

Original article

Student Perception and Effectiveness of Case based Learning in Pharmacology

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Abstract

Background: Pharmacology is an important subject of second year MBBS curriculum. Present study has been planned to find out the student perception and effectiveness of innovative new teaching learning method of Case based Learning (CBL) as compared to traditional didactic lecture.

Material and Methods: Total 186 students from 5th semester MBBS participated in the study. Two batches (A and B) were exposed to Didactic lecture & CBL respectively in first week for topic of Antiamoebic drugs and then cross-over was done in second week for the topic of Antileprotic drugs. The students' knowledge before and after both the sessions was assessed by Pre and Post-test questionnaire. Perceptions of students about CBL was assessed by pre-validated questionnaire using a five-point Likert scale.

Results: Post-test scores in CBL groups have shown significant improvement as compared to Post-test scores in didactic lecture groups in both topics i.e. Antiamoebic drugs and Antileprotic drugs ($p < 0.0001$). 80.4% students from feel that CBL is good teaching learning method which increased their understanding of subject and they were satisfied with it.

Conclusion: Result from Post-test and the positive perceptions of students indicate that the introduction of CBL in the Pharmacology teaching will be a successful endeavour.

Key words- Case Based Learning, Pharmacology, Medical education, Competency based medical education

1. Introducción

In India, traditionally delivered didactic lectures may not always suffice the students to understand the basic concepts of Pharmacology.¹ Most of the knowledge given through didactic lecture is focussing on recall (Lower cognitive domain) rather than comprehension and application (higher cognitive domain). Routine didactic lectures are not having sufficient active participation of students in learning & students find the subject of Pharmacology very vast, dry and volatile as

well as less interesting and having poor memory retention.

Competency based Medical Education (CBME) adopted by Medical council of India (Now replaced by National medical Commission) provides an effective outcome-based strategy where various domains of teaching including teaching learning methods and assessment form the framework of competencies.² Competency is defined as “the ability to do something successfully and efficiently,”³ and CBME is an approach to

ensure that the graduates develop the competencies required to fulfil the patients' needs in the society. Since CBME focuses on outcomes and prepares students for actual professional practice, teaching-learning activities would be more skill-based, involving more clinical, hands-on experience. Some examples of teaching methods adopted in CBME include problem-based learning in the preclinical years and case-based learning in the clinical years, clinical pathological conferences, clinical audits, and early clinical exposure.⁴ Thus, Case Based Learning (CBL) is innovative teaching learning method to understand the subject better and to have active participation of students in learning.

There is not a set definition for CBL. An excellent definition has been proposed by Thistlewaite et al in a review article. In their 2012 paper, a CBL definition is "The goal of CBL is to prepare students for clinical practice, through the use of authentic clinical cases. It links theory to practice, through the application of knowledge to the cases, using inquiry-based learning methods".⁵

CBL is learner-centric, interactive and patient-oriented, instead of being teacher-centric, monotonous, and content-driven. The aim of CBL is to teach basic medical sciences in a coherent manner closely related to topics in clinical sciences and re-enforcing the reasoning, collaborative and communication skills of the students.⁶

Early clinical exposure (ECE) is the need of the hour and it has been promoted by the Medical Council of India (MCI) in its Vision 2015 document.⁷ Keeping this in view, this study has been planned to promote interest, in-depth understanding and analytical thinking in undergraduate students in Pharmacology using case based learning as new tool.

2. Aim and Objectives:

- 1) To study the effectiveness of CBL as teaching-learning method in II MBBS students as compared to didactic lecture.
- 2) To study the perception of II MBBS students about the CBL approach as a teaching-learning method in Pharmacology.

3. Materials and Methods:

This was Prospective, Parallel group, Cross over and Observational study conducted after obtaining prior Institutional Ethics Committee approval. Study was conducted in the department of Pharmacology on 5th semester MBBS students. Total 186 students participated in the study.

Inclusion Criteria: Students who attended the class and were willing to participate in the study.

Exclusion criteria: Students who were not willing to participate in the study.

