Pakistan Journal of Medical and Health Education

Original Article

Case-based learning: a successful teaching tool of physiology for medical undergraduates. A cross sectional study in LUMHS.

Salma Farukh Memon[1], Hudabia Allah Buksh[1], Shakil Ahmed Shaikh[2], Jehanzeb Jahangeer Dars[3], Moomal Tager[1] & Keenjher Rani[1]

[1]Liaquat University of Medical & Health Sciences, Jamshoroo-Pakistan
[2]Suleman Roshan Medical College, Tando Adam-Pakistan
[3]Medical Officer, Matiari District-Pakistan

Citation: Memon SF, Buksh HA, Shaikh SA, Dars JJ, Tager M, Rani K. Case-based learning: a successful teaching tool of physiology for medical undergraduates. A cross sectional study in LUMHS. PJMHE. 2023;3(1):15-21.

Corresponding Author Email:
hudebia@lumhs.edu.pk

Funding:
The author(s) received no specific funding for this work.

Conflicts of Interests:
The authors have declared that no competing interests exist.

Received 22/01/2023
Accepted 18/03/2023
First Published 20/04/2023

Abstract

Background: Physiology is the basic and most crucial subject that is being taught in the early years of medical life as it lay the foundation upon which all major subjects including medicine and surgery rest upon, so its understanding and implication is of the utmost importance for all medical students.

Objective: This research aims to determine effects of CBL sessions in MBBS students and to examine the attitudes of faculty and learners on the efficiency of the CBL strategy among students of Liaquat University of Medical and Health Sciences Jamshoro medical students (LUMHS).

Methodology: This cross-sectional study was conducted involving 411 medical undergraduates of LUMHS. Random sampling technique was used for sample selection to minimize the bias. Out of 411 sample size male students were 157(38.1%) and female 254(61.8%) respectively, studying form 1st year and 2nd year MBBS students of LUMHS campus. And 10 teachers who are conducting case-based learning sessions weekly at physiology department, were interviewed and their response were included in this study. Data was collected using self-reported questioner, then SPSS version 26.0 was used to analyze the data. P-value of 0.05 or lower was significant.

Results: Data of this study shows that 97% students and 100% teachers thinks that CBL sessions, helps them understand topic better, whereas 90% students and 90% teachers thinks that CBL helped bridge the gap between theory and clinical scenarios. Furthermore over research shows that 70% students and 60% teachers thinks that cases that were presented in CBL sessions were interesting, and 98% students and 100% teachers prefer CBL sessions over old methods of learning, 90% students and 70% teachers thinks that CBL sessions motivate them to learn Physiology in depth, this shows that CBL sessions have very positive overall effects on the students as well as teacher, and this is very effective tool of teaching Physiology.

Conclusion: Our research has proven that Physiology students may benefit from the unique and effective CBL teaching style. Case studies in the classroom improve student engagement, critical thinking, and intrinsic motivation. Their general comprehension of the subject improves, their recollection of the topic's key elements improves, they get better at interpreting clinical settings, and their overall interest in the subject grows.

Keywords

Case Based Learning, Scenarios, Medical Education, Students, Critical Thinking, Student Feedback, Teaching Module.

Introduction

Since medical research is in a perpetual state of evolution, even the most up-to-date editions of reference works are rendered obsolete by new findings every day. Teaching medical education is becoming the most difficult task at the moment. It is a demanding area since it combines academic and practical study. When it comes to medical education, the quick pace of innovation necessitates new approaches, while the traditional focus on theory necessitated a shift in teaching methods. The proposed clinical cases will be dissected by students in class utilizing the information presented in the didactic lectures. Researchers have advocated "case-based learning (CBL) as a useful tool for enhancing teaching and learning techniques, keeping in mind the present gaps in teaching approaches"[1]. One of the most successful strategies for enhancing students' knowledge and skills is case-based education. Case-based learning (CBL) is an approach of teaching that uses actual clinical cases to better prepare students for those situations they would encounter in the field, in upcoming years. It employs inquiry-based teaching strategies to bridge the gap between classroom learning and real-world critical situations.

Fundamental scientific education have come to the conclusion that case based learning (CBL) is effective in fostering students' capacity for both rational reflection and practical application. Students are able to focus on the most important aspects of a clinical case owing to CBL, and they get to play the role of "subject experts" for a while during class. Case-based learning is a classroom strategy in which students and teachers meet in smaller groups to debate a topic while working toward predetermined learning goals. The provided clinical case serves as an incentive to learn more about the topic at hand. Students' personal and professional development is bolstered by the demands of CBL. Students are more likely to share their ideas and work together to solve problems while studying in a small group, and they are more likely to learn from the comments they get from their facilitators[2].

