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Original Research Article

# Utility and Effect of Case Based Learning and Conceptual Learning of Biochemistry Classes in First Year Medical Students

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**Conflict of interest: Nil**

**Abstract:**

**Background:** Case based learning (CBL) and conceptual learning are newer methods of learning in medical education. CBL engages us with real life case scenarios, involving ourself in self-directed learning. Conceptual learning guides students to understand the abstractions. Introducing CBL and conceptual learning with didactic lectures will lead to deeper understanding of the subject.

**Aims and Objectives:** We wanted to study and put forth the perception of first year MBBS students towards CBL and conceptual learning in understanding biochemistry in medical education.

**Methodology:** First year medical students were taught biochemistry topics by didactic lecture. Followed by the lecture, either CBL or conceptual learning-based questions on respective topics were posted through digital platform for students to analyse the question. Responses were collected through google forms. Post Didactic lecture and post CBL or conceptual learning test were conducted and compared. A questionnaire addressing different aspects of CBL and conceptual learning were given to students after completion of all the topics.

**Result:** Performance of the students significantly improved after CBL and conceptual learning as compared to didactic lectures ($p<0.0001$). 89.2% of students developed positive attitude in learning biochemistry after CBL and conceptual learning and found these methods to be helpful for studying biochemistry (88.4%). Interaction with peer groups (82.2%) and teachers (74.8%) has been increased post CBL and conceptual learning. 91.3% of students improved their clinical reasoning skills and clinical competence. 58.8% of students did not find CBL and conceptual learning as extra work and time consuming.

**Conclusion:** CBL and conceptual learning has inculcated interest to understand biochemistry more thoroughly and develop Scientific reasoning skills which would help them to understand the medicine better.

**Keywords:** Case based learning (CBL), Conceptual learning, Biochemistry, Medical education.

## Introduction

Case based learning (CBL) and conceptual learning are newer methods of learning in medical education. Biochemistry, study of chemical process in living organism (human) includes complex metabolic process which are usually taught through didactic lectures. During didactic lectures students are not actively involved. CBL engages us with real life case scenarios, involving our self in self-directed learning, encouraging to correlate the disease condition with metabolic process and associated abnormalities. [1] Conceptual learning guides us to understand the abstractions rather than memorizing the information. [2] Combing CBL and conceptual learning with didactic lectures will lead to deeper understanding of the subject. [3] CBL is an established method which uses a guided enquiry method for learning.

It deals with real world problems or situations. [4] Emerging trend all over the world today with changing curriculum is to teach medical students through Problem Based Learning (PBL) or CBL demanding active participation of students. [5]

## Methodology

### Study design and population

A total of 130 First year MBBS students of batch 2020-2021 attending biochemistry classes at CDSIMER were included in the prospective cohort study. Students who are unable to take test, did not answer the questions and not willing to answer the questionnaire were excluded from the study.

