Original Article

Impact of Advanced Case Based Learning in Pathology for Phase II MBBS Students

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Abstract

Background : The traditional lecture method is teacher centred& promotes passive learning for students. An incorporation of Case Based Learning (CBL) with traditional lecture will be an active learning strategies for better understanding of Pathology subject knowledge and be able to correlate in the context of clinical disease during their medical practice. Aim is to find out the usefulness of CBL in Pathology as a students perspective.

Materials and Methods : After obtaining the Institutional Ethical Committee clearance, 140 students of phase II MBBS were included in this study. students were randomly divided into 2 equal groups of 70 each A & B groups. Each group were given structured Pre test Questionnaires & they were taught Case Based Learning on Breast & Thyroid modules. At the end, post test Questionnaires & feedback was obtained using 5 point Likert scale. The comparison of mean of pre- test & Post-test scores of the groups were done.

Results : The mean pre-test score in Breast module was 7.22 and Thyroid module was 9.44 and the post test mean scores were 11.38 and 15.53 respectively. Both these scores were analysed by using independent 't' test & Mann Whitney U with the help of statistical software & the mean differences of these scores were statistically significant.

Conclusion : CBL can be combine with lecture classes to promote self directed learning and enhances the knowledge of real-life situations, promotes the critical thinking, communication & analytic skills.

Key words : Case Based Learning, Breast & Thyroid Modules, Likert Scale.

Pathology being one of the fundamental sciences in medical curriculum where teaching is mostly lecture-based, with practical and tutorials as interactive sessions. It is taught as an individual subject without any interdisciplinary interaction leading in failure to associate and correlate the pathophysiology of the disease with the clinical presentation and diagnosis of the disease and in applying this theoretical knowledge to clinical practice[1].

The introduction of Competency-based Medical Education (CBME) for medical graduates as per the Graduate Medical Education Regulations (GMER), the educational scenario in India has undergone a paradigm shift. The aim of the new CBME pattern emphasizes on application of the gained knowledge. Many innovative teaching learning methods have been developed over the years to achieve it. One of them is Case Based Learning (CBL), where clinical cases are used to assist in teaching the concepts. It is an effective teaching method as it links learning across multiple disciplines and allows for clinical integration[2,3].

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Editor's Comment :

- Advanced case-based learning transforms pathology from rote memorization into meaningful clinical reasoning, enabling Phase II MBBS students to integrate mechanisms of disease with patient care.
- This learner-centered approach enhances diagnostic thinking, long-term retention and preparedness for real-world clinical practice.

There is not a set definition for CBL. An excellent definition has been proposed by Thistlewaite et al in a review article. In their 2012 paper, a CBL definition is "The goal of CBL 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, using inquiry-based learning methods"[4].

In a review of the literature, Williams (2005) describes how CBL utilizes collaborative learning, facilitates the integration of learning, develops students' intrinsic and extrinsic motivation to learn, encourages learner self-reflection and critical reflection, allows for scientific inquiry, integrates knowledge and practice, and supports the development of a variety of learning skills[5].

Students were finding difficulty to read pathology & applied aspect after attending the traditional lecture classes. We plan to assess the perception of students after introducing a teaching method of Case Based Learning in Pathology & thereby develop interest in the same.

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Aims and Objectives

1) To create the Case Based Learning (CBL) module in Pathology.
2) To implement the CBL module to Phase II MBBS students.
3) To assess the usefulness of CBL in Pathology from students' perspective.

Materials and Methods

This was a pre-post interventional study carried out at Tertiary Care Medical College and Hospital in the Second year MBBS students in the Department of Pathology. After taking permission from Institutional Ethics Committee, the present study was conducted in a batch of 140 students of Phase II MBBS Students.

- Study Type & design – Intervention study
- Study Setting : Setting: Phase II MBBS Students in VMKVMC & H, Salem.
- Study Target population : Phase II MBBS Students (2021 – 2022Batch).
- Inclusion Criteria : All students who provided consent
- Exclusion Criteria : Absentees
- Sample size for quantitative studies: 140 Phase II MBBS Students
- Modules – 2 (Modified CBL of Thyroid & Breast)
- Study period – January, 22 – April, 22 (4 months)
- Methods of data collection - Pre-test & Post-test Questionaries.

