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Research Article

Real-Life Cases in Student-Family Environment as a New Model for Case-Based Learning for Dental Students in Pathology: Students' Perspective

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I N F O

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A B S T R A C T

Background: Case-based learning is a widely accepted technique to promote critical thinking in health care students. This paper focuses on active learning through real life clinical cases as opposed to hypothetical cases in the dental academic curricula. The overall experience of the faculty as well as the students throughout the case assignment has been reported in this study.

Objective: This study provides a student's perspective and insight into an innovative real-life case-based approach in online learning of pathology.

Material and Methods: A real-life case of hypertension, diabetes or both was assigned to the Bachelor of Dentistry students in their second academic year of Pathology. The case was then presented by the students, followed by an open discussion involving peers and faculty members. Students' responses were obtained for the assignment.

Results: The response of students towards case assignment was promising and their feedback on each aspect of the assignment has been described. Faculty perception has also been included in order to share feedback about the students' participation in the assignment from a faculty viewpoint.

Conclusion: The present study introduces an innovative teaching method in medical education which can be utilized in the online learning of pre-clinical subjects and even clinical subjects during adverse situations when patient exposure is less. The real-life case-based learning method discussed in this paper offers real potential in developing critical diagnostic skills in students under a realistic clinical environment.

Keywords: Case-based learning, CBL, Real-Life Cases, Community, dental, Pathology, Active Learning, Online Education

Introduction

The need for reforms in health professionals' education is ever-growing, in view of various reasons such as the rapidly changing disease pattern, increasing number of non-communicable diseases, the COVID-19 pandemic, technological advances, growing access to digital technology. Medical education in India, as a part of ongoing reforms, has undergone substantial changes in order to adopt a more inclusive and integrative approach towards learning.[1]

The 21st century requires experts with excellent diagnostic skills and a multidisciplinary approach towards emerging conditions at a quicker pace. Students are required to apply their knowledge in practical scenarios while diagnosing a condition or devising a treatment plan to provide the best care for their patients. Small group learning strategies in healthcare education, such as problem-based learning (PBL),[2] task-based learning (TBL),[3] case-based learning (CBL),[4] and team-based learning (TBL)[5] have paved a way for a new generation of clinicians with adept critical thinking and reasoning skills.

According to the revised Bloom's Taxonomy (2001), among six levels of cognitive learning, the three highest levels are - analyze, evaluate, create - where the highest form of critical thinking is achieved.[6] CBL is a time-tested method to promote critical thinking through a hypothetical case scenario and a facilitator to enable maximum engagement of the learner.[7] It promotes the reinforcement of previously acquired knowledge in the best possible manner.

As per the dental curricula in India, students of Bachelor of Dental Surgery (BDS) are taught pathology in the second year, but clinical postings start only in the third year for medicine and surgery, where they experience clinical scenarios for the first time. Therefore hypothetical CBL in pathology is done routinely after didactic Lecture-Based Learning (LBL) to give them the concept of clinical-pathological correlation and promote analytical skills and critical thinking in the second year. However, this method relies more on theoretical aspects and ideal case situation than the actual clinical scenario, where multiple variables are involved. Real-life CBL introduced through this paper will give an early impetus to students towards self-directed patient-based learning, foster easy learning of subject content, facilitate its application in real-life situations.

The identified need and opportunity: Online didactic lectures during the COVID-19 pandemic took a toll on student engagement. Their participation dwindled due to the lack of in-person interaction and online academic sessions led to passive learning. Although students could learn a lot from textbooks and lectures, they lacked the opportunity of real life patient-centered learning. This affects students' understanding of a disease's true impact on patients and their families.

The innovation: A novel real-life case and scenario-based approach was formulated. This approach utilizes live cases, allowing students to understand the impact a disease has on patients and their families. The focus of this approach was to foster analytical and critical thinking, help students synthesize information themselves, rather than merely exposing them to information. The goal was to motivate students into developing social and analytical skills and supplement the curriculum with active learning opportunities, that promote critical thinking and a comprehensive learning of the subject area. Furthermore, one of the long-term expected outcomes was also to include improved patient empathy and communication.

This paper shares an account of the experience of students and teachers using this approach and highlights its advantages and challenges. A review of literature is done to compare this novel approach of CBL with other traditional approaches.