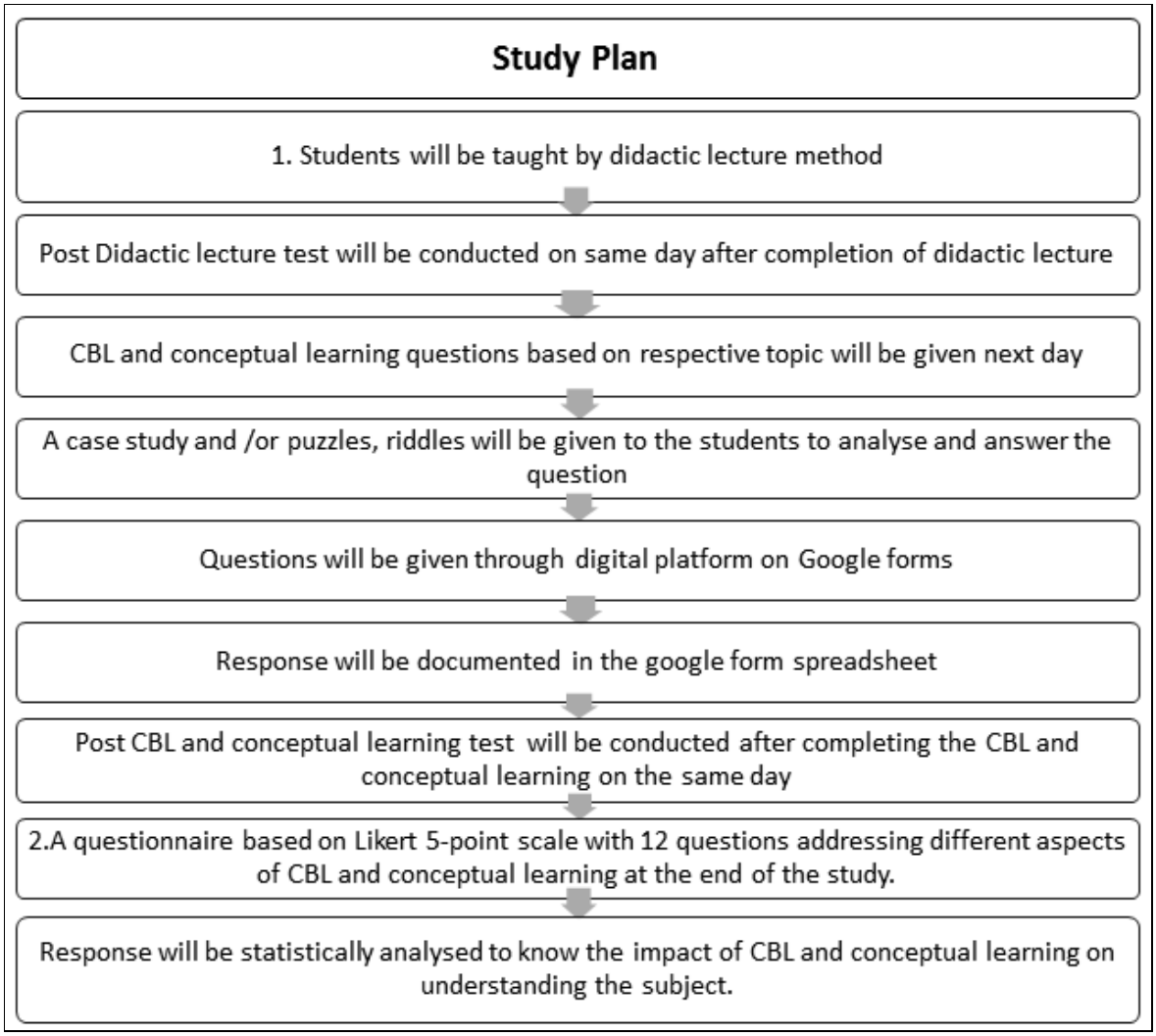
### Study Plan

Initially students will be taught by didactic lecture method; post didactic lecture test in form of multiple-choice questions will be conducted on same day after completion of didactic lecture and students' scores will be evaluated before the introduction of CBL and conceptual learning. CBL and conceptual learning questions based on respective topic will be given next day. A case study and/or puzzles, riddles will be given to the students to analyse and answer the question. These questions will be given through digital platform on Google forms. All their responses will be documented in the Google form spreadsheet. Also, a post CBL and conceptual learning test will be conducted after completing the CBL and conceptual learning of biochemistry topics on the same day and students' scores will be evaluated. Test scores will be statistically analysed to know the impact of CBL and conceptual learning on understanding the subject. Institute ethical committee approval was obtained.

A questionnaire based on Likert 5-point scale with 12 questions addressing different aspects of CBL and conceptual learning will be given to students after completion of all the topics.

### Statistical Analysis

Graph Pad Prism 8.0.2 was used to perform statistical analysis. Normality of quantitative data was checked using Kolmogorov-Smirnov tests. Mann Whitneys test was used to compare test scores of Post Didactic lecture tests, Post CBL & conceptual learning tests.