Although lectures are widely recognized as an effective medium of teaching, researchers suggests that this kind of instruction still lacks the capability to stimulate students' active thinking skills. By incorporating CBL into traditional teaching practices, students are better able to retain information, analyze critically, and communicate their ideas and findings. Building effective leadership abilities is another benefit of case-based education[3].

Case-based learning (CBL) is an approach to medical education in which students gain knowledge via experiences that mimic real-world scenarios. Clinical cases encourage students to apply what they have learned in one context to another, simulating the kind of learning that would occur during real-world clinical rotations. Actively discussing real-world instances from the clinical setting as a teaching tool promotes medical education to yet another level. The goal of clinical education is to make students ready to work in interdisciplinary teams to provide the best treatment possible for patients[4-6].

The main goal of this article is to give a holistic approach to determining the efficacy of case based learning in order to enhance educational practices. Students' problem-solving skills may be enhanced via curricular reforms and the incorporation of innovative teaching practices into the traditional lecture format. It would be irresponsible to downplay the significance of CBL in educating future physicians in the skill of problem solving and better preparing them for their summative evaluation.

Methodology

This Cross-sectional survey was conducted in Physiology department of LUMHS; the data was collected from 1st January 2022 till 1st June 2022. The informed consent was obtained from students at the start of survey. This is a qualitative survey-based cross-sectional study in which 411 students participated from Liaquat University of medical and health science Jamshoro. 411 students of 1st and 2nd years of M.B.B.S were selected along with 10 teachers who are conducting case-based learning

sessions weekly at physiology department, were interviewed and their response were included in this study. After strictly following all inclusion criterions. The responses of the students were analyzed. The importance, aims, and rationale of the study were discussed via pre-research interviews with students. Data was gathered using proformas. Participants filled out a questionnaire detailing all their demographic information such gender, age, education level, eating habits, BMI, etc. The questionnaire was presented to respondents in their native tongue (Sindhi or Urdu). When analyzing the data, we utilized SPSS 26. P-value <0.05 was considered statically significant and cross tabulations for mean mode frequencies and percentages were calculated and formed. Ethical clearance was obtained from ERC LUMHS. Informed consent was obtained from each patient/ student before data collection.

Results

Results from our cross-sectional survey have shown that out of 411 sample size male students were 157(38.1%) and female 254(61.8%) respectively, as shown in table: 01. 97% of students and 100% teachers thinks that CBL sessions, helps them understand topic better, whereas 90% students and 90% teachers thinks that CBL helped bridge the gap between theory and clinical scenarios. as shown in table 2 and 3 Furthermore over research shows that 70% students and 60% teachers thinks that cases that were presented in CBL sessions were interesting, and 98% students and 100% teachers prefer CBL sessions over old methods of learning, 90% students and 70% teachers thinks that CBL sessions motivate them to learn Physiology in depth, as shown in table 2 and 3 This shows that CBL sessions have very positive overall effects on the students as well as teacher, and this is very effective tool of teaching Physiology.

Table 1: Demographic data showing frequency, age, BMI & domicile of sample size (n-=411)

Gender	Frequency	Age (mean)	BMI (mean)	Urban	Rural	Std deviation
Male	157(38.1%)	27.32	31.9	24.64%	22.74%	3.45
Female	254(61.8%)	26.19	29.13	27.01%	25.59%	4.31

