Introduction Of 'Case Based Discussions' In Teaching Biochemistry And Its Impact On Learning Of Students

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Abstract: Background: When topics of clinical importance are taught by didactic lecture, knowledge gained is hardly retained till the clinical teaching starts in the later years. So, we introduced 'Case Based Discussions' while teaching Biochemistry. Material And Methods: Students of II semester were divided in three groups- Group A and B was taught 'Liver function tests' by Didactic Lectures. Group B and C were further subdivided and taught through Case Based Discussions in which students collaborated in a small group environment to work through paper-based cases. Students' understanding of the topic was assessed using a test paper and written feedback was collected from the students in first year to know their perception towards two methods of teaching and then in final year to know if CBD sessions were helpful in clinics. Result: Mean total marks obtained by students of Group B were higher than those obtained by group A and C. Students perceived CBD sessions more stimulating educationally than traditional lectures and also found them helpful in clinics. Conclusion: Traditional teaching along with CBD resulted in significantly better test scores of students and promoted a deeper understanding of the basic concepts of Biochemistry to relate and link to patient cases in clinics. [Jain V Natl J Integr Res Med, 2021; 12(4):]

Key Words: Case Based Discussion, Case Based Learning, Traditional Learning

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Introduction: It's a challenge for medical students to apply their knowledge of basic science material to clinical scenarios. Most students at these levels will not have a deep well of information. Focus should be on finding ways to enable students to think and solve problems in a clinical context. More importantly, students need to have opportunities for self-directed learning – to discover for themselves what they do and don't know, what information they need, and how to find it as they approach a clinical problem.

The last decade has witnessed a rapid expansion of biomedical knowledge. Trends in medical education have shifted away from didactic teaching and towards interactive lecturing, problem-based learning (PBL), case-based learning (CBL) and project based learning[1].

Experiential learning allows students to develop both their knowledge and skill by solving real-world professional problems. Case-based learning is one form of experiential learning in which students collaborate in a small group environment to work through patient cases. The group focuses on creative problem solving with some advance preparation[2]. By placing the knowledge in a clinical context, students are thinking as professional in a clinical context.

Case Based Learning (CBL) is a teaching learning method which promotes analytical and problem solving skills in the learners[3]. CBL is an interactive, learner-centered approach that helps medical students to appreciate clinical applications of theoretical knowledge as it uses a guided inquiry method[4]. It is considered that CBL offers an appealing student-centric approach that encourages questioning and critical inquiry[5]. The role of the instructor is to facilitate learning.

Biochemistry curriculum content is predominantly taught by means of didactic lectures at the undergraduate level. There are many must know topics in the curriculum of Biochemistry having clinical importance. Knowledge gained on these topics by traditional method is hardly retained till the clinical teaching starts in the later years. The purpose of this study is to introduce 'Case Based Discussions'in teaching Biochemistry and determine its impact on learning of first and final year medical students.

Material & Methods: This study was carried out in the Department of Biochemistry of LN Medical College, Bhopal, India on MBBS students of II semester after obtaining their informed consent.

Prior permission of the Institutional Ethical Committee was obtained. Students were equally divided in three groups- A, B and C by simple random sampling (lottery method) to prevent selection bias of including better and motivated students in a particular group. Group A and B (merged during lecture) were taught must know topic of clinical importance 'Liver function tests' by means of two didactic lectures (120 minutes).

Group B and C were further randomly divided into 10 sub groups of 10 students each and were taught 'Liver function tests' through Case Based Discussions (CBD) (for 120 minutes). At the end students understanding of the topic was assessed using 25 marks test paper which included a mix of MCQs and case studies. This was done to have an accurate assessment of impact of teaching sessions on retention of knowledge and learning by students.[6] Assessment included questions based not only on factual knowledge but also on comprehension, reasoning and critical analysis of the main topic. All assessments were peer-reviewed by subject matter experts. To ensure uniformity, lectures and case based sessions were taken by single faculty member.

Group A included 50 students but only 42 students attended both the lectures, Group B included 50 students but only 39 students attended both lecture and CBD sessions and Group C included 50 students but only 45 students attended CBD session. While compiling results only those students were considered who attended all the sessions.

For ethical reasons, after completion of the study same topic was taken in group A by Case Based Methodology and in group C by Traditional Lecture method.

At the end of the sessions written feedback was taken from the students to know their perception towards two methods of teaching. When the same students were in final year written feedback was again taken from them to know if CBD sessions were helpful to them in clinics. The responses for both the feedback were measured in terms of agreed, disagreed or remained neutral. The questionnaire prepared for this was based on that used by previous studies and it also included two open-ended questions.

Data were collected and statistical analysis was done. Performance of students by two methods of teaching – Traditional Lectures and Case Based Methodology was compared using ANOVA.