## Results

Test scores of Post Didactic lecture test and Post CBL & conceptual learning test showed significant difference ($p < 0.001$) [Figure 1]. Mean value of post didactic lecture test scores from all topics was (3.18±0.19) and of post CBL and conceptual learning was (6.94±0.26). 105 medical students responded to the questionnaire. 85.4% of students found CBL and conceptual learning of biochemistry interesting [Figure 2]. 89.2% of students developed positive attitude in learning biochemistry after CBL and conceptual learning [Figure 3] and found these methods to be helpful for studying biochemistry among 1st year MBBS students (88.4%) [Figure 4]. Self-learning skills were improved in 86.3% [Figure 5], with ability to listen, give, and receive criticism after discussion was enhanced in 80.6% [Figure 6] of students. In about 78.5% [Figure 7] of students found CBL and conceptual learning encourage them to perform at their best and reduced the amount of time required for self-study and also helped in recollecting facts faster (84.4%) [Figure 8]. Interaction with our peer groups (82.2%) [Figure 9] and teachers (74.8%) [Figure 10] has been increased post CBL and conceptual learning. 89.3% [Figure 11] of students found positive impact of CBL and conceptual learning on their performance in examination. 91.3% [Figure 12] of students improved their clinical reasoning skills and clinical competence. 58.8% [Figure 13] of students did not find CBL and conceptual learning as extra work and time consuming.

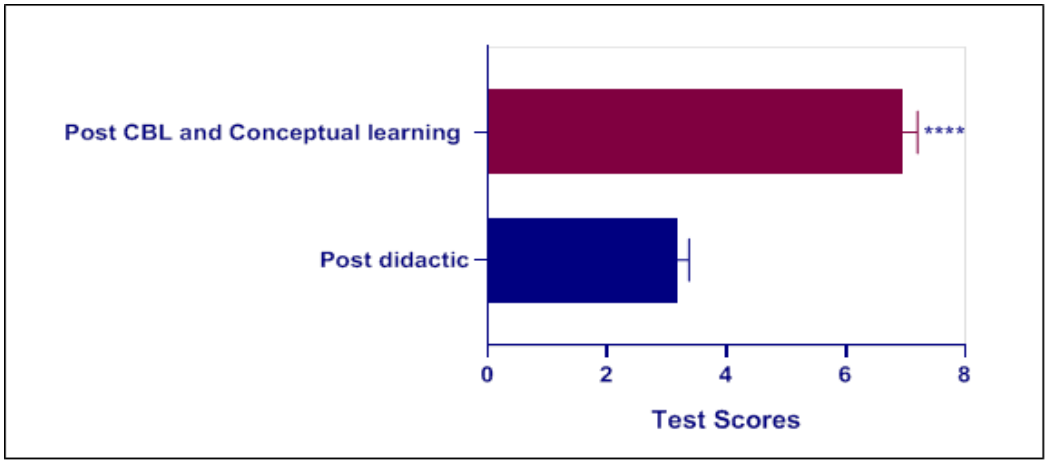



**Figure 1: Comparison of mean values of post didactic lecture and post CBL & Conceptual learning test scores (**** =p<0.0001).**

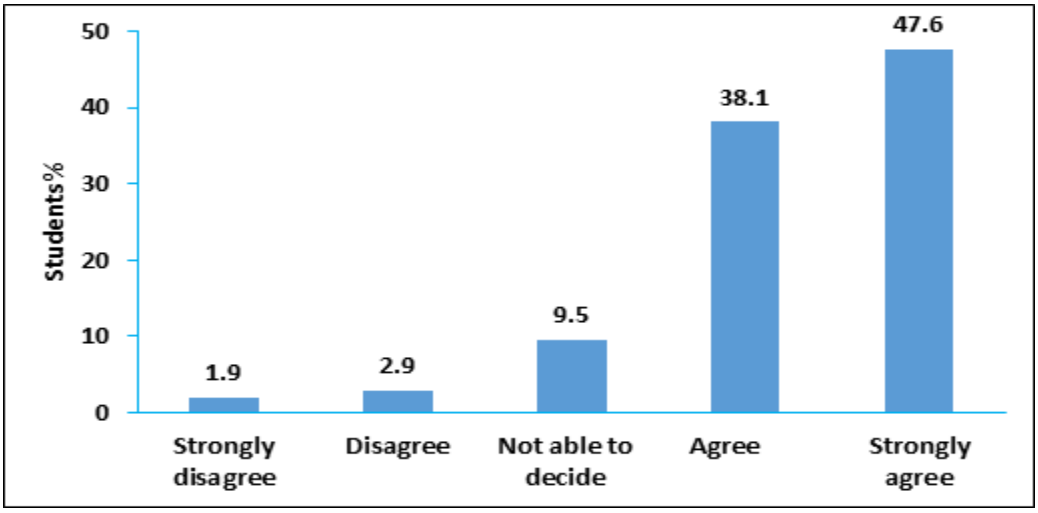



**Figure 2: Percentage of students agreeing CBL and conceptual learning method of learning biochemistry are interesting.**