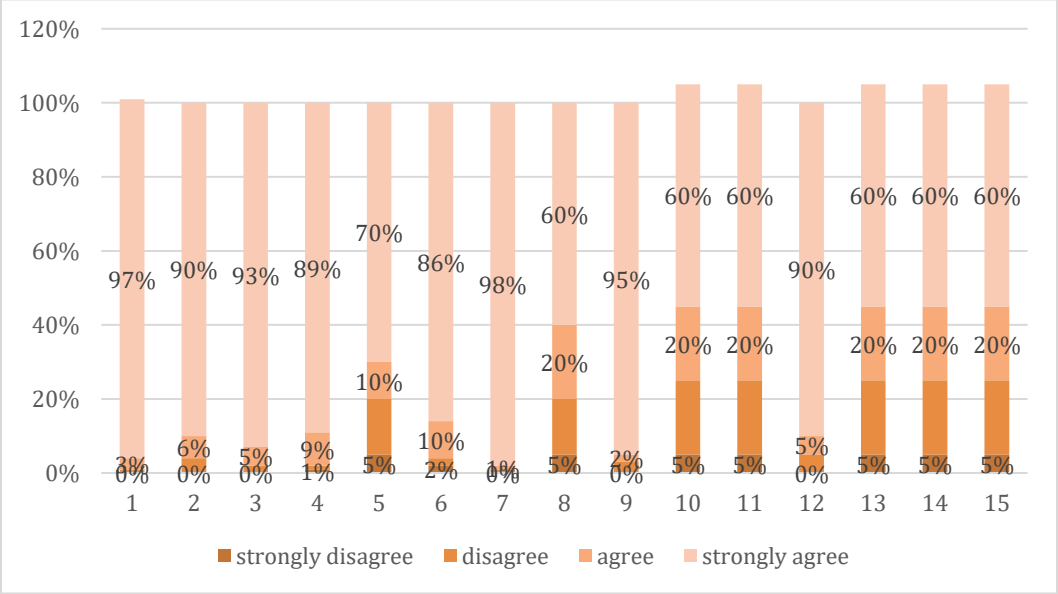

Figure 1: Response by 1st year and 2nd year students (n=411).

Table 2: Response by 1st year and 2nd year students (n=411).

Responses by students:	Strongly agree	Agree	Disagree	Strongly Disagree
CBL helps you understand topic better?	97%	3%	1%	0
CBL sessions were facilitating critical thinking via active learning	90%	6%	4%	0
CBL helped bridge the gap between theory and clinical scenarios?	93%	5%	2%	0
CBL sessions improve overall learning?	89%	09%	1%	1%
Are CBL cases given in session, interesting?	70%	10%	15%	5%
CBL model was useful in future application of knowledge?	86%	10%	2%	2%
Do you prefer CBL sessions over old methods of learning?	98%	1%	1%	0
Is this approach student centric?	60%	20%	15%	5%
Are the discussion sessions within group of students helpful?	95%	2%	3%	0
CBL sessions make you thinks professionally?	60%	20%	15%	5%
Are teachers able to make you understand the scenarios accurately?	60%	20%	15%	5%
Does CBL sessions motivate you to learn Physiology in depth	90%	5%	5%	0
Are teachers encouraging you to learn more clinical scenarios	60%	20%	15%	5%
CBL sessions helps you remember fact and figures accurately?	60%	20%	15%	5%
CBL sessions useful in setting realistic personal learning goals?	60%	20%	15%	5%

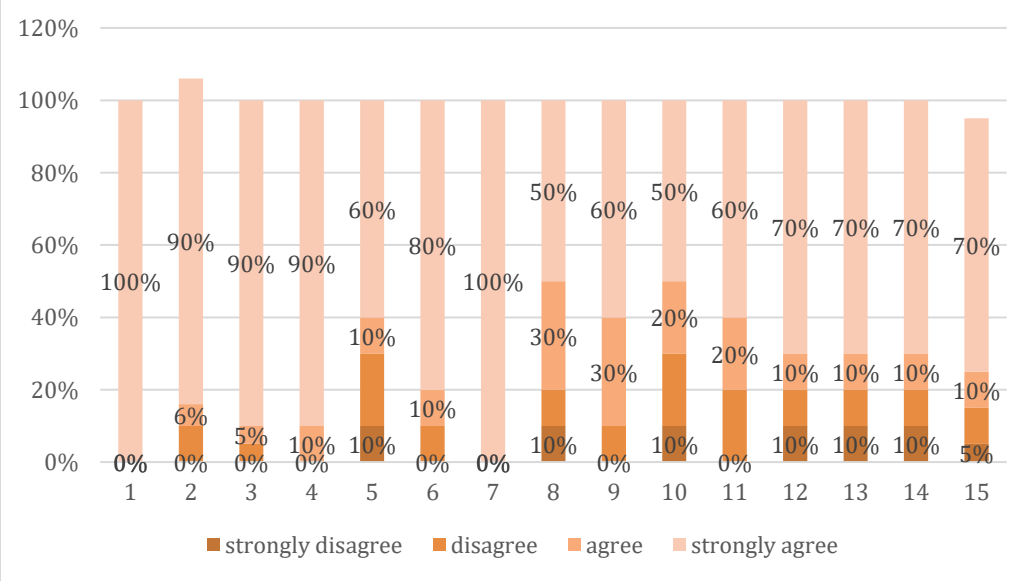

Figure 2: Response by teachers conducting CBL sessions for 1st year & 2nd year students (n=10).