Feedback given by students was evaluated on a three point Likert scale. Internal consistency of feedback questionnaires was evaluated by Cronbach's alpha score.

Results: Table 1 shows the mean of total marks obtained in test by three groups and their comparison in various groups. There was statistically significant difference between group means as determined by one-way ANOVA ($F = 9.3$, $p < 0.001$).

Comparisons indicated that mean of group A was significantly different from mean of group C ($p<0.001$) but it was not significantly different from mean of group B ($p>.05$). Mean of group B was significantly different from mean of group C ($p<0.001$).

Table 1: Total Marks Obtained

Group (N)	Mean (SD) (Out Of 25)	F Score	P Value	Multi Comparison	P Value
A (42)	12.8 (4.2)	9.3	<0.001	A vs B	>0.05
B (39)	13.2 (4.6)			A vs C	<0.001
C (45)	8.8 (4.6)			B vs C	<0.001
A= Attending only lectures; B= Attending both lectures and CBD; C= Attending only CBD					

Table 2 show the mean of marks obtained in case study portion by three groups and their comparison in various groups.

There was statistically significant difference between group means as determined by one-way ANOVA ($F = 6.0$, $p < 0.01$).

Comparisons indicated that mean of group B was significantly different from mean of group A and C ($p<0.01$).

Mean of group A was not significantly different from mean of group C ($p>0.05$).

Table 2: Marks Obtained In Case Study Portion

Group (N)	Mean (SD) (Out Of 10)	F Score	P Value	Multi Comparison	P Value
A (42)	4.8 (2.7)	6.0	<0.01	A vs B	<0.01
B (39)	6.7 (2.9)			A vs C	>0.05
C (45)	3.8 (1.5))			B vs C	<0.01
A= Attending only lectures; B= Attending both lectures and CBD; C= Attending only CBD					

Descriptive analysis of student's perception towards two methods of teaching at the end of the sessions, collected through feedback questionnaire was performed. The internal consistency of questionnaire was found to be 0.72. The response of students is shown in Table 3.

Table 3: Students Perception Towards Case Based Discussions (CBD) At The End Of Sessions

Q. No.	Question Pertaining To CBD	Agreed %	Neutral %	Disagreed %
1	Useful in learning Biochemistry.	61	33	6
2	Helped in understanding of topic further.	70	27	3
3	Improved problem/case solving skills.	71	25	4
4	Motivated me to work more in the subject.	62	32	6
5	Brought in more interaction with teacher & other students.	56	41	3
6	Sessions - conducted in a systematic manner.	65	30	5
7	Case studies - interesting and relevant to 1st MBBS.	56	39	5
8	Session- better than tutorials.	62	28	10
9	Sessions - can be taken along with lectures.	65	20	15
10	Will help in performing better in University exams.	46	42	14
11	Will offer more opportunities to apply learning in 1st MBBS to clinical cases in future years.	38	46	16
12	Future batches can be taught through this method.	61	30	9
13	One thing you liked about session.	**Refer Table 4**		
14	One thing you disliked about session.	**Refer Table 4**		
Total number of students responding to feedback = 109				

One hundred and nine students responded to the questionnaire. Majority of the students' responses rated "agree" on a 3-point Likert scale for "CBD is useful in learning biochemistry", "CBD helped in understanding of topic further", "CBD improved problem/case solving skills" and "CBD motivated me to work more in the subject". The overall students' remarks on liking/disliking about CBD are shown in Table 4.

Table 4: General Remarks Regarding Liking And Disliking Of CBD By The Students

Like	Dislike
Helps to get the concepts clear	Nothing to dislike about it
Increases analysing power	Very few classes held on CBD
Helps in detailed study	More time taking
Very helpful in studying subject	Introduced late in teaching schedule
Helps in retaining theoretical information as I have already performed activity on it	Practically we can't see the patients in 1st year/ patients were paper based
Makes dull subject more interesting	Have to be thorough in theory before taking sessions
Sessions were interactive	Active participation by some students was absent

Descriptive analysis of students' feedback in final year collected through questionnaire, about how helpful were CBD sessions to them in clinics, was performed. The internal consistency of questionnaire was found to be 0.64. The response of students is shown in Table 5.

