Dept. of Microbiology, All India Institute of Medical Sciences, Gorakhpur, Uttar Pradesh, India

⁵Dept. of Microbiology, Government Medical College, Mahbubnagar, Telangana, India



ARTICLE INFO

Article history:

Received 04-10-2021

Accepted 20-04-2022

Available online 13-03-2024

Keywords:

Case based learning

Newer teaching learning methods

Didactic lectures

Evaluation

ABSTRACT

Introduction: Case-based learning (CBL) is an interactive student-centred exploration of real-life situations. It has been used in addition to didactic lectures (DL) in the medical curriculum for strengthening the students' critical thinking, clinical reasoning, and better understanding of the disease and its management.

Materials and Methods: 100 students were divided into 2 groups. Group A was exposed to CBL first and didactic lectures later and Group B were exposed to didactic lectures and then to CBL, with pre and post tests conducted with questionnaire each time.

Results: 91% of the students were satisfied with the newer teaching learning method and 94% of the students felt the teaching method must be student centric.

Conclusion: CBL revealed improvised learning among the students and enhanced their communication skills and long term memory, while with didactic lectures, the students seemed not too keen on applying and implementing the topics.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Medical education is a complicated one with theory in form of didactic lectures, practicals and clinical case studies with live patients. In the first two — 2&1/2 years of medical education, the students are mainly exposed to conventional lectures and practicals in a practical lab in the college atmosphere. The clinical application of these subjects during these years is comparatively minimal and is basically done when the student ultimately enters the 3rd year with the clinical subjects. Thus, the students feel the pressure to secure good marks in these subjects and tend

only to read and learn rather than to apply the knowledge in the clinical setting'.¹

It is essential for the student to have an active learning method rather than passive absorption of information, which is normally seen in didactic lectures to understand the subject and retain the information for a longer period of time.²⁻¹³

The microbiology teaching is quite challenging as it involves the student to learn many microorganisms with similar properties leading to confusion during memorising. An introduction of clinical correlation would be beneficial in teaching as well as learning'. Case based learning or case study learning or case method learning was first introduced

* Corresponding author.

E-mail address: dr.tjyothi@gmail.com (Lakshmi Jyothi T).

by Baron Carl von Rokitansky, a Viennese pathologist over 50 years ago in his teachings on correlation between pathological anatomy and disease presentation'.¹⁴

Medical Council of India (MCI) and now National Medical Council (NMC) has recommended a clinical and case based learning for the 1 and 2nd year students also as a new curriculum all over India. This led to the introduction of problem based student centric curriculum, which demanded an active participation from the students and motivated them for self direct learning. This new curriculum is being implemented by all the medical colleges, all across India. This change is a new trend in contrast to the conventional teaching methods, thus it is a great challenge to train not only the students, but also the faculty in the newer ways of training.^{15–17}

This style of teaching introduces the application of the knowledge in the clinical settings by more active and interactive learning methods so that the student is able to assess a situation critically and analytically.^{1,2,5,6} Hopefully, the conventional taking notes during the class and memorising before exams will be a thing of the past in the foreseeable future.

The newer trends include case based learning, which basically involves the presentation of a real life scenario, with the students using their knowledge to interact with each other and with the instructor to solve the problem. The case involves the sign and symptoms of the patient, case history and investigational data, which are presented to the student. The students critically analyse the case and interact with each other to come to a diagnosis. This instructor here merely acts as a facilitator.^{2,6,7}

This study was therefore done to determine the effectiveness of case based learning approach as a preferred teaching method in comparison to Conventional Didactic Lectures with the feedback obtained from the undergraduate MBBS students.

2. Materials and Methods

This prospective study was conducted by the Department of Microbiology at ESIC Medical College & Hospital, Hyderabad, India. The study group included 100 Medical students attending microbiology classes with 75% attendance and more. Students who did not attend exams and those who did not have at least 75% attendance were excluded from the study. The study content was explained to the students and informed consent was taken from all the students included in the study as well as the concerned staff members and the medical education unit members.