Students perspective view of pathology was obtained by structured Pre- and Post test Questionnaires. Attitude & Perceptions of Group A & Group B students towards Case Based Learning sessions were assessed by feedback of self administered questions using 5 point Likert Scale ranging from 1- strongly disagree to 5- strongly agree.

After the sensitization of the students about the project and getting the informed consent from the students, the study was done for a period of 3 months in Lecture Hall on the topics of modules from Breast & Thyroid. Among the total of 145 students Phase II MBBS, 140 were included in this study & divided into 70 and 70 students were participated & five students were on leave. Two CBL sessions were conducted where the students were instructed to go through the request form of Thyroid & Breast specimens received from the surgical departments, Analysing the clinical details with patient examination, Lab investigations (USG, Mammogram), with demonstration of fine needle aspiration cytology & interpretation of Lab details followed by facilitation by faculty were done to support & promote learning. Skill Lab was also used in addition, for the demonstration of Breast carcinoma & Axillary lymph node metastasis. Gross microscopic details of specimens & application of treatment details were discussed. By observing their interaction, & analysing the perception of learning pathology will be assessed in the form Pre test & Post test questionnaires.

Statistical Analysis :

Statistical significance between the mean differences of the scores were tested by Independent t test and Mann Whitney 'U' test using JAMOVI software 2.3.21

Results

140 students of the second-year MBBS were exposed to this Case Based Learning for Thyroid and Breast topic. All 140 students gave Pre- and Post-tests for Case Based Learning (Table 1) and also completed the feedback analysis.

There is a substantial increase in mean scores from Pre-test to Post-test. In the Breast topic, the mean scores increased from 7.22 to 11.38, and in the Thyroid topic, from 9.44 to 15.53. Which suggests that case-based scenarios are effective in enhancing knowledge. The p-values for case- based scenarios on Thyroid and Breast topic are <0.0001, indicating that the improvements observed are statistically significant.

Feedback analysis (Table 2) on Attitude & Perceptions of CBL by student showed majority (94%) either agree or strongly agree that CBL sessions help achieve learning objectives, indicating alignment between the sessions and educational goals. Sixty percent agreed that CBL sessions stimulate active learning, which is crucial for engagement and deeper understanding. Over 90% of respondents find CBL sessions helpful in learning content comprehensively.

Approximately 91% believe that CBL sessions are effective for teaching differential diagnosis. A majority (94.5%) feel that CBL sessions enhance their ability to propose appropriate investigations, indicating practical application of knowledge. While a majority (86%) agree, there's a notable portion (11.7%) who are neutral, indicating room for improvement in bridging basic science and clinical scenarios. Fifty percent agree that CBL aids in better retention of knowledge, highlighting its potential benefits for long-term learning.

Table 1 — *Effectiveness of CBL in Pretest and posttest.*

	Case-Based Scenario	
	Breast	Thyroid
Pre-test (Mean ± SD)	7.22 ± 2.04	9.44 ± 3.1
Post-test (Mean ± SD)	11.38 ± 2.78	15.53 ± 4.6
Pre-test & Post-test (Mean Difference)	4.16 ± 0.416	6.09 ± 0.416
p value	< 0.0001	< 0.0001

Table 2 — *Feedback analysis of case based learning from students.*

Feedback Questionnaires	Agree	Strongly Agree	Neutral	Disagree	Strongly Disagree
Case Based Learning (CBL) Sessions helped me to achieve the Learning Objectives of the topic.	56%	38%	5%	0.8%	0.8%
CBL Sessions stimulates Active learning.	60%	33%	6.7%	-	0.8%
CBL helped me to learn the content in a Comprehensive manner.	54%	37%	7.5%	0.8%	0.8%
CBL Sessions are better teaching tool to make Differential Diagnosis.	50%	41%	7.5%	0.8%	0.8%
CBL sessions enhanced my ability to propose appropriate Investigations.	57.5%	37%	4.2%	0.8%	0.8%
CBL helped me to apply concepts of basic sciences to Clinical situation's better than traditional lecture.	54%	32%	11.7%	0.8%	0.8%
CBL helped me in better retention of Knowledge.	50%	35%	13.3%	0.8%	0.8%
CBL Session is an Effective Learning Tool.	53%	34%	11.7%	-	0.8%
CBL enhances Self Directed Learning.	46%	32%	20.8%	-	1.7%
CBL enhanced my Problem Solving Skills.	53%	32%	14.2%	0.8%	0.8%

Over 87% perceive CBL sessions as an effective learning tool, although there's a small portion (11.7%) who are neutral. Forty-six percent agree that CBL enhances self-directed learning, suggesting room for improvement in fostering autonomy among learners. Over 85% believe that CBL enhances their problem-solving skills, indicating practical application and critical thinking development.

