

USE OF CASE BASED LEARNING AS A TEACHING LEARNING METHOD IN UNDERGRADUATE PATHOLOGY TEACHING- OUR EXPERIENCE.

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ABSTRACT

Background

The CBME Curriculum introduced by NMC is a subject based education. Newer components like alignment and integration provide an understanding of the interconnectedness between subjects and their application in patient care. Pathology bridges the basic sciences with the clinical sciences. Case Based Learning (CBL) is a pedagogical method in which the basic sciences are studied in relation to a case. It lays emphasis on the development of higher orders of cognition like interpretation and application rather than promoting learning by rote.

Aims & Objectives

The objectives of this study were to assess the effectiveness of CBL as a Teaching Learning (TL) method in Pathology and also to analyze the perceptions of Phase II MBBS students regarding this TL method.

Settings & Design

The study setting was the Department of Pathology. It was a prospective interventional study using qualitative and quantitative (mixed method) study design. All Phase II MBBS students were included in this study. 5 sessions of CBL were conducted with a pre and post-test.

Statistical Analysis Used

The statistical analysis of the Pre and Post test scores was done using a Two Tailed Wilcoxon Signed Rank Test. Feedback was taken using a 5-point Likert scale and percentages were used to analyze the feedback.

Results

A significant improvement ($p < 0.001$) was noted in the mean post test scores. The CBL sessions helped arouse interest in the topic (91.9%) and improve clinicopathological correlation skills (91.2%).

Conclusion

CBL promotes clinical correlation skills and serves as an excellent platform for the implementation of integrated learning in Pathology. It is recommended that more topics should be taught using CBL mode of TL to make the learning experience more practical oriented.

Key words: Case Based Learning, Pathology, Phase II MBBS, Teaching Learning

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Introduction

The Competency Based Medical Education (CBME) curriculum introduced by National Medical Commission (NMC) in 2019 provides the learners a subject based education, so as to help them develop strong fundamental concepts of the subject. At the same time inclusion of newer components like Alignment and Integration also

Provides an understanding of the "interconnectedness" between subjects and thus their final application towards patient care. [1]

The CBME curriculum has also brought about a shift in the teaching methods from a traditional teacher centred,

lecture-based teaching model to a student-centred approach with more emphasis on small group teaching methods. Pathology is a bridge linking the basic sciences with the clinical sciences. The four aspects of the disease process that form the core of pathology are etiology, pathogenesis, morphological and molecular changes and clinical features.^[2]

A strong foundation of Pathology thus provides answers to all the Whys & Hows of the disease. The role and significance of Pathology is rightly summed up by the Father of Modern Medicine, Sir William Osler who quotes, "As is our Pathology, so is our Practice". One of the most effective ways of teaching Pathology is using Case Based Learning (CBL), a pedagogical method that demonstrates linkage between theoretical knowledge and practical applications. Though CBL has been used as a teaching learning (TL) method in various disciplines of medicine since a long time, it has gained more importance as a student centric teaching tool in the post CBME era as it provides an excellent platform for implementing integrated learning.

This study focusses on our experience of using CBL as a TL method for teaching Pathology to the Phase II undergraduate medical students. It provides insights about the effectiveness, student perceptions and challenges faced in the implementation of this teaching methodology.

The objectives of this study were to assess effectiveness of CBL as a TL method in Pathology to improve interpretation and analytical skills of Phase II MBBS students and also to analyse their perceptions regarding this teaching method.

Methods

Study setting

This study was carried out in the Department of Pathology of a Medical College situated in Western Maharashtra, India

Study design

Mixed Method Study Design. The study was a Prospective Interventional study using both Quantitative (numeric) and Qualitative (descriptive) research elements.

Inclusion criteria

All the Phase II MBBS students were included in this study.

