

RESEARCH ARTICLE

BIO CHEMISTRY

CASE BASED LEARNING IN BIOCHEMISTRY

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**ABSTRACT**

**Background:** Case based learning (CBL) is a popular method of teaching in medical schools. The primary aim of implementing CBL in to the curriculum of medical schools is to expose the students to the real world problems and to prepare them to analyze, interpret and solve them. The objective of our study is to find the effectiveness of CBL compared to routine didactic lectures and to know whether CBL can be adopted as a regular method of learning in biochemistry curriculum.

**Methodology:** In addition to didactic lectures, CBL was used as learning method in few topics like heme metabolism in fourth and lipoprotein metabolism in third semester exclusively. The effectiveness was assessed by comparing the post CBL and post lecture scores. Students' perception was assessed by a questionnaire which is validated by peers.

**Results:** Mean scores were  $67.3 \pm 1.8\%$  and  $65.7 \pm 1.7\%$ , post CBL and post lecture respectively for the fourth semester and  $76.1 \pm 1.2\%$  and  $74.3 \pm 1.9\%$  respectively for third semester.  $P < 0.001$  suggested that post CBL grades were extremely significantly higher in both the semesters. Majority of the students (54%) opined that the case was appropriate and useful. 41% students found this method of learning very difficult.

## KEY WORDS

Case based learning, effectiveness, student perception

## INTRODUCTION

The case based learning (CBL) in medicine is a real world experience because a case study is a record of all the events pertaining to the patients. It involves history, clinical examination findings, investigation reports and treatment aspects of a clinical condition. It stimulates students to think the cause for the disease, arouse interest to know the prognosis of the disease, any recent advances in the treatment. So it makes the students to participate actively (1). Case study demands decisions from the students which develop by practice. They have to analyze the case situation, share their knowledge with other participants and try to find a solution. Main aim of our study is to give students knowledge by strategic method of learning. Instructor plays the role of a facilitator or explorer. Student joins him as a fellow explorer. Students individually and collectively take the responsibility for their own learning. Complexity of case situations forces students to interpret areas that are ambiguous for which they read between the lines, make decisions even with an incomplete data. Case based learning provokes interest in the subjects and helps in deep and strategic learning (2).

## OBJECTIVE

The aim of our study is to find out whether the case based learning is more effective than the routine didactic lectures by comparing the post CBL and post lecture scores and also to collect feedback on students' perception on case based learning in biochemistry. Based on the student perception assessment, to find out whether CBL can be incorporated in to our teaching curriculum on regular basis.

## METHODOLOGY

This study was conducted in Kasturba Medical College international centre, which is a twinning

programme of Manipal University with the American University of Antigua. This programme offers training in premedical subjects (physics, chemistry etc) in one year duration( two semesters) and pre and paraclinical subjects over a period of two years(four semesters).Students who are admitted twice a year, fall and spring sessions have to go through six semesters. In the third and fourth semesters, students learn anatomy, physiology, biochemistry & genetics and introduction to clinical medicine (ICM).In the last two semesters they are trained in pharmacology, microbiology, pathology and ICM.The course content is totally different as compared to other Indian medical colleges. The main aim is to train the students for USMLE part 1 examination which they have to be through to get in to the clinical rotations in hospitals of United States of America.

We incorporated case based learning along with didactic lectures in the biochemistry teaching curriculum. Sixty students studying in the fourth semester and fifty students of third semesters were divided in groups, each group with 10 students, actively participated in our study. Students were informed about the topic of discussion two weeks prior. Specific learning objectives were defined.Cases were selected not only with the intention of solving a clinical scenario, but also to create interest about the background knowledge.

The CBL was carried out in three steps, first a brief introduction was given to orient the students about the case. In the second step we projected videos which showed real patients in which entire clinical scenario was live. In the third step was for the discussion of the biochemical basis of the case.In the last session , students doubts were also cleared. The interactive sessions made the subject more interesting.

The cases for discussion for fourth semester students were on different types of porphyrias along with heme synthesis pathway and also students were exposed to cases on different types of jaundice, clinical features, laboratory findings, and the heme degradation pathway and metabolism of bilirubin in the body. In this we have covered entire heme metabolism along with the associated disorders.

Similarly cases of hyperlipoproteinemias were discussed with the third semester students along with the lipoprotein metabolism and lipid transport.