Table 5: Students Perception Towards Case Based Discussions (CBD) In Final Year

Q. No	Question Pertaining To Cbd	Agreed %	Neutral %	Disagreed %
1	CBDs gave relevant pre-clinical exposure.	95.5	4.5	0
2	Previous CBD sessions created interest in clinics.	86.4	13.6	0
3	Learning in CBD sessions could be applied in making differential diagnosis of clinical cases.	100	0	0
4	CBDs were helpful in making provisional diagnosis.	90.9	9.1	0
5	Provisional diagnosis was in line with final diagnosis because of previous CBD sessions.	72..7	27.3	0
6	Previous CBD sessions gave confidence for discussing cases with clinical teachers.	72..7	27.3	0
7	Previous CBD sessions gave confidence for discussing cases with peer group.	90.9	9.1	0
8	Clinics would have been difficult without CBDs.	45.5	50	4.5
9	One thing now you like about CBD sessions at this stage.	**Refer Table 6**		
10	One thing now you dislike about CBD sessions at this stage.	**Refer Table 6**		
Total number of students responding to feedback = 78				

Seventy eight students responded to the questionnaire. Majority of the students' responses rated "agree" on a 3-point Likert scale for "CBDs gave relevant pre-clinical exposure", "Learning in CBD sessions could be applied in making differential diagnosis of clinical cases", "CBDs were helpful in making provisional diagnosis" and "Previous CBD sessions gave confidence for discussing cases with peer group". The overall final year students' remarks on liking/disliking about CBD sessions at this stage are shown in Table 6.

Table 6: General Remarks Regarding Liking And Disliking Of CBD By Final Year Students

Like	Dislike
It helped me in understanding the clinical application of biochemistry.	Nothing to dislike about it.
Right kind of approach in understanding cases.	Very few classes held on CBD.
Improved my clinical knowledge and clinical skills.	CBD sessions were held on very few topics.
When we apply theory learned in understanding clinical scenarios immediately it seems more interesting and is retained better.	
Made me more confident.	
Experienced as early clinical exposure.	
It created an interest in solving cases in clinics.	

Discussion: Students of Group B obtained higher marks as compared to students of other groups on solving case studies. MBBS students are taught Biochemistry related to diseases in semester I and II but pathology of diseases is usually taught in subsequent years when students are exposed to clinics. Students have difficulty in applying their theoretical knowledge to solve case studies at this stage.

Here, constructive and direct supervision helped students attending CBD sessions to integrate theoretical knowledge gained during lectures into practice by solving case studies[7].

Mean total marks obtained by students of Group Bare higher than those obtained by group A and C though difference in the marks between group A and B is not significant as both of them attended the lectures. Significant learning occurs during the lectures but discussions are equally important for enhanced learning[8]. This can be a reason for group C not doing well because they did not attend lectures though they attended CBD sessions.CBD can be a useful method if taken up along with traditional method of lectures[9].

Most of the students enjoyed the active participation in CBD sessions and considered the

process to be clinically relevant[10]. Student's perception indicated that clinical reasoning, diagnostic interpretations and ability to think logically improves with CBD. CBD appears to be an effective, superior and student-centred alternative to the traditional lecture format[11].

Design of our study was such that participation in CBD sessions was not voluntary and all the students of a group whether, motivated or not, better or average equally undertook the CBD sessions. Also test carried out was ungraded. On ethical grounds, after completion of the study similar CBD sessions were arranged for the group of students who did not go through them during the study. This study therefore makes a contribution to the literature by establishing a causal relationship between participation in CBD sessions and performance in test.

Based on the results of this study, regular CBD sessions on various topics have been planned for new batch at LN Medical College. Case based questions have been made part of university examination. Also feedback obtained from students during CBD sessions was utilised next year to improve teaching.

As per MCI's vision 2015 document introduction of case scenarios for classroom discussion/case based learning should be emphasized. This study resulted in a move in that direction and CBD is being used for early clinical exposure.

Since our study was done covering a single topic, it was short and effect of participation in CBD sessions could be measured only once. If such a study could be done over longer period covering various topics then effect of participation in CBD sessions could be measured several times.

In this case, it would have additional diagnostic value to know whether there is improvement in performance of student due to regular CBD sessions.

Some of the problems faced during study were- interaction of students was not 100% because some students had difficulty in expressing ideas, CBD was time consuming and required lot of preparations, since the pattern of case solving was not part of university examination, CBD sessions could not create interest in most of the students and some of the students were reluctant to give their feedback.

Conclusion: With the traditional teaching of biochemistry student may not acquire the skills and attitudes to link knowledge with medical problems. The use of traditional teaching along with CBD results in significantly better test scores and promotes a deeper understanding of the basic concepts of biochemistry to relate and link to medical problems. Thus CBD can be used for early clinical exposure. Students perceived CBD sessions more interactive and enjoyable. They found CBDs more stimulating educationally than traditional lectures. In order to be more rewarding CBD should be used as an adjunct to lectures.

Acknowledgement: I am thankful to MBBS Students and Department of Biochemistry, LN Medical College, Bhopal.

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Conflict of interest: None
Funding: None
Cite this Article as: Jain V, Agrawal V, Das Y. Introduction Of 'Case Based Discussions' In Teaching Biochemistry And Its Impact On Learning Of Students. Natl J Integr Res Med 2021; Vol.12(4):