The students were divided into 2 groups of 50 each. Group A attended case based learning for the first time at the start of the study and later Didactic lecture. An internal examination was conducted after the CBL session to assess the performance. Group B attended Didactic lectures first

followed by the internal examination and then case based study was done for them.

For Case based learning, the Group of 50 students were further divided into 5 smaller groups of 10 each (A1, A2 — A5 & B1, B2 — B5). Each small group had a faculty as a facilitator to guide their discussions. 1 week prior to the day of the CBL, the topic which was on applied microbiology was given to the students, with the case scenario handouts, important articles, videos, PPTs etc. A questionnaire was prepared and given to the students with related questions to guide them with the method of interpretation and clinical correlation.

A pretest, in the form of multiple choice questions was given before the start on the day of discussion, which was for 2 hours. The discussion was started by the facilitator by putting forth the scenario and allowing the discussion to carry on. All the students were given the opportunity to discuss and put up their ideas within the purview of the set questionnaire. A group leader, who was chosen before the start of the discussion would summarise the discussion answering all the questions in the questionnaire. At the end of the session the students were asked to answer the posttest questionnaire.

In the next session, which was after the 1st Internal assessment examination, the students attended a different topic vide didactic lecture for 1 hour. A pretest and a post test was taken for the same before and after the session.

For Group B, similar pattern was followed, except that didactic lecture was taken first for them for 1 hour with pretest and post test questions. This was followed in the next session after the Internal Examination by case based learning for 2 hours, where the group was divided into smaller groups of 5 with a facilitator for each group as was done for the Group A. Pretest and post test was done before and after the session and during the session, all the students were made to involve in the discussions as per the given questionnaire.

A 3 point Likert scale was given to the students with 24 questions and with 6 questions to the faculty to know their opinion on the usefulness of CBL. Data was collected and the evaluation was done with Kirkpatrick Model.

3. Results

Out of the 100 students included in the study, 91% were satisfied with the new CBL method, and 83% of the faculty showed a positive response to the same.

In the pretest scores in the Group A, during the CBL method, the minimum marks scored was 17 by 5 students (10%) and the highest was 22 by 2 students (4%), while in the post test, the least marks scored was 20 by 1 (2%) students and 25 out of 25 was the highest score by 1 (2%) students. Most of the students in the pretest scored 20 by 15 (30%) of the students followed by 18 and 21 by 10 (20%) students each. In the post test, the most common score was

23 by 18 (36%) of the students while 13 (26%) scored 22 out of 25 marks (Figure 1).

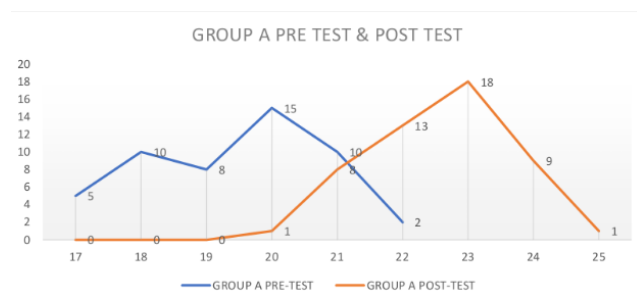


Figure 1: Pre and post test scores for CBL by group

The Likert scale for feedback was given to the 7 faculty members with 6 questions on CBL method. (14.3%) staff member disagreed that didactic lecture was a better method of teaching compared to CBL, while 2 (28.6%) were neutral and 4 (57.1%) agreed that Didactic was better and a II these 4 found CBL to be cumbersome. All the faculty members agreed that this technique is the way of the future and must be implemented, however, 2 of them maintained that the didactic lectures should continue, while 4 wished CBL to replace the didactic lectures.

A 3 point Liked scale with 25 questions was given to the students to assess the CBL method. Most of them found CBL to be far better than the regular didactic lectures. They found that in the long term, CBL was better (68%) and 85% of the students found it to be good to remember the subject. 50% of the students found that CBL helped them to analyse the case and preparation off the subject and 44% of the students felt that they participated more in the class. Most of the students felt that the faculty was more approachable for doubt clearing and discussions, both during the class and after to class, thereby imbibing more confidence in them (72%). 78% said that they are able to concentrate well in the class and 58% said that they have become active learners.