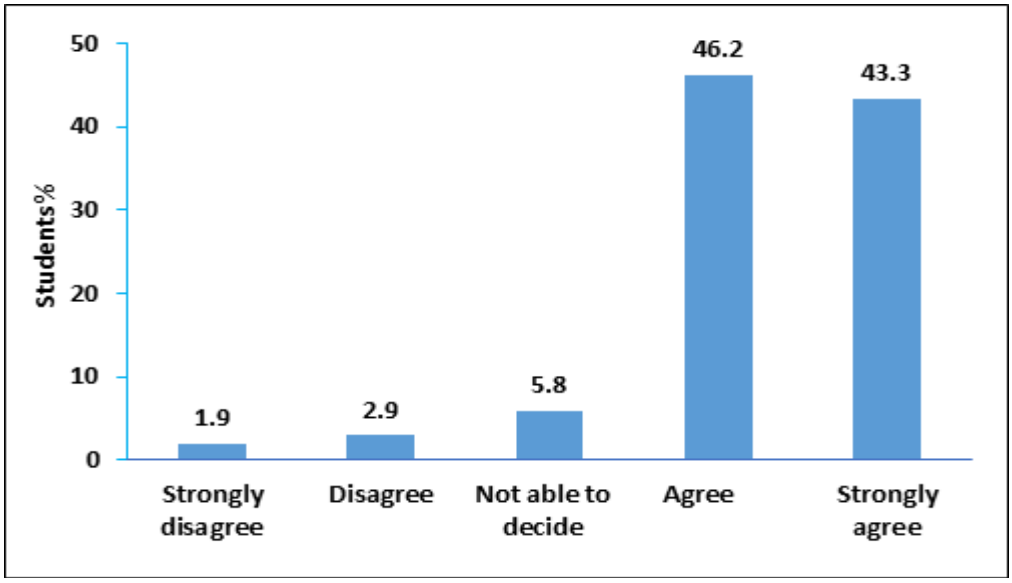



**Figure 3: Percentage of students agreeing CBL and conceptual learning have developed positive attitude in them towards learning biochemistry**

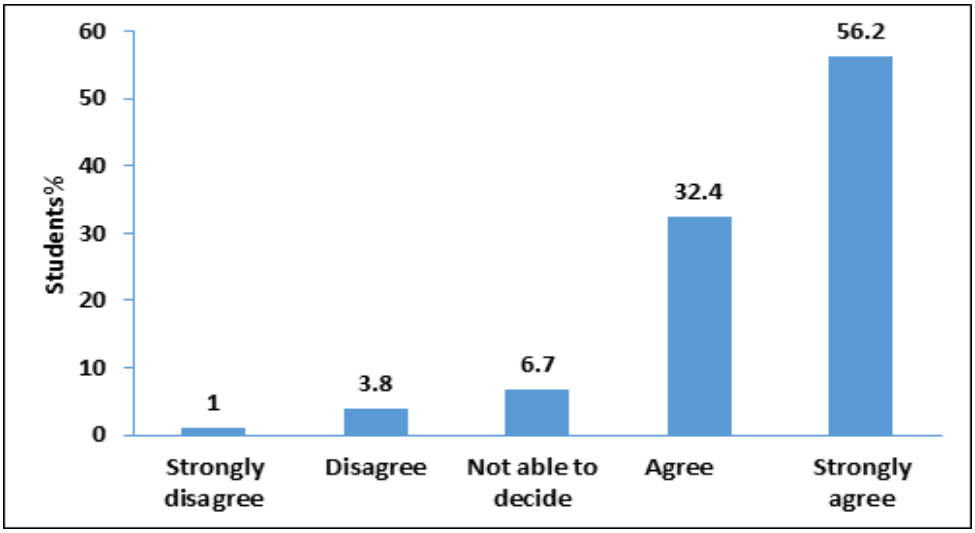



**Figure 4: Percentage of students agreeing CBL and conceptual learning method are very helpful for 1st year MBBS in studying biochemistry**

