

COMPARISON OF TRADITIONAL- AND CASE-BASED METHOD FOR LEARNING PHYSIOLOGY AMONG 1ST YEAR MBBS STUDENTS

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ABSTRACT

Objective: The medical science of physiology is both basic and applied. Traditional physiology instruction is teacher-centered, with little involvement from the students. A self-directed learning strategy focused on training through the use of personal narratives is known as case-based learning (CBL). The present study was conducted to assess the effectiveness of CBL method in teaching physiology among 1st year MBBS students.

Methods: This study was conducted among 1st year MBBS students of 2022–2023 batch. The study design included a pre-test, a CBL discussion on a specific topic, and a post-test following the CBL session. MS Excel and SPSS version 23 were used to gather, tabulate, and statistically analyze the data. Results from the pre-and post-tests were compared using the student's "t" test, and $p < 0.05$ was regarded as statistically significant. The 12 questions that made up the feedback survey were all expressed as percentages.

Results: When pre-and post-test results were compared, the post-test score after the CBL session was significantly better than the pre-test score of the session. The majority of students supported CBL activities. In student feedback, more than 95% of the students thought CBL classes helped interaction among them. More than 94% of the students thought CBL classes helped in clearing doubts, helped in increasing interest. More than 91% of the students thought CBL classes improved conceptual thinking.

Conclusion: Through active learning, CBL can be utilized as an addition to lectures to augment standard teaching/learning approaches. It encourages the drive to learn and the development of clinical reasoning.

Keywords: Case-based learning, Active learning, Physiology.

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INTRODUCTION

In this era of medical education, a combination of teaching methodologies can be acquired to facilitate learning among students who have different learning approaches [1]. Physiology is both basic and applied medical science. It has to be taught and learned effectively so as students graduate and practice in the community [2]. The traditional conventional system (didactic lecture) of teaching is teacher centered with minimal or no active participation from the students, it has minimal or no integration of the subject both horizontal and vertical. Teaching of physiology in this context is an art that transfers knowledge from instructor to student using a competent teaching/learning exchange process [3]. The subject needs to be taught with comprehension of concepts and mechanisms together with the orientation of clinical aspects of disease [4]. One such approach is case-based learning (CBL) where the students learn with the help of case scenarios and are actively engaged to solve a problem to attain the learning objectives. CBL is known to transmit analytical skills and ability to solve real medical problems in the students [5,6].

CBL is defined as learning that is based on the description of a health problems faced by patient, scrutiny, and understanding of all the related facts obtained from past events, exploration, systematic examination, and organizing the further management of the patient [7]. In CBL, the faculty formulates the case scenarios and students discuss the case in small groups and attempts to arrive at a solution using the knowledge gained from previously taught curricular content. CBL has been shown to impart early clinical exposure, assist students to link clinical conditions to basic sciences, develop clinical reasoning, improve

students score, enhance communication skills, and galvanize students toward self-directed learning [8].

In CBL, the faculty expresses the case scenarios in a concise way and students discuss the case in small groups, explore, and analyze it, and makes an effort to reach to solve the problem using the facts, information, and skills acquired through experience gained from previously taught subject content. CBL has been shown to foster exposure of medical students to patients as early as the 1st year of medical college. It aids students to connect observable conditions of a disease to fundamental sciences and develop strategies to gather and analyze patient information. It also enhances students score; strengthen the process of exchanging, creating, and sharing information skills. It motivates the students toward making their own decisions and organizing their own work rather than being told what to do by teachers [8].

The objectives of the present study were to assess the effectiveness of CBL in teaching by comparing pre-test and post-test scores of multiple choice questions (MCQs) and to analyze the feedback from students about the perception and effectiveness of the CBL method.

METHODS

The present prospective and interventional study was conducted in the Department of Physiology, at Viswabharathi Medical College and General Hospital, Kurnool. Approval from the Institutional Ethics Committee and informed consent of the subjects was taken before the conduction of this study.

Table 1: Students responses to the didactic lecture and CBL

Serial number	Question	Didactic lecture (%)	CBL (%)
1	Most comfortable method	19.1	81.1
2	Most active way of learning	8.8	91.2
3	Most understanding method	19.1	80.9
4	Most interest arousal method	5.9	94.1
5	Method which helps in concept building	18.8	81.2
6	Method which helped interaction among them	4.4	95.6
7	Method which helped in better retention of the topics taken	15.9	84.1
8	Method which was most relevant to topic	15.9	84.1
9	Method which improves conceptual thinking	8.8	91.2
10	Method of opportunity to clear doubts	5.9	94.1
11	Method stimulating for further studies	14.7	85.3
12	Method of most active involvement of teachers	17.6	82.4