Materials and Method

Developing Protocol for Clinical Exercise

The clinical exercise started during the second lockdown in the second wave of COVID-19 around April-May 2021, when the students were given a break from online didactic classes. This was a completely voluntary assignment designed for the students in the second academic year of BDS, purely for educational purposes. Students were asked to identify a previously diagnosed case of either diabetes or hypertension or both from within their family or friend circle, based on whoever was willing to share their medical and personal details for educational purposes. Students were asked to review the previous prescriptions of the identified patient, record the findings, investigate the findings if required. They were asked to refrain from writing any prescriptions, performing clinical examinations, or advising drugs to the patient. Instructions for obtaining a detailed case history, including the patient's diagnosis, risk factors, clinical presentation, disease-related complications, other parameters were given to the students in order to guide them on how to record the medical history of patients [Table 1]. It was expected that pre-clinical students will write narratives describing patients' experiences during the illness, talk to a patient outside the hospital environment in a family or friend circle through a video call or directly if the patient resided in the same house as the student, to discuss their varied health care system experiences, elicit patient information firsthand in a professional manner.

Diabetes and hypertension are now common conditions, found ubiquitously around the world. Therefore, a real-life assignment was designed around these conditions with an understanding that these cases will be easy to find. Although there was flexibility in the kind of disease based cases one could find, due to the limitations that COVID -19

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posed. Due to ethical reasons, only those patients who gave written consent were considered for the study.

Table 1.Detailed Checklist for Recording the Case History

Clinical Diagnosis
Inquiry and assessment of modifiable and non-modifiable risk factors in the patient
Clinical presentation: What brought them to see the doctor for the first time?
Duration of their disease
Any disease-related complication(s) they had
List of investigations carried out in order to arrive at the diagnosis
Drugs consumed for the disease
If any recommendations made for counseling/change in lifestyle/diet
Follow-up tests for evaluation of the prognosis. Frequency of follow-up visits.
Compliance of the patient towards doctor's advice on medicines and/or changes in diet/ physical activity
Reason for non-compliance/ difficulties in following
Oral health issues present, if any, and their correlation with the systemic disease
Summary- Student's analysis and comments

Project Submission and Presentation

A period of three weeks was given to each student for completing the assignment and uploading on Google Classroom (a platform for online learning and education in recent times). All students who had submitted their assignment on Google Classroom presented their case on a Google Meet platform on separate days assigned for each case. Students who could not submit their assignment due to any reason were also encouraged to attend the presentation by other students and participate in an open discussion to facilitate maximum output from the exercise. Every presentation was followed by an open question-and-answer (Q & A) session and critical appraisal by the Department of General Pathology and peers.

Feedback and Suggestion

After the presentation, feedback was obtained from the students who participated and also from those who were unable to participate in the assignment. The questions were designed in such a way that assessed the usefulness, experience, applicability, relevance, difficulty level of each case among other things. A different feedback form was sent to those students who were unable to complete this assignment, which focused on their reason for not participating and suggestions for improving the assignment to ensure maximum participation in future. The faculty also gave their feedback. A qualitative analysis of the feedback obtained has been presented here.

Result

Student Characteristics

The participation rate was 38.2% (18 out of 47 students) Out of these 18 students (Group A) who completed the clinical exercise, 15 were females and 3 were males. Participation in the individual cases varied significantly for the combination of Diabetes and Hypertension which was 11.11% as compared to Hypertension at 50% and Diabetes at 38.88%.

Response from Students who Participated in the Assignment

The feedback obtained from 18 students who participated in the assignment was found to be in favor of real-life CBL approach. 77.8% students found the assignment helpful in understanding the whole process of contracting a disease to its treatment and healing, 50% students were self-motivated to use additional resources for active exploration on their case. 55.6% of the students found interaction with a real-life patient useful and 38.9% appreciated the opportunity it provided to enhance communication skills and self-confidence in carrying out live research. The involvement of pre-clinical subjects and para-clinical subjects in real-life scenarios and early exposure to clinical subjects was appreciated by 55.6% of the students. Moreover, 94.4% of these students reported that the assignment made the topic more interesting to learn, helped them in identifying the gaps in their knowledge regarding the topic. 88.9% of the participants felt that real-life CBL was better than hypothetical case studies which were reviewed within the confines of the classroom (Figure 1). The difficulty level of cases in the clinical exercise was reported to be the highest for "combination of hypertension and diabetes", whereas the level for diabetes mellitus and hypertension lay in between, with a difficulty level somewhat similar to diabetes (Figure 2). 88.9% of the students strongly suggested that such activities be held in the future for pre-clinical students to broaden their horizon of clinical understanding.