All the faculty members of the Pathology Department and the Phase II MBBS students were initially sensitized about the study. 5 sessions of CBL were conducted:

1. Interpretation of Liver Function Test- consisting of 3 cases- Hemolytic Jaundice, Hepatogenous Jaundice and Obstructive Jaundice
2. Nephrotic Syndrome, Nephritic syndrome and Urinary Tract infection-consisting of 3 cases- Minimal Change Disease, Post Streptococcal Glomerulonephritis and Urinary Tract Infection.
3. Acute Kidney Injury, Chronic renal failure and Diabetic Nephropathy- consisting of 3 cases- Shock, Chronic analgesic nephritis and Diabetic nephropathy
4. Meningitis: consisting of 3 cases- Pyogenic meningitis, Tuberculous meningitis and Viral meningitis
5. Cardiac Function Tests: consisting of 2 cases- Acute Myocardial Infarction and Angina Pectoris

These cases were prepared, discussed and later validated by the senior faculty of the Department of Pathology. Questionnaires for Pretest and Post test for each of the 5 sessions were also prepared and validated. The topics were chosen based upon the regular teaching schedule in progress at the time of the study. After the Didactic lectures of a particular system (e.g., Liver) the dates of the CBL session were announced to the students. There were 150 students in Phase II MBBS. These students were divided into 2 batches (A & B) of 75 students each. CBL sessions for the same topic were conducted for Batch A on Mondays and for Batch B on Fridays. Each batch was further divided into 3 smaller groups of 25 students each. Each of these smaller groups had a faculty as a facilitator. Prior to the conduction of the CBL session, the 3 facilitators discussed the conduct of the sessions so that a uniformity was maintained. The CBL sessions began with a pretest taken using a google form, discussion of cases and then a post-test taken using a google form.

Statistical analysis

In order to assess the effectiveness of CBL as a TL method in Pathology to improve interpretation and analytical skills of II MBBS students, statistical analysis of the Pre and Post test scores was done using a Two Tailed Wilcoxon Signed Rank Test. On the completion of all the 5 sessions, feedback about CBL as a teaching method was taken from the students using a 5-point Likert Scale and percentages were obtained.

Ethical Considerations

Institutional Ethical Committee approval was obtained before the commencement of the study. (IEC Approval Number: IEC/MIMER/2021)

Results

Session No	Test	Significance
1	Pre-4.95	<0.001
	Post-6.25	
2	Pre-7.18	<0.001
	Post-8.38	
3	Pre-5.88	<0.001
	Post-6.91	
4	Pre-6.90	<0.001
	Post-7.83	
5	Pre-7.70	<0.001
	Post-8.61	

Table 1: Analysis of Pre and Post test scores

A statistically significant improvement was noted in the mean post test scores as compared to the pre-test scores in all the five sessions (Table 1).

Sr. No	Question	Agree & Strongly Agree
1.	The CBL sessions aroused my interest in the topic	91.9%
2.	The CBL sessions improved my analytical skills	88.2%
3.	The CBL sessions helped improve my Clinicopathological correlation skills	91.2%
4.	The CBL sessions guided me towards Self Directed Learning	79.4%
5.	The CBL sessions helped my long term retention of the topic	83.1%
6.	The topics selected for the CBL sessions were good	77.9%
7.	The discussions during the CBL sessions helped improve my communication skills	66.9%
8.	The CBL sessions helped me to work as a team with my peers to understand the case	64.7%
9.	CBL sessions helped improve my interaction with my teachers	80.8%
10.	I enjoyed CBL sessions and would like more topics to be covered in this manner	85.3%

Table 2: Analysis of Feedback Using 5-point Likert Scale

91.9% of the students felt that the CBL sessions aroused their interest in the topic, while 91.2% felt that these sessions helped improve their clinicopathological correlation skills. Only 66.9% of the students felt that the CBL sessions helped them improve their communication skills while 64.7% felt that these sessions helped in working as a team with their peers towards understanding the case. (Table 2)

Discussion

CBL is a well-established pedagogical active learning method, the goal of which is to prepare the students for clinical practice, through the use of clinical cases. It is a guided inquiry-based learning method, linking theory to practice, through the application of knowledge in the interpretation of these cases. The earliest description of CBL dates back to 1912, where it was used by Dr James Lorrain Smith while teaching Pathology at the University of Edinburgh. [3]