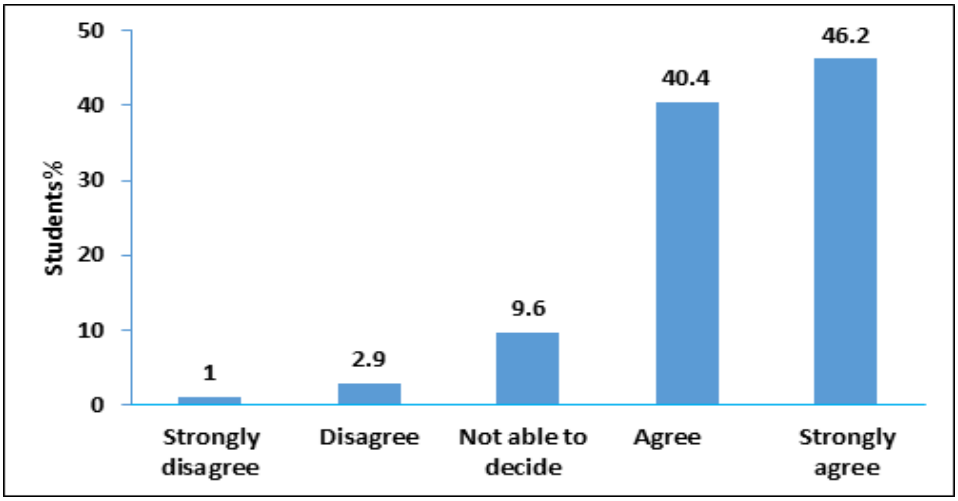



**Figure 5: Percentage of students agreeing CBL and conceptual learning method have trained them in self-learning skills.**

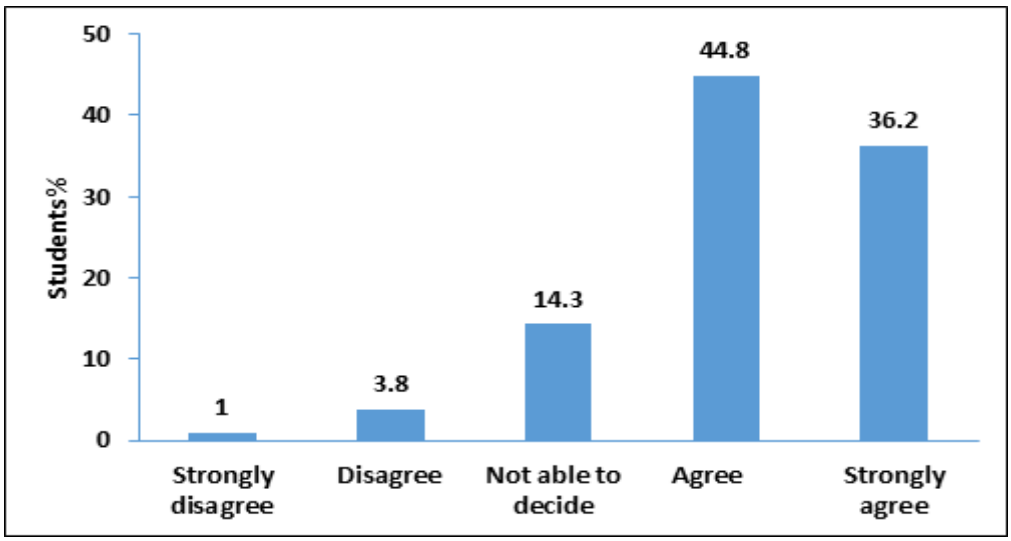



**Figure 6: Percentage of students agreeing they have better interpersonal skills of listening, giving, and receiving criticism after CBL and conceptual learning.**