Student evaluation was done with a test paper consisting of 25 MCQs in the topic at the end of the session. We compared their scores with the previous scores (after routine lectures). Students' perception regarding case based learning was assessed by collecting their feedback by using a closed ended questionnaire which was validated by peers. A common questionnaire was given to both the fourth and third semesters.

#### Statistical analysis

Statistical analysis was done using Graph pad Statistical Software. Unpaired student 't' test was applied. Scores were expressed as mean±SD and P value less than 0.05 was considered to be

significant. Subjective assessment was analyzed by descriptive statistics.

## RESULTS

Post CBL scores were significantly higher ( $p < 0.001$ ) in both third and fourth semesters as compared to that of post didactic lectures. The mean score of fourth semester students in CBL was  $67.3 \pm 1.8\%$  and that of post didactic test was  $65.7 \pm 1.7\%$ . The mean scores of third semester students were  $76.1 \pm 1.2\%$  and  $74.3 \pm 1.9\%$  after CBL and after didactic lectures respectively as depicted in the table.

Students' perception about this learning method was positive. Majority of the students (54%) opined that the case was appropriate and useful in learning. Thirty eight percent (38%) students felt that introduction sessions were interactive and hence created interest in learning. Forty one percent (41%) students found this method of learning very difficult. Forty seven percent (47%) students appreciated this method of learning as they could actively participate as compared to routine lectures which used to be one sided. Eighty nine percent (89%) students felt that the role of the instructor was crucial.

**Table**  
**Comparison of scores**

Semester	Scores(%) expressed as mean±standard deviation		P value
	Post lecture	Post CBL	
IV (N=60)	$65.7 \pm 1.7$	$67.3 \pm 1.8^*$	<b>&lt;0.001</b>
III (N=50)	$74.3 \pm 1.9$	$76.1 \pm 1.2^*$	<b>&lt;0.001</b>

95% confidence intervals were 0.967 to 2.233 for the fourth semester and 1.169 to 2.431 for the third semester.

## DISCUSSION

CBL uses a guided inquiry method and provides more structure during small-group sessions. Better performance of the students in post CBL evaluation suggests that case based learning is

an effective method compared to didactic lectures. Interactive sessions make students curious, attentive and active participants. Our finding is supported by a study in a medical school in University of California, Davis, where whole curriculum is shifted to case based



learning (3). The students as well as faculty of their medical school opined that CBL as an effective alternative model to PBL as well as to lectures.

Cases stimulate students to predict, make choices and offer suggestions that will affect the outcome. Students start correlating the clinical findings to the biochemical aspect, learn to make the diagnosis in case based learning. They were enthusiastic to give the biochemical basis of the signs and the symptoms. This helped the students in deep learning. The deep approach is the most appropriate and desirable way of learning that is closely linked to the intellectual processes that are expected in all medical students. A deep approach is likely to result from relevance of the subject matter to students' interests (4); the interest, support, and enthusiasm shown by the instructor (5); and the environment where students have an opportunity to manage their own learning (6). It was also found to be related to what students perceive as "good teaching" and "freedom in learning" (choices in what and how to learn).

A case based study by Schoeman JP *et al* in preclinical veterinary science coincides with our study as their students also reacted very positively to the ability of the course to equip them with problem-solving skills(2).

Student perception is important in implementing CBL in the biochemistry curriculum of the international programme. Curriculum development is a continuing and evolving process that is enormously informed by student

feedback and organized studies of perceptions of learning(7-9).

Even though students were positive about the case based learning approach, a significant proportion of students felt that CBL was difficult. This could be due to the lack of comfort zone as explained by Nardi and Kremer (10). In didactic teaching methods, teacher transmits knowledge to students in a securely anchored way. Didactic teaching methods contribute to students' comfort zone (11).When the role changes as in CBL they have to learn in a self motivated manner; comfort zone changes which make them feel that this method is difficult.

A case based study by Cook DA *et al* in postgraduate physicians suggests that case based questions are preferred irrespective of their scores (12).

## CONCLUSION

We could conclude from our study that CBL is an effective method of learning as compared to learning through didactic lectures as it promotes deep learning. Student's perception on this method was positive suggesting a success in future implementation of CBL in the curriculum. We suggest a comparative study that can be done to assess the effectiveness of CBL in students who have undergone CBL sessions with a set of topics with students who have undergone didactic lecture sessions on the same topics.

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