CBL consists of a clinical case, a problem or question to be solved and a stated set of learning objectives with a

measured outcome. The students actively learn through the discussions involved in interpreting the clinical features, signs and symptoms, investigations provided to reach the diagnosis, complications and prognosis of disease states using these clinical cases. The facilitator helps build up knowledge during these sessions and thus the students are directed towards an active participatory mode of learning. CBL is thus considered as an educational paradigm, that allows students to develop a collaborative approach to their education by fostering integrated learning.

CBL is often compared and contrasted with Problem Based Learning. PBL is also an active learning strategy involving small groups in which the group focusses on solving a presented problem. However, unlike CBL, PBL is more self-directed, allows students to discuss the various aspects of the problem, based on their prior knowledge and with no guidance provided by facilitator even if learners move away from the problem. In PBL, the process is the outcome, while in CBL the outcomes are defined at the beginning of the learning session and need to be met. PBL is student driven, while in CBL, the entire

process is controlled by the facilitators who guide and direct the learning. Both these methods encourage team work and accountability promote active learning instead of passively receiving information, however, CBL is more structured. [3,4]

CBL has been used as an educational tool for promoting active learning to teach basic sciences like biochemistry, pathology, pharmacology and microbiology. [5-11] Using a case-based approach provides ample scope to develop strong fundamental concepts of the subject as well as provide an understanding of the “interconnectedness” between subjects and their ultimate application to patient care. [1,4]

One of the major problems encountered during the assessment of Phase II MBBS students in the subject of Pathology was that they were not able to apply theoretical knowledge in interpretation of clinical findings and investigations leading to difficulties in diagnosis of case scenarios. This was because Knowledge acquisition was restricted mainly to the lower levels of cognitive domain – Recall and less emphasis was laid on the development of higher orders of cognition like interpretation and application/problem solving. The new CBME curriculum provides ample opportunities by vertical and horizontal integration of the curriculum to prepare students to think like clinicians before they enter into the clinical arena. Increasing Collaborative Discussion in Case-Based Learning improves student engagement and knowledge acquisition Thus the major advantages of case-based learning are promotion of self-directed learning, clinical reasoning and decision making. [3,12]

In a similar study conducted by Dubey et al, where pathology topics related to hepatobiliary system was conducted as CBL sessions for Phase II MBBS students, 98.77% communicated that cases made learning the topic more interesting and 96.30% students felt more confident in handling the clinical situation. Case based learning also caused highly significant improvement ($p < 0.0001$) in higher level cognition and 95.06% of students expressed a desire for additional sessions for other topics. [6]

In our study also, the students agreed that the CBL sessions were an excellent tool to arouse their interest in the topic (91.9%) and that it helped improve their clinicopathological correlation skills (91.2%) and analytical skills (88.2%). 79.4% of the students felt that this TL method guided them towards self-directed learning.

Cross over studies using Didactic lecture and CBL have also been conducted for common topics like Microcytic hypochromic anaemia and pulmonary tuberculosis in a study conducted by Abhijeet Datta et al. Analysis of MCQ based pre-test results showed no significant difference in the pretest mean scores for didactic lectures and CBL groups of students, indicating the same level of pre interventional knowledge in students. The post test scores of the CBL groups were significantly higher than that of the Didactic lecture group. [7]

In a study by Nishant A et al, statistically significant improvement was seen in mean scores in post CBL test for 3 CBL session in Pathology. 87% of the students agreed that CBL helped in better understanding of the topic and in retention in memory. [13]

83.1% of the students in our study admitted that the CBL sessions helped in long term retention of the topic but since post-test was taken immediately after the CBL session so mainly the short-term retention of the students was analyzed. This is one of the limitations of the study. However, in the feedback taken at the departmental level at the end of the Phase II MBBS course on the impact of the various teaching learning methods, 90% of the students felt that the CBL sessions helped in better understanding of the subject and so helped in the long-term retention of the topic.