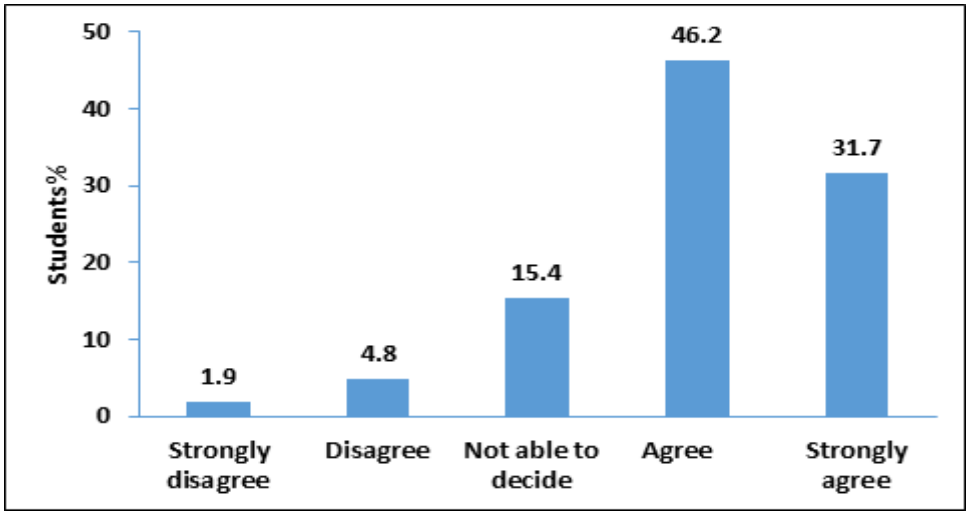



**Figure 7: Percentage of students agreeing CBL and conceptual learning challenged them to give the best and reduced the amount of time required for self-study.**

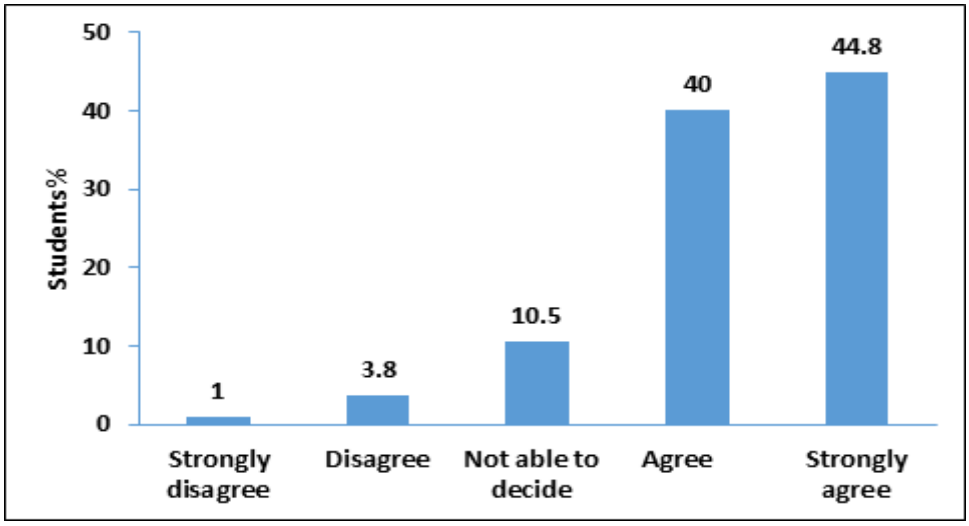



**Figure 8: Percentage of students agreeing CBL and conceptual learning helped them in recollecting facts faster.**

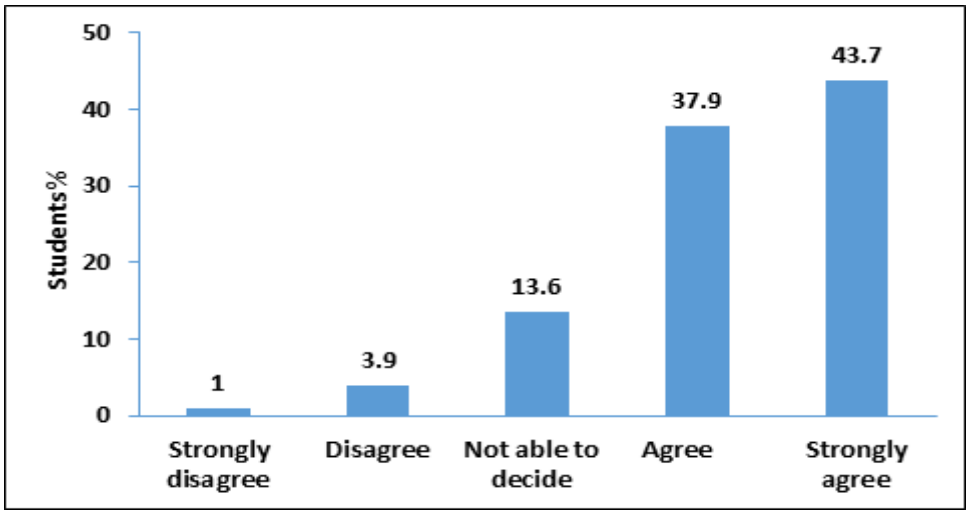



**Figure 9: Percentage of students agreeing CBL and conceptual learning method have prompted more peer group discussions among them.**