Table 3: Response by teachers conducting CBL sessions for 1st year & 2nd year students (n=10).

Responses by students:	Strongly agree	Agree	Disagree	Strongly Disagree
CBL helps you teach topic better?	100%	0%	0%	0%
CBL sessions promotes active thinking in learning?	90%	0	10%	0%
CBL helped bridge the gap between theory & clinical scenarios?	90%	05%	05%	0%
CBL sessions improve overall teaching skills?	90%	10%	0%	0%
Are CBL cases given in session, interesting for teaching?	60%	10%	20%	10%
CBL model was useful in future application of knowledge?	80%	10%	10%	0%
Do you prefer CBL sessions over old methods of learning?	100%	0%	0%	0%
Is this approach teacher centric?	50%	30%	10%	10%
Are the discussion sessions within small group of students helpful?	60%	30%	10%	0%
CBL sessions make you thinks as a clinician?	50%	20%	20%	10%
Are students showing enthusiasm towards this type of learning?	60%	20%	20%	0%
Does CBL sessions motivate you to teach Physiology in depth	70%	10%	10%	10%
Are students encouraging you to teach more clinical scenarios?	70%	10%	10%	10%
CBL sessions help you remember fact and figures accurately?	70%	10%	10%	10%
CBL sessions useful in setting realistic personal teaching goals?	70%	10%	10%	10%

Discussion

Our research shows that using a Case-based approach to teaching and learning in the medical sciences improves students' capacity for interpersonal communication and their ability to draw connections between theoretical concepts learned in the basic medical sciences and practical situations encountered in clinical practice. The majority of students and teachers agree that case-based learning (CBL) sessions are superior to more traditional teaching methods because they help students better understand the material, the cases presented in CBL sessions are interesting, and CBL sessions motivate students to learn Physiology in greater depth, among other benefits. Therefore, the purpose of this research was to evaluate CBL based on the views of the students and teachers who participated in the survey. Since understanding medical concepts requires interpretation, it helps if issues have some real-life perspectives.

In study carried out by Aleem SB et al, 2014[7] at Rawalpindi medical college 80-89% of students reported CBL to be productive and acknowledged CBL as an effective learning tool. Another study by Grauer et al, 2008[8] stresses the importance of CBL in fostering deeper conceptual comprehension. It has been shown via research that CBL may significantly reduce the amount of time spent in teaching complex topics. According to the studies conducted by Li X, et all 2022[9], medical undergraduates lose interest in lessons if they do

not see the relation to their normal day's scenarios. Furthermore he states that "If you're looking for a more effective method of education, consider switching to case-based learning from more conventional approaches". Learning via questions encourages an empathetic and analytical mindset. Having students discuss the fictitious clinical situations after the lectures helps them to better absorb the materials. Students said that CBL facilitated their remembering of a large amount of material, reduced their overall burden (which in turn improved their ability to retain information), and fostered a more collaborative learning environment[10].

Students reported feeling less overwhelmed and gaining a deeper knowledge of the material when they worked in smaller groups, as was reported in a recent article[11]. Researchers found that using case studies to learn new material significantly enhanced students' cognitive capacities and retention of such material[12]. Case-based learning integrated into traditional lecture settings, has been shown to improve students' ability to identify and address complex issues. Coaching and training for faculty members to improve their teaching is yet another advantage of this approach. Teachers and students alike may agree that CBL is an excellent method for fostering independent study and critical reflection, as well as enhancing communication between the two groups. Students are more engaged in class when they have opportunities to apply what they are learning in real-world contexts. Case-based learning encourages a more thoughtful approach to the material and helps develop the competence necessary to integrate the material into clinical practise according to Malau-Aduli BS, et al. 2013[13].

As Physiology subject is the most vital subject for medical undergraduates, as all other major subjects including medicine, surgery, pathology rely upon the understanding of the normal functioning of the cell, tissue and organs i.e.: Physiology. Hence Our study focusses on the importance of CBL, as students must familiarize with all the clinical scenarios and cases that they are going to encounter in their upcoming years and create a bridge between the understanding of physiology and clinical case scenarios are therefore become utmost importance.

The aforementioned studies, conducted in different institutions throughout are in concordance with the results we have achieved through our cross sectional analysis. Incorporating case-based learning into the curriculum of medical undergraduates, with a focus on physiology, has proven to be a highly effective method of instruction, with promising outcomes in terms of students' mastery of key physiology concepts and their ability to make connections between theory and practice in real-world settings.