Being a guided inquiry method with the teacher acting as a facilitator, in our study the students interacted with the faculty more at an individual level than with their peers throughout the discussion. 80.8% of the students admitted that CBL sessions helped improve their interaction with the teachers. Limited time allotted for these sessions also at times does not facilitate team-based participation, particularly if the groups consist of more students. This led to the less scores for the point relating to working as a team (64.7%). The students also did not strongly feel that the CBL sessions helped improve their communication skills. (66.9%). The recent work by Schwartzstein and colleagues suggested that collaborative case-based learning (cCBL), a modification of CBL, in which much more smaller groups consisting of 4-6 students participate in the sessions. allows increased interactivity between them. This collaborative format is particularly useful for students with below average academic achievement and/or who are hesitant to participate in discussions in large groups. [12]

Varied topics in pathology like basics of anemia, iron deficiency anemia, megaloblastic anemia, thalassemia, and sickle cell anemia, hepatobiliary system, pulmonary TB etc have been reinforced using a case-based approach. [6,14]

CBL has been used for teaching specific aspects of cancer diagnosis to practising pathologists using cases of breast, cervical, colorectal and prostate cancers. [4]

77.9% of the students felt that the topics selected for the CBL sessions were good and 85.3% of them felt that more topics in pathology should be covered in this manner.

The main challenges faced during the conduction of these sessions were preparation of cases, faculty training, faculty motivation and time constraints for the conduction of more number of case based modules. [15] Although many studies mention the concepts and methods of conducting CBL, there are no significant resources that provide a step by step guide for developing and evaluating CBL cases. There is also no formal tool to assess the quality and consistency of the cases. Scott Kohlert et al developed a tool that would allow a standardized approach to quality review CBL cases. The five phases in the

development of this CBL template tool included literature review, case review, template construction, student testing and faculty testing.^[16] The review of case-based teaching across disciplines revealed that the five core attributes that should be kept in mind while developing effective cases are that they should be relevant, realistic, engaging, challenging, and instructional. Studies mention formation of a Case Oversight Team consisting of members involved in the implementation of the curriculum for the creation, revision, replacement, and maintenance of cases in an institutional catalog in a topic wise or in a system-based module.^[17] It is of utmost importance to keep in mind the phase for which the cases are prepared. The same case of a particular topic cannot be used for a Phase I and a Phase III MBBS student. The complexity of the cases should increase as knowledge acquisition of the various domains also increases in a step wise manner. Taking faculty feedback in the present study would have helped shed more light on the challenges faced by the faculty. Implementation of flipped classroom combined with CBL is a novel teaching modality in undergraduate pathology education.^[18] Use of CBL aided by WhatsApp messenger has also been used in pathology teaching for medical students.^[19] CBL sessions also helps highlight the importance of pathology as a diagnostic modality in patient care and helps to showcase the important role played by the pathologists in health care decision making thus exposing students to pathology as a medical profession.^[12] Use of CBL contributes towards application of theoretical knowledge and helps improve the clinical correlation skills which are of utmost importance in the day-to-day patient care.^[20]

Limitation of the Study

Since post test was taken immediately after the CBL sessions, the short term memory of the students was primarily tested. Taking post tests at a later date would have helped assess the long term memory using this teaching learning modality.

Conclusion

CBL promotes clinical correlation skills. It also serves to highlight the importance of pathology concepts as a foundation on which the knowledge of the clinical subjects can be built upon. It is recommended that more topics should be taught using CBL mode of TL to make the learning experience more practical oriented.