CBL: Case-based learning

Medical students in the age group of 17–21 years of the first MBBS students of 2022–2023 batch were selected. Eighty students out of the 150 students of the first MBBS participated in the study. Two topics (Hyperthyroidism and Hypothyroidism) were selected, cases were constructed, and the faculty of physiology was trained. MCQs and feedback questionnaires for students were designed, and they were prevalidated and validated. Before the intervention, counseling of the students was done. Informed written consent was obtained from the first MBBS students who were willing to participate in the study. All 80 students were taught by the traditional method on the two topics (Hyperthyroidism and Hypothyroidism) which were followed by MCQ pre-test to elicit their baseline knowledge about the given topic. The next day, the students were divided into small groups. CBL session was conducted wherein they were presented with a case scenario. The case scenario included clearly written symptoms and signs related to the topic. Adequate time was given for case discussion and solving the Specific Learning Objectives by the students. This was followed by MCQ post-test. Finally, feedback was taken from the students. The feedback survey was based on 12 questions which were expressed in percentages.

Data analysis

Data were analyzed using SPSS version 23. Descriptive statistics were used to describe the results for the quantitative variable. Student's examination performance: MCQs Pre- and Post-Tests were compared by Paired Sample t-test. $p < 0.05$ was considered as significant. For qualitative data, that is, the perception of the students about CBL method was obtained through the questionnaire. Students feedback was expressed in percentages.

RESULTS

A total of 80 1st year MBBS students participated in the study. Student's examination performance such as MCQs pre- and post-test was analyzed by paired sample t-test. The post-test score after the CBL session was significantly better than the pre-test score of the session (Fig. 1). The t-test between pre-test and post-test scores was statistically significant with a value of $p < 0.05$.

The statistical analysis of students feedback showed that percentage of students for most of the questions posed to them was in the range of 81–94%. The maximum scoring was for questions 4, 6, 9, and 10-stating that the clinical case was in the context of the system taught currently followed by questions stating that CBL methodology was useful for them to improve the knowledge and generating new ideas in relation to the topic in human physiology (Table 1).

DISCUSSION

To boost student enthusiasm and active learning, different teaching strategies are used in medical education. The adoption of an engaging, student-centered methodology has fundamentally altered how pupils learn. With repeated experiences in a supportive environment and a focus on the complexity of clinical care, the case-based method has the

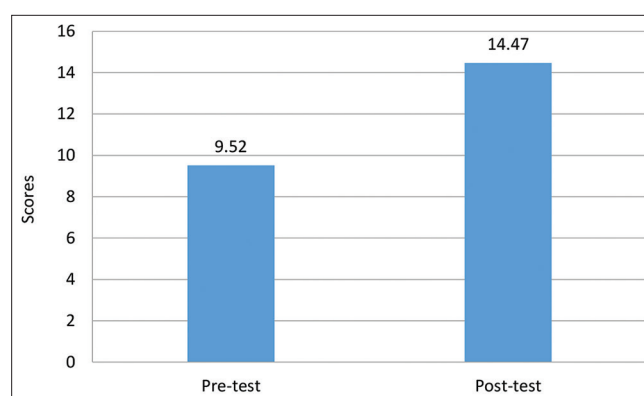


Fig. 1: Pre-test and post-test scores

advantages of encouraging self-directed learning, clinical reasoning, clinical problem-solving, and decision-making [9]. The purpose of the present study was to assess medical students' perceptions of this novel teaching approach and to ascertain if interactive, case-based lectures are an effective teaching tool for medical physiology.

Studies conducted in India and across the globe have certainly authenticated the benefits of CBL in medical education Ma *et al.* in China compared the effectiveness of CBL to lecture-based learning in teaching clinical laboratory immunology course [10]. Dulloo and Pathare in Oman benefited the students in teaching cardiovascular and respiratory physiology to undergraduate medical students [11]. Pearson *et al.* in the School of Medicine, Rochester, New York, conducted an innovative pilot testing of incorporating case-based series in a population-oriented prevention program in a problem-based medical curriculum at the Department of Preventive and Community Medicine with positive outcomes [12]. Hansen *et al.*, in Iowa, assimilated the CBL model in obstetrics and gynecology [13]. Engel and Hendricson [14] and Garvey *et al.* [15] positively conducted CBL strategies in orthodontics and final-year Dublin Dental School students, respectively. Bhardwaj *et al.* [16], in India, conducted a comprehensive integrated teaching program in all medical departments using CBL. Gade and Chari [17] introduced this model in teaching cases in endocrine physiology. Ali *et al.* introduced an interactive CBL system for medical education with a great success rate in terms of student interaction: group and solo learning and clinical skills [18].

In the context of ability and skills, the results in our study indicated that the majority of students reported that problem-solving, self-learning, knowledge integration, oral and written communication, critical thinking, clearing doubts, and initiative were the most developed areas with the CBL. This was in concurrence with various studies and literary works by scholars and researchers as mentioned above [11,12,18].