Challenge

The students also experienced a few difficulties in certain areas while doing this exercise. The major problem was related to the gathering of information from patients. One student reported, "It was difficult for the patient to recall past events and therefore not able to answer properly". Another student said "Patient had forgotten most of the details related to what their lab findings were and which drugs were prescribed to them initially." Furthermore, one student added, "The latest reports showing complete lipid

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profile, KFT, LFT of the patient were not available. So, the current health status of the patient could not be analyzed". Other challenges included, interacting with the patient without any prior experience of note-taking and recording of medical history. In this aspect, some of the students commented: "Gathering information from the elderly patients was a little difficult"; "Interacting with the patient requires much patience and endurance. Asking too many questions to the patient might make them feel irritated."; "It was difficult to act professionally."

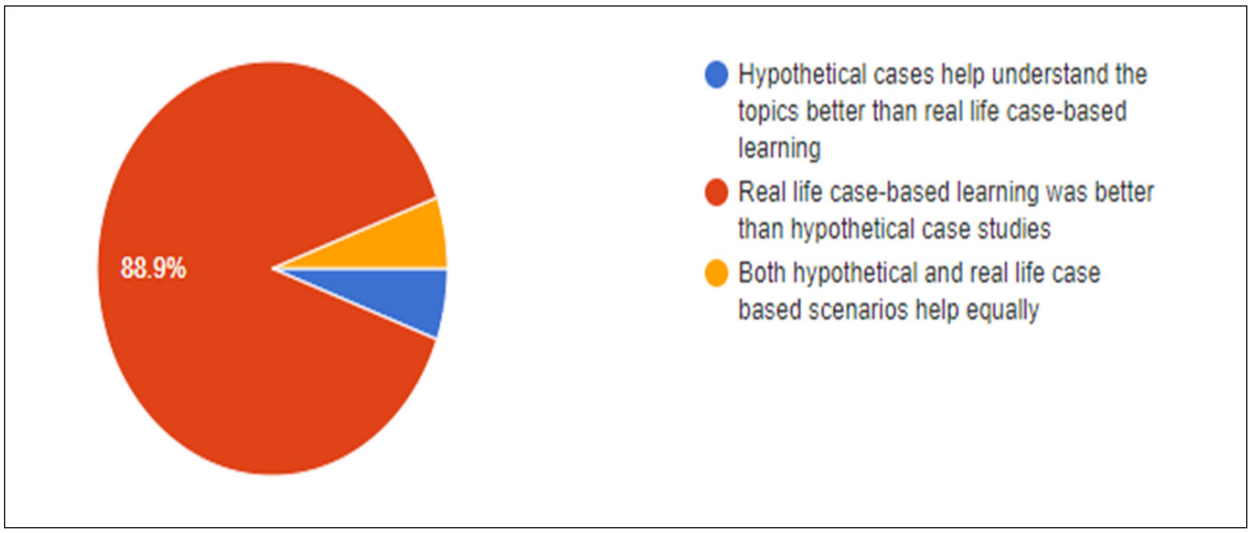

Figure 1.Results Pertaining to Comparison Between Hypothetical Cases and Real-Life Case-Based Learning