4. Discussion

Learning the various microorganisms, whether bacteria, fungi, viruses or parasites and associating them with the disease in the patient is the essence of microbiology, In the conventional method, the organisms and the clinical relevance are taught in the second year, with an emphasis more on the theoretical knowledge rather than the clinical association, The students are expected to relate these learnt knowledge in the third year onwards, when the move on to the clinical subjects.

With the revised curriculum, and the introduction of the case based learning, the students are initiated to learn and apply the knowledge of the causative organisms and their clinical aspects in a give case scenario. The Introduction of CBL also encourages a small group teaching and

discussion, which enable the students to study before hand and participate in discussions, with personal attention given by the faculty.

In the present study, we found the students to be motivated and interested taking part in most of the discussions in the CBL method. This was similar to the results by Michel et al and Gurleen et al, who stated that the students found CBL more interesting.^{8,9}

Most of the students in the present study felt that CBL was a better study tool as compared to the didactic lectures as it gives them more opportunity to participate, discuss and analyse a case, In a similar study, Gupta et al found 76% of the students CBL session to be more interesting and easier to learn than didactic lectures, while in another study by Gurleen et al, 75% of the students found it to be better.^{9,10}

50% of the students in the present study felt that CBL method helped them to analyse and prepare better for their exams and 48% felt the memorising the ideas was better with CBL. A study by Tayem et al stated that 82% students were able to prepare better when exposed to CBL method rather that conventional lecture method.¹¹ Similar was the case with 74% of the students in a study by Gurleen et al and 89% by Gupta et al.^{9,10} In a study by Dube et al, 50% of the students felt CB to be better, which was similar to ours. We felt that since the study was done only for 8 weeks, we had a lower result. With more exposure to the CBL over time, more students would be interested.

72% of the students stated that they felt more confident with the CBL learning method and 88% of them felt that it helped them to be less stressful as compared to the didactic lectures especially before the examinations. A study by Adiga and Adiga state that CBL helped in achieving strategy, deep achieving approach, triggered motivation among the students.¹² Chilwant et al reported that 73% of the students were motivated with the CBL method of study and 71% of them feel that they would fare better in the examinations.¹³

68% of the students in the present study felt that this method would be better than the regular didactic lectures and 70% of them suggest more classes to be conducted with CBL rather than the conventional method. A study by Chilwant reported a 76% of students who were willing the didactic lectured to be replaced by the case based learning method.¹³

5. Conclusions

Our faculty was a little more laid back. Since most of them were used to the conventional teaching methods, they were a little hesitant in the CBL method and found didactic lectures to be easier to teach. They felt that the CBL method was more cumbersome, though they felt that it was a good change in the teaching method. However, it was felt that in future the teaching should shift towards the clinical case scenario so that the students would discuss more. In a study

Table 1: Feedback of students for CBL method by faculty

Questions	Agree	Strongly agree	Neutral	Disagree	Strongly disagree
DL is much easier & good way of teaching	2	2	2	1	
CBL is good way of new teaching technique		5	2		
Cbl is cumbersome	3	1	3		
CBL helped students to perform better	4	1	1	1	
In Future this technique must continue in this college	5	2			
Didactic lecture should continue instead of replacing with CBL	2		1	4	

Table 2:

Questions	Agree	Neutral	Disagree
Knowledgeable in the long term	65	20	15
Frequently do you suggest this method	70	25	5
Good For long term memory	85	10	5
Faculty was more approachable even outside class	55	30	15
Able to analyse and prepare well	50	25	25
Better than conventional didactic lectures	68	13	19
Imbibes more confidence	72	11	17
Interesting and less stressful	88	2	10
Prefer case based learning	65	5	30
Participated more in class with CBL	44	18	38
CBL improved my learning skill	68	29	3
Could interact more with faculty during class	62	28	10
Memorizing facts and ideas with CBL was good	48	23	29
CBL was more problem solving	66	18	16
I am able to concentrate well with CBL	78	18	4
CBL can make me active learner	58	19	23
Reference materials indicated for CBL were useful	67	25	8

by Gurleen et al, the faculty felt that the CBL experience was very motivating not only to the students, but to the faculty as well.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