CONCLUSION

The CBL teaching method is a learner-centered teaching methodology. It is an interesting and effective active learning strategy. Overall, results indicate that students expressed a strong preference for CBL compared to traditional methods.

REFERENCES

1. Rehman R, Khan R, Akahai MA, Hassan F. Approach of freshly-induced medical students towards learning at Bahria University medical and dental college. *J Pak Med Assoc* 2013;63:320-3. PMID 23914629
2. Ghosh S. Combination of didactic lectures and case-oriented problem-solving tutorials toward better learning: Perceptions of students from a conventional medical curriculum. *Adv Physiol Educ* 2007;31:193-7. doi: 10.1152/advan.00040.2006, PMID 17562910
3. Singh S, Savita S, Gautam S. Teaching styles and approaches: Medical students' perceptions of animation-based lectures as a pedagogical innovation. *Pak J Physiol* 2009;5:16-9.
4. Kamran A, Rehman R, Iqbal A. Importance of clinically oriented problem solving tutorials (COPST) in teaching of physiology. *Rawal Med J* 2011;36:232-6.
5. Nair SP, Shah T, Seth S, Pandit N, Shah GV. Case based learning: A method for better Understanding of biochemistry in medical students. *J Clin Diagn Res* 2013;7:1576-8. doi: 10.7860/JCDR/2013/5795.3212, PMID 24086843
6. Majeed F. Effectiveness of case-based teaching of physiology for nursing students. *J Taibah Univ Med Sci* 2014;9:289-92. doi: 10.1016/j.jtumed.2013.12.005
7. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, Matthews P, et al. The effectiveness of case-based learning in health professional education. *ABEME systematic review: BEME Guide No. 23. Med Teach* 2012;34:e421-44. doi: 10.3109/0142159X.2012.680939, PMID 22578051
8. Sathishkumar S, Thomas N, Tharion E, Neelakantan N, Vyas R. Attitude of medical students towards early clinical exposure in learning endocrine physiology. *BMC Med Educ* 2007;7:30. doi: 10.1186/1472-6920-7-30
9. Richards PS, Inglehart MR. An interdisciplinary approach to case-based teaching: Does it create patient-centered and culturally sensitive providers? *J Dent Educ* 2006;70:284-91. doi: 10.1002/j.0022-0337.2006.70.3.tb04084.x, PMID 16522757
10. Ma X, Luo Y, Wang J, Zhang L, Liang Y, Wu Y, et al. Comparison of student perception and performance between case-based learning and lecture-based learning in a clinical laboratory immunology course. *LaboratoriumsMedizin* 2016;40:283-9. doi: 10.1515/labmed-2016-0026
11. Dulloo P, Pathare NA. Case based methodology: A method to enhance the learning of physiological basis of cardiovascular and respiratory system to undergraduate medical students. *Am J Educ Res* 2013;10:425-9.
12. Pearson TA, Barker WH, Fisher SG, Trafton SH. Integration of the case-based series in population-orientated prevention into a problem-based medical curriculum. *Am J Prev Med* 2003;24:4 Suppl:102-7. doi: 10.1016/s0749-3797(03)00030-8, PMID 12744987
13. Hansen WF, Ferguson KJ, Sipe CS, Sorosky J. Attitudes of faculty and students toward case-based learning in the third-year obstetrics and gynecology clerkship. *Am J Obstet Gynecol* 2005;192:644-7. doi: 10.1016/j.ajog.2004.10.595, PMID 15696016
14. Engel FE, Hendricson WD. A case-based learning model in orthodontics. *J Dent Educ* 1994;58:762-7. doi: 10.1002/j.0022-0337.1994.58.10.tb02897.x, PMID 7962913
15. Garvey MT, O'Sullivan M, Blake M. Multidisciplinary case-based learning for undergraduate students. *Eur J Dent Educ* 2000;4:165-8. doi: 10.1034/j.1600-0579.2000.040404.x, PMID 11168482
16. Bhardwaj P, Bhardwaj N, Mahdi F, Srivastava JP, Gupta U. Integrated teaching program using case-based learning. *Int J Appl Basic Med Res* 2015;5 Suppl 1:S24-8. doi: 10.4103/2229-516X.162262, PMID 26380204
17. Gade S, Chari S. Case-based learning in endocrine physiology: An approach toward self-directed learning and the development of soft skills in medical students. *Adv Physiol Educ* 2013;37:356-60. doi: 10.1152/advan.00076.2012, PMID 24292913
18. Ali M, Han SC, Bilal HS, Lee S, Kang MJ, Kang BH, et al. iCBLS: An interactive case-based learning system for medical education. *Int J Med Inform* 2018;109:55-69. doi: 10.1016/j.ijmedinf.2017.11.004, PMID 29195707