Discussion

Need for active productive mental activity to make comprehend a certain area of knowledge, it is best to involve students in active learning process[6]. New evidence-based researches in medical education and improved understanding of memory retention and reproduction have revealed the shortcomings of traditional methods. Traditional method cannot fulfill the needs of current medical education system as there is rapid development in the medical and science technology, understanding pathology cannot be effective through traditional method[7]. The purpose of this study was to show the effectiveness of CBL method among MBBS students in the subject of pathology.

CBL is a participatory, discussion-based way of learning where students gain knowledge & skills in critical thinking, communication and group discussion. Studies have shown that case-based learning approach brings more attention for students in discussion of specific situations and thus can be perceived challenging, interesting and helpful towards learning[8].

In our present study analysis (Table 1) of MCQ based test results showed there was significant difference in the Pre-test & Post-test mean scores of CBL, indicating case based scenario was effective in terms of acquiring knowledge as (immediate) Post-test mean scores were significantly higher than Pre-test mean scores in CBL.

Study by Datta A, *et al*[9] showed post-test mean scores of CBL groups were significantly higher than that of DL groups which is similar to our current study as there was significant difference in the posttest of CBL. Study by Nishal A, *et al*[7] showed the same, increase in the mean score of CBL in the posttest conducted.

A study by Ciraj AM, *et al*[10] found that including the CBL in routine teaching as a learning strategy was superior to teaching without any CBL sessions in the curriculum. Vora MB, *et al*[11]; Tathe SS, *et al*[13]; Joshi KB, *et al*[12] have suggested that CBL was an effective teaching method in different pre- and para-clinical subjects like Pharmacology, Microbiology, Biochemistry etc. They also opined that perceptions of Students and Teachers to CBL were very positive and highly satisfactory[11-13].

Study by Datta A, *et al*[9] also found that the perceptions of students and teachers to CBL were very positive and no significant lacunae or drawbacks were revealed from their feedback responses. CBL promotes team work, retention of key concepts and their application to patient care situations. Study by Nishal A, *et al*[7] revealed that 87% of the students agreed with the usefulness of CBL in better understanding of the topic and retention in memory. They also acclaimed that it encouraged their critical thinking and decision-making qualities.

Two recent studies conducted on the pharmacology subject also concluded that CBL was an effective tool in teaching the subject to a large group of students[14,15]. CBL provided better motivation and satisfaction to the students. It also improved students' attendance in class[15]. Hasamnis AA, *et al*[14] also concluded that CBL helped in amalgamating theoretical knowledge into clinical pharmacology practices. Pearson D, *et al*[16] were able to conclude that the innovative CBL paradigm appeared to be an effective adjunct to the traditional lecture format. Study by Gogoi G, *et al*[17] students agreed that CBL is a good method and it stimulated their desire to learn. They also felt confident to apply the knowledge of basic sciences and pathology to solve clinical cases[17]. The study by Kassebaum DK, *et al*[18] was able to show that students undertaking the CBL format were better able to ask questions and make comments during class and CBL made the learning more enjoyable.

In our study showed that majority of the students revealed

that, CBL enhances the problem solving skills, Self Directed Learning (SDL), promotes effective learning tool & helps in better retention of knowledge. CBL promotes team work, retention of key concepts and their application to patient care situations. CBL take a lot of time and demand for active engagement from the faculty[19].

Conclusion

CBL is a tool that can supplement & combine with lecture classes and promote self directed learning and deep understanding of the subject.

CBL enhances the ability to apply knowledge to real-life situations, promotes & enhance the critical thinking, communication & analytical skills.

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