- Ghosh S. Combination of didactic lectures and case-oriented problem-solving tutorials toward better learning: perceptions of students from a conventional medical curriculum. *Physiol Educ.* 2007;31(2):193–7.
- Ciraj AM, Vinod P, Ramnarayan K. Enhancing active learning in microbiology through case based learning: Experiences from an Indian medical school. *Indian J Pathol Microbiol.* 2010;53(4):729–33.
- Armbruster P, Patel M, Johnson E, Weiss M. learning and student-centered pedagogy improve student attitudes and performance in introductory biology. *CBE Life Sci Educ.* 2009;8(3):203–13.
- Chan WP, Hsu CY, Hong CY. Innovative "Case-based integrated teaching" in an undergraduate medical curriculum: Development and teachers' and students' responses. *Ann Acad Med Singap.* 2008;37(11):952–6.
- Hashim R, Azam N, Shafi M, Majeed S, Ali S. Perceptions of undergraduate medical students regarding case based learning and tutorial format. *J Pok Med Assoc.* 2015;65(10):1050–5.
- Sharma N, Choudhary R. Evaluation of acceptance for case based learning in the undergraduate medical curriculum. *Sch J Appl Med Sci.* 2015;3(6C):2365–8.
- Tathe SS, Singh A. Case based lectures versus conventional lectures for teaching Medical Microbiology to undergraduate students. *Int J Cur Res Rev.* 2014;6:35–41.
- Michel MC, Bischoff A, zu Heringdorf D, Neumann D, Jakobs KH. Problem- vs. lecture-based pharmacology teaching in a German medical school. *Nounyn Schrniedebergs Arch Pharmacol.* 2002;366(1):64–8.
- Kaur G, Rehncy J, Kahal KS, Singh J, Sharma V, Matreja PS, et al. Case based learning as an effective tool in teaching Pharmacology to Undergraduate Medical Students in a large group setting. *J Med Educ Curric Dev.* 2020;7:2382120520920640. doi:10.1177/2382120520920640.
- Gupta K, Arora S, Kaushal S. Modified case based learning: our experience with a new module for pharmacology undergraduate teaching. *Int J Appl Basic Med Res.* 2014;4(2):90–4.
- Tayem YI. The impact of small group case-based learning on traditional pharmacology teaching. *Sultan Qaboos Univ Med J.* 2013;13(1):115–20.

12. Adiga S, Adiga U. Problem based learning-An approach to learning pharmacology in medical school. *Blamed Res.* 2010;21(1):43–6.
13. Chilwant KS. Comparison of two teaching methods, structured interactive lectures and conventional lectures. *Biomed Res.* 2012;23(3):363–6.
14. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, Macdougall C, Matthews P, et al. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Med Teach.* 2012;34(6):421–44.
15. Competency based undergraduate curriculum for the Indian Medical Graduate. Alignment and Integration. [February 12, 2020]. Available from: <https://www.nmc.org.in/rules-regulations/graduate-medical-education-regulations-1997/>.
16. Badyal DK. Pharmacology education in India: challenges ahead. *Indian J Pharmacol.* 2016;48(Suppl 1):3–4.
17. Available from: https://www.nmc.org.in/wp-content/uploads/2017/10/GME_REGULATIONS-1.pdf.

Author biography

M Wajid, Associate Professor

Saranya M, Assistant Professor

Shazia Naaz, Assistant Professor

Lakshmi Jyothi T, Additional Professor

Vivek Hada, Assistant Professor

Usha Rani, Associate Professor

Swathi Suravaram, Assistant Professor

Ariyanachi K, Assistant Professor

Cite this article: Wajid M, Saranya M, Naaz S, Lakshmi Jyothi T, Hada V, Rani U, Suravaram S, Ariyanachi K. Impact of case-based learning approach in clinical microbiology on second-year students: A prospective observational study. *Panacea J Med Sci* 2024;14(1):11-15.