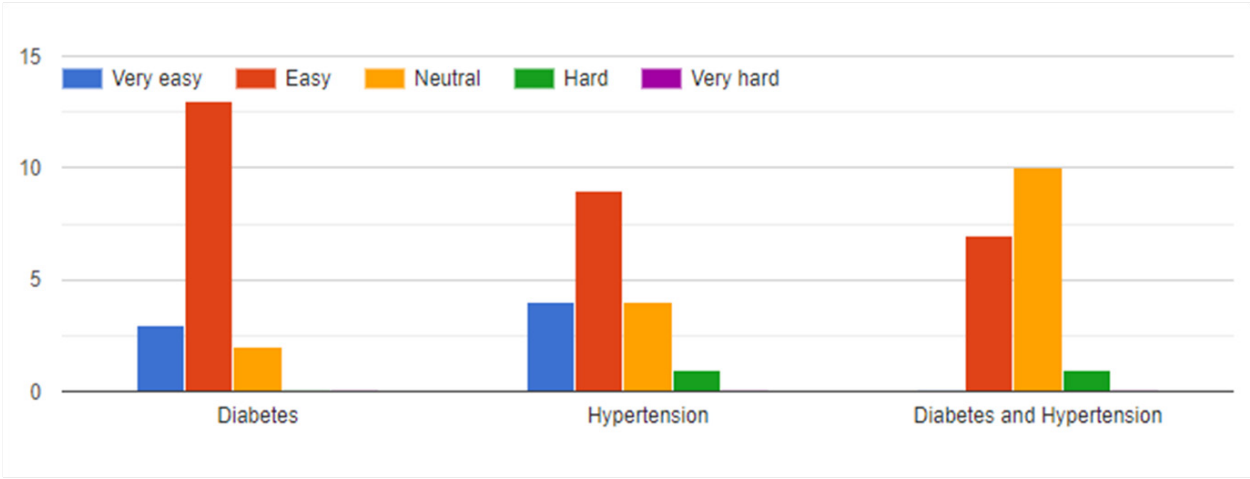

Figure 2.Students' Assessment of Difficulty Level Associated with Each Case

Response from Students who were Unable to Participate in the Assignment

The feedback form sent to 29 students who were unable to complete the assignment, was an effort to identify the reason(s) behind their inability to participate. 18 out of 29 students gave their feedback. 61.1% of the students stated paucity of time as their inability to participate, whereas 22.2% of them found the assignment difficult to complete. 11.1% of students did not find the assignment useful and 5.6% of them did not complete the exercise because it was voluntary and did not consider it important as a part of their internal assessment. The remaining students, however, could not find any patient to collect data from and therefore were unable to participate in the exercise.

Although these students could not complete the assignment, when asked about their opinion after listening to others' presentations, a positive response was obtained. 66.7% students reported that the clinical exercise for CBL was useful and 83.3% found the real-life CBL assignments more helpful than hypothetical case studies. A positive response was obtained from them for future participation in such events if given the opportunity.

Suggestions from students were also sought on improving this CBL assignment. One student suggested making teams and working in groups for the exchange of thoughts and appropriate distribution of workload to enable maximum participation. Other students' suggestions were directed towards "time slot allotment for each candidate" and a

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rapid question-answer session for reinforcement of the key concepts. Many students also recommended that the assignment should carry reward points or marks, in order to promote engagement and healthy competition amongst peers.

Faculty Perception

The students presented the cases in a very professional and comprehensive manner with all possible data that could have been collected from the patient. The data was collected in a comfortable environment conducive to both the student and the patient. There was no pressure on students regarding evaluation or scoring of the assignment. The presentation reflected students' deeper understanding of their cases, including the pharmacological aspects of the disease. The group discussion was very healthy and students were able to answer any follow-up questions related to their topic satisfactorily. Students demonstrated their interest and motivation throughout the activity. They were introduced to the entire course of a disease from predisposing risk factors, clinical presentation, medical approach to diagnosis, treatment and follow up, role of counseling regarding change in dietary pattern, life style changes, challenges faced by the patient and family in compliance regarding the treatment and follow up. Moreover, since these patients were from the family and surrounding community, it enabled students to have a broader and empathetic perspective while looking at any disease.

By utilizing a patient-centered teaching model, we tried to expose the students to a community setting. The students demonstrated an understanding of the importance of involving the patient and their family in the development of their medical care plan for non-communicable diseases. This no-cost strategy helped students to reflect upon social and individual determinants of health, including the environmental risk factors, access to care, barriers to positive health outcomes.

Discussion

CBL is considered a significant method in introducing critical thinking elements to the curriculum. In a typical preclinical class, hypothetical case studies are used followed by an open discussion to bring in the clinical aspects of learning into the preclinical subjects such as pathology, microbiology, or pharmacology in the second academic year of BDS. However, in contrast to hypothetical case studies, real-life clinical case studies promote critical decision-making skills through firsthand experience. In this study, we have introduced a real-life case-based approach to inculcate the realistic component of a doctor-patient interaction and get an early hands-on experience at recording medical history and rapport building with the patient, with an added advantage of active learning of clinical concepts and practices. This was especially beneficial for BDS students in their second year, who do not get early clinical exposure. Moreover, this activity was planned to motivate students during the lockdown period as there was no alternative to possibly capture the clinical essence of learning.

The students who completed the assignment found it useful in several domains. The positive feedback obtained in multiple aspects signifies the usability and thus the requirement of similar assignments in the education program. The assignment was able to identify gaps in the knowledge of students and the problem-solving approach prompted them to apply the knowledge obtained from pre-clinical and para-clinical subjects in real-life scenarios, thus facilitating better learning. The shorter duration of student-patient interaction and single patient encounter is not expected to enhance self-confidence and communication skills in the students. However, this attribute is expected to grow with increased encounters with patients and more frequent real-life case assignments in the dental curriculum. This attribute, if practiced from an early stage in their career, can prove to be of utmost help to students in building a good rapport with the patient, later in their clinical years. The importance of real-life cases over a hypothetical case study cannot be over-emphasized in online education which is lately being called the new normal. During the COVID-19 lockdown phase, the clinical exposure was reduced to negligible in order to avoid physical contact and dental students found this barrier to be stressful in their education.[8] In such times, students can be motivated with newer methods of teaching while preventing any possible risk of exposure to infection.