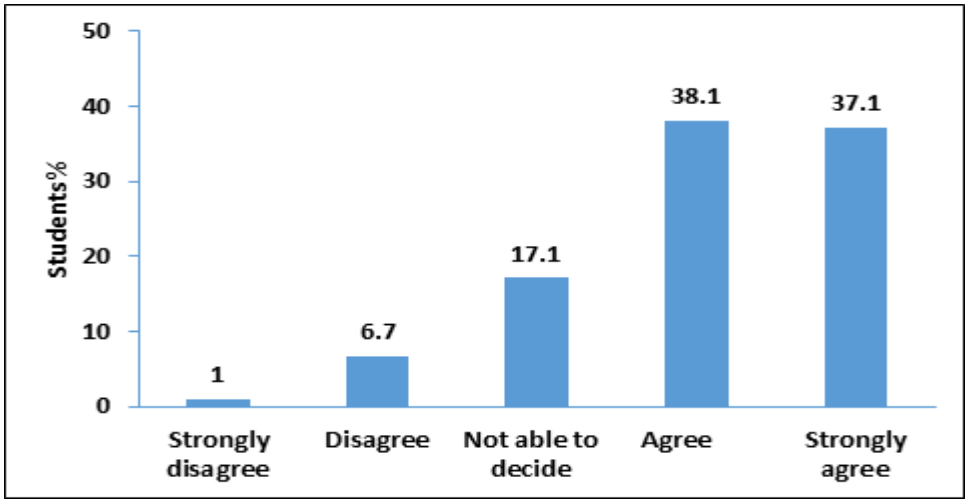



**Figure 10: Percentage of students agreeing interaction was better with their teachers after introducing CBL and conceptual learning.**

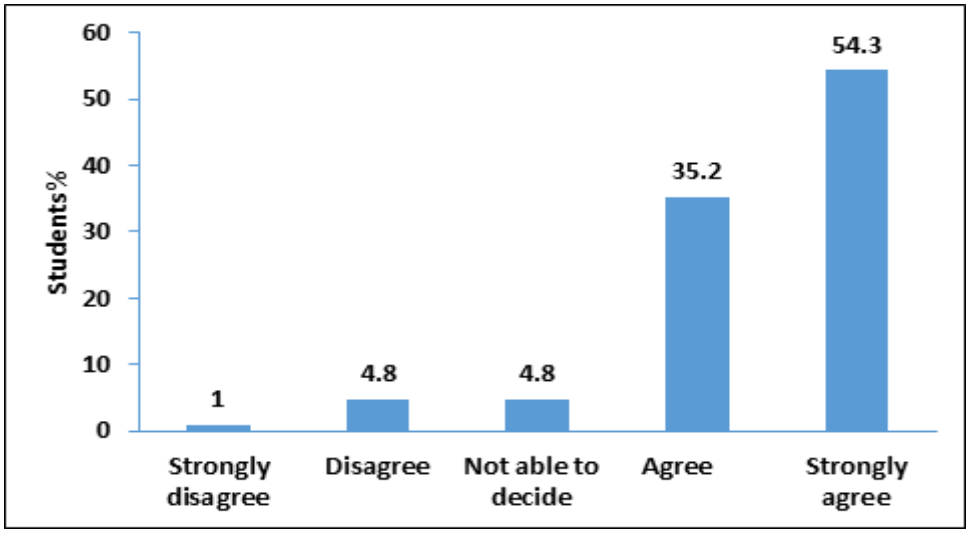



**Figure 11: Percentage of students agreeing CBL and conceptual learning method will definitely have a positive impact on their performance in examinations.**