It will be easier for a teacher to build a road map for students if he or she has a clear image of where students are lacking in terms of ideas and knowledge. In contrast to large-group lectures, when the instructor can't possibly pay attention to each individual student, small-group sessions are very beneficial. Based on student evaluations of each class, it was determined that CBL aided students in making connections between classroom theory and real-world application and enhanced their ability to grasp complex concepts. Research shows that splitting a big class into smaller sections benefits both teachers and their charges. When CBLs followed lectures, students recalled more information and reported more enjoyment of the learning process.

Conclusion

Our findings suggest that CBL is a promising method of teaching physiology to undergraduate students. Most students feel that these sessions are helpful in grasping the lecture's major ideas, and teachers like the opportunity to concentrate on the needs of particular students during the brief group sessions. Students' interest, critical thinking, and intrinsic motivation all increase when case studies are used in the classroom. It also facilitates the building of a link between the clinical situation and their knowledge of physiological norms in humans. They get a deeper understanding of the study material, have a stronger memory for the fundamental ideas, can more accurately assess

clinical circumstances, and are more invested in the topic as a whole. Respondent facilitators said that CBL sessions helped them think more like clinicians, CBL model will be helpful in the future application of information, small group discussions with students were beneficial, and that CBL sessions improved their overall teaching abilities. Finally, CBL sessions encourage teachers to provide in-depth lessons in Physiology, which is good for both the teachers and the students.

Acknowledgement

The authors would like to acknowledge all the female physicians for their time and contribution to the study.

References

1. Bi M, Zhao Z, Yang J, Wang Y. Comparison of case-based learning and traditional method in teaching postgraduate students of medical oncology. Medical teacher. 2019;41(10):1124-8.
2. Kaddoura MA. Critical Thinking Skills of Nursing Students in Lecture-Based Teaching and Case-Based Learning. International Journal for the Scholarship of Teaching and Learning. 2011;5(2):n2.
3. Kulak V, Newton G, Sharma R. Does the Use of Case-Based Learning Impact the Retention of Key Concepts in Undergraduate Biochemistry?. International Journal of Higher Education. 2017;6(2):110-20.
4. Ziv A, Ben-David S, Ziv M. Simulation based medical education: an opportunity to learn from errors. Medical teacher. 2005;27(3):193-9.
5. BOKER JR, THOMPSON M. Transforming patient care: aligning interprofessional education with clinical practice redesign. Transforming Patient Care: Aligning Interprofessional Education. 2013:113.
6. Jones B, Phillips F. Social work and interprofessional education in health care: A call for continued leadership. Journal of Social Work Education. 2016;52(1):18-29.
7. Aleem SB, Imam KA, Hammad M. STUDENTS OPINION ON EFFECTIVENESS OF CBL IN ARMY MEDICAL COLLEGE, RAWALPINDI, PAKISTAN. Pakistan Armed Forces Medical Journal (PAFMJ). 2014;64(4):564-8.
8. Grauer GF, Forrester SD, Shuman C, Sanderson MW. Comparison of student performance after lecture-based and case-based/problem-based teaching in a large group. Journal of veterinary medical education. 2008;35(2):310-7.
9. Li X, Li Y, Li X, Chen X, Yang G, Yang L. Comparison of case-based learning combined with Rain Classroom teaching and traditional method in complete denture course for undergraduate interns. BMC Medical Education. 2022;22(1):1-8.
10. Sinatra VJ, Sapozhnikov M, Grossman J, Granat B. Poster Presentations Abstracts, 23rd Annual Meeting of the International Association of Medical Science Educators, Roanoke, VA, USA, , 2019.
11. Chadha D, Campbell J, Maraj M, Brechtelsbauer C, Kogelbauer A, Shah U, Hale C, Hellgardt K. Engaging students to shape their own learning: Driving curriculum re-design using a theory of change approach. Education for Chemical Engineers. 2022;38:14-21.
12. Khoiriyah U, Wijaya DP. Exploring Problem-Based Learning (PBL) and Case-Based Learning (CBL) in Stimulating Cognitive Skills among Medical Students: Analysis of Verbal Interaction. IIUM Medical Journal Malaysia. 2022;21(4).
13. Malau-Aduli BS, Lee A, Cooling N, Catchpole M, Jose M, Turner R. Retention of knowledge and perceived relevance of basic sciences in an integrated case-based learning (CBL) curriculum. BMC medical education. 2013;13(1):1-8.