There have been multiple pieces of evidence suggesting the role of active learning strategies such as CBL, in developing critical thinking and reasoning.[9] In preclinical medical students, it was found that CBL promoted deeper understanding as opposed to superficial learning.[10] In a study conducted by Yoo et al,[11] the role of CBL in promoting communication skills, problem-solving ability, learning motivation was established. Similarly, Alzhami et al reported a significant mean difference ($P<0.001$) between CBL and traditional learning methods in the orthodontic diagnostic ability of undergraduate dental students. Additionally, the level of satisfaction for CBL methods was higher in students when compared to lecture-based strategies.[4] In another study, Zhao et al evaluated the combined effect of PBL and CBL strategies in teaching thyroid surgery. The PBL-CBL group showed increased scores than the conventional learning group ($P<0.001$) and an increase in understanding, communication, critical thinking, self-learning, teamwork was observed.[12] A comparison between TeBL and CBL methods yielded positive results in favor of TeBL approach in the knowledge-based exam, but quite the

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contrary in the application-based test.[5] However, previously conducted studies have not discussed real-life strategies in preclinical subjects of dental education to promote self learning in students through active exploration. The real-life CBL approach differs from the previous approaches of medical education in adding a realistic component within the student-family environment, which includes benefits of a CBL approach with additional advantage of learning in a real-life scenario.

This real-life CBL assignment in hypertension and diabetes helped the students to not only understand risk factors, etiopathogenesis and clinicopathological correlations, but also the complete natural history of these non-communicable diseases which require long term follow up and serious commitment from patients and family support for the desired dietary and life style changes. The role of pharmacological agents in modifying the severity of the disease was also highlighted in the assignment. Participation in the individual cases varied significantly with a combination of diabetes and hypertension, having a participation rate of 11.11%, as compared to hypertension at 50% and diabetes at 38.88%. This was most probably due to a higher prevalence of either hypertension or diabetes, rather than the presence of a combination of both in a patient. The promising results obtained in this study can be extrapolated to reproduce more such assignments in future, for the benefit of students in the dental field. This real-life CBL assignment in hypertension and diabetes can be expanded to various other cases such as anemia, ischemic heart diseases, jaundice in pathology. When access to patients in dental college is not possible, for example in critical times such as lockdown due to COVID 19, this method of learning can be used for third and final-year students for teaching medicine and surgery to decrease student burnout with online classes.

Feedback included from students generated extremely positive comments about the interactive and inclusive nature of the assignment. By allowing active learning through exploration, increased student engagement, satisfaction and clinical preparedness is expected. This approach can help dental students improve their empathy and communication, besides knowledge and expertise. This will facilitate a strong foundational medical knowledge in the dental students and therefore produce excellent clinicians with a comprehensive knowledge of all the areas that medical practice entails. Furthermore, it has been observed across dental institutions that clinical posting rotations start only from the third academic year. The findings of our study can also be inferred in a way to begin purely observational clinical ward rotations right from the second academic year for pathology, microbiology, pharmacology, in order to facilitate visual and practical learning.

Limitation

Apart from the multiple advantages that the real-life CBL approach presents, there are certain limitations to it. The real-life cases are not as ideal as compared to hypothetical case studies, due to a number of variables involved, which lead to inter-individual variation, making the interpretation of cases difficult for students. There could also be variations due to late diagnosis of the patient, non-compliance to the prescribed drugs, lack of regular follow-ups. The assignment required a single case history in a particular time frame. Therefore the students missed on the long-term follow-up data with respect to prognosis and associated complications of the disease. The real-life case-based learning introduced in this study is an innovative teaching method that was only introduced as an assignment for the students. Therefore, objective evaluation of the method was not performed. Further studies are recommended to critically evaluate the real-life CBL approach in medical education, with a pre and post-evaluation of knowledge design, to obtain more accurate data. Further promotion of the method as a viable learning technique, especially when access to patients in the hospital is not possible.

Conclusion

This study emphasizes the connection and the gap that exists between theoretical learning of concepts and actual clinical practice through a real-life case in pathology. It highlights the importance of real-life CBL in dental students who are yet to enter their clinical phase of practice. Through this study, it has been suggested to include such activities in the dental curriculum, in order to promote student-patient centered active learning of real world scenarios. Furthermore, this learning method can be used in any discipline of health care as a part of academic learning, which will ultimately benefit the students in the long term when they begin medical practice.

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