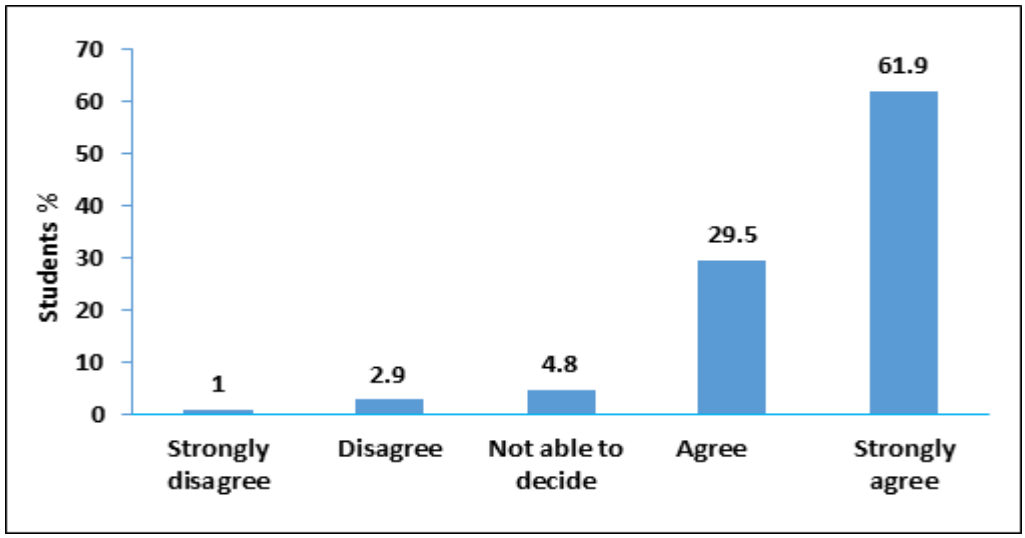



**Figure 12: Percentage of students agreeing CBL and conceptual learning in biochemistry have improved their clinical reasoning skills and clinical competence.**

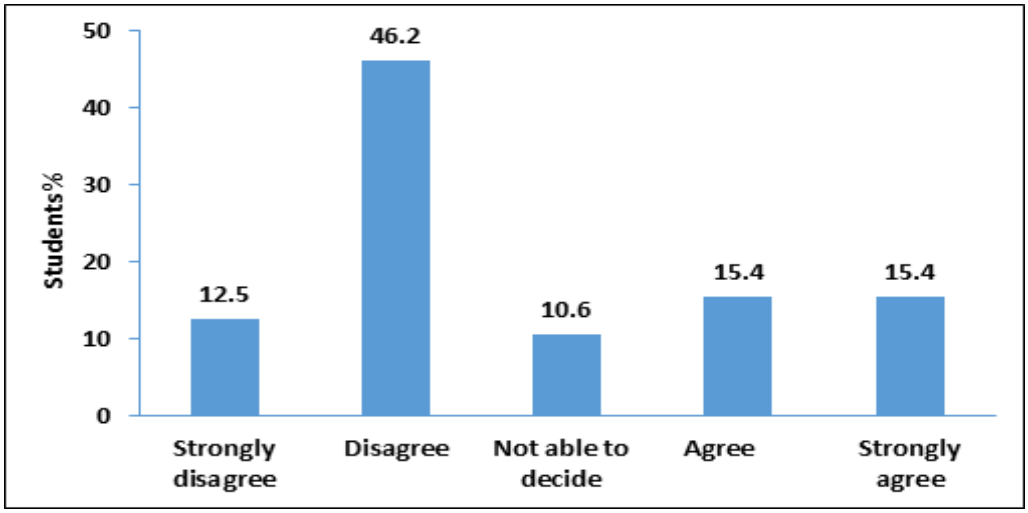



**Figure 13: Percentage of students agreeing CBL and conceptual learning method requires too much of time and are not worth all efforts.**

## Discussion

Students' performance in test post didactic and post CBL/Conceptual learning were significantly better after CBL/Conceptual learning as seen from previous studies.[5] In Approximately 80% of students, CBL and conceptual learning has inculcated interest in students to understand biochemistry more thoroughly. Almost 90% of students found improvement in scientific reasoning skills, which will help in correlating clinical decision making and this would form a strong foundation for future years of learning medicine. Communication skills of students also improved as they interacted more with other students and teachers. At the same time the study was not extra burden to students as they found these newer methods of learning interesting.

## Conclusion

Case Based Learning and conceptual learning has helped to modify the student understanding and perception of biochemistry. It has helped to understand biochemistry better and apply the subject in real time life scenarios leading to a strong foundation required to understand the field of medicine.

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