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Conflict of Interest statement

No Conflict of Interest was declared by the author

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Abbreviations

CBL-Case Based Learning
TL- Teaching Learning
UG- Undergraduate
CBME- Competency Based Medical Education
NMC- National Medical Commission
PBL-Problem Based Learning
IEC- Institutional Ethical Committee
MCQ-Multiple Choice Question


References

1. Medical Council of India. Alignment and Integration Module for Undergraduate Medical Education Program;2019: P1- 34.
2. Kumar V, Abbas AK, Aster JC, Turner JR. Robbins and Cotran. Pathologic Basis of Diseases. 10th Edition, Elsevier, Philadelphia; 2021. P33-34
3. McLean SF. Case-Based Learning and its Application in Medical and Health-Care Fields: A Review of Worldwide Literature. J Med Educ Curric Dev. 2016; 3:39-49.
4. Sayed S, Lester SC, Wilson M, Berney D, Masia R, Moloo Z et al. Creation and pilot testing of cases for case-based learning: A pedagogical approach for pathology cancer diagnosis. Afr J Lab Med. 2017; 6(1): 637. Published online 2017 Oct 25 doi:10.4102/ajlm.v6i1.637
5. Kaur S, Sharma R. Introduction to case-based learning: An attempt to integrate topics in biochemistry. Adesh Univ J Med Sci Res 2021;3: 91-5.
6. Dubey S, Dubey AK. Promotion of higher order of cognition in undergraduate medical students using case-based approach. J Educ Health Promot. 2017; 6:75.
7. Datta A, Ray J. Case Based Learning in Undergraduate Pathology – A Study to Assess its Efficacy and Acceptability as Teaching-Learning Tool. IAIM 2016; 3(6): 93-100.
8. Kapoor N. Teaching pathology of breast cancer to medical undergraduates by case-based learning method. Indian J Cancer. 2015;52(2):215-216.
9. Garg P, Bhanwra S. Case Based Learning in Teaching Pharmacology to Undergraduate Medical Students. Cureus 2022;14(9): e29187.

10. 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):729-733.
11. Lall M, Datta K. A pilot study on case-based learning (CBL) in medical microbiology; students perspective. *Medical Journal Armed Forces India.* 2021; 77(1): S215-S219
12. Sartania N, Sneddon S, Boyle JG, McQuarrie E, de Koning HP. Increasing Collaborative Discussion in Case-Based Learning Improves Student Engagement and Knowledge Acquisition. *Med Sci Educ.* 2022;32(5):1055-1064.
13. Nishal A, Patel J, Balvalli R, Yadav PP, Jayani P, Singh R et al. A Comparative Study of Case-Based Learning vs. Traditional Teaching Method in Pathology in Indian Medical Graduates. *J Med Edu.* 2022; 21(1): e 127188. Published online 2022 August 27 doi: 10.5812/jme-127188
14. Villatoro T, Lackritz K, Chan JSY. Case-Based Asynchronous Interactive Modules in Undergraduate Medical Education. *Acad Pathol.* 2019; 6:1-8.
15. Das S, Das A, Rai P, Kumar N. Case-based learning: Modern teaching tool meant for present curriculum: A behavioral analysis from faculties' perspective. *J Educ Health Promot.* 2021; 10:372.
16. Kohlert S, Brulotte M, Bell R, Roy J, Jalali AR. A quality assurance template for revision of case-based learning modules. *Education in Medicine Journal.* 2018;10(3):47-56.
17. Bruner LP, Szymik B, House E, Chappell MT, Teshager D, Baldwin A. Curating a Case Catalog: Development and Implementation of a Process for Revising Small Group Teaching Cases for Pre-clerkship Medical Education. *Med Sci Educ.* 2022;33(1):215-222.
18. Cai L, Li YL, Hu XY, Li R. Implementation of flipped classroom combined with case-based learning: A promising and effective teaching modality in undergraduate pathology education. *Medicine* 101(5): p e28782, February 04, 2022.
19. Grover S, Garg B, Sood N. Introduction of case-based learning aided by WhatsApp messenger in pathology teaching for medical students. *J Postgrad Med.* 2020;66(1):17-22.
20. Gogoi G. Introduction Of Case Based Learning in Undergraduate Pathology Teaching. *Paripex-Indian Journal of Research.* 2021: 10(1).

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