Study duration: 6 months (April to August 2018).

Methodology: Those students who accepted verbal consent were divided into two batches: Batch A and Batch B. Study was conducted for 2 weeks duration.

In first week, Students in batch B were exposed to topic of Antiamoebic drugs in Case based learning format. First pre-test was conducted for Antiamoebic drugs. Then 3 hypothetical case-based scenarios regarding Antiamoebic drugs were prepared on which questions were asked. First discussion among students was facilitated by faculty to sort out the answer of the given questions. Later, faculty & students discussed proper explanation and reasoning for the same. Also, students were encouraged to ask further questions for in-depth understanding of topic. After this post-test was conducted with same questions as in pre-test

Batch A was exposed to traditional didactic lecture of Antiamoebic drugs. Pre-test and post-test was conducted with similar questions before and after didactic lecture.

Same faculty conducted both CBL and didactic lecture sessions in order to avoid bias. In second week, Batch A was exposed to CBL format for the topic of Antileprotic drugs and Batch B was exposed to Didactic Lecture for the topic of leprosy. Pre-test and post-test were conducted for both CBL & didactic lecture in similar pattern as in first week for topic of Antileprotic drugs.

Cases, Pre-test questionnaire and students feedback questionnaires were developed and

peer viewed by experts from our institute. The case scenario included the clinical problem, history of patient (including personal, family history), laboratory investigations, provisional diagnosis, and treatment chart of the patients. Pretest & Posttest documents were analyzed by the faculty who was kept blind for the entire study protocol. Perceptions of students were assessed by pre-validated questionnaire using a five-point Likert scale.

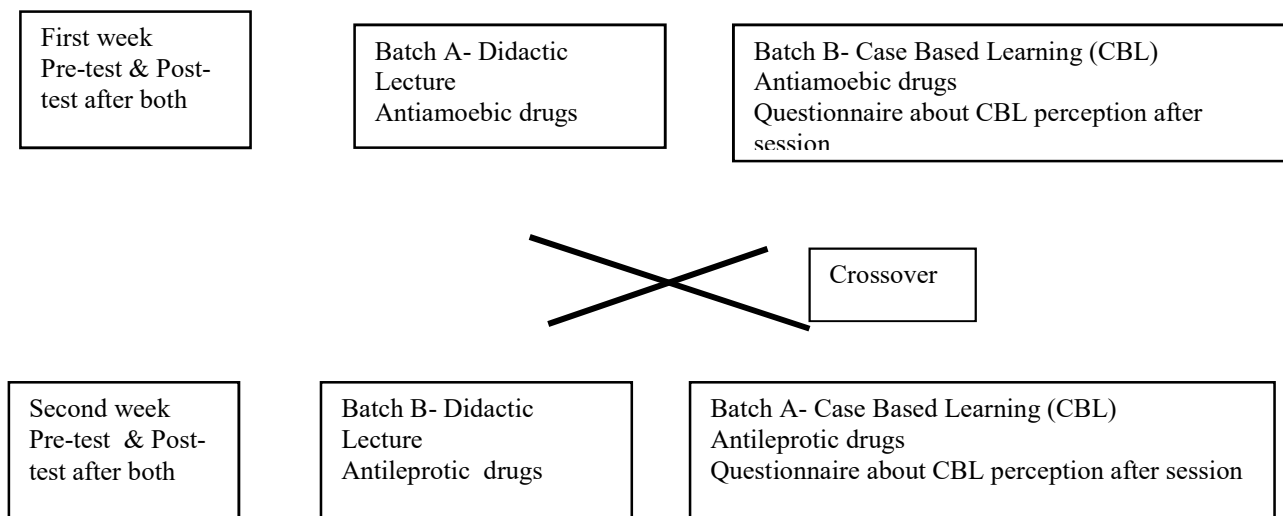


Fig.I Flow Diagramme - study design

Comparison of Pre-test and Post-test score was done using “Paired t test” in Both A and B groups in each session separately of Antiamoebic drugs and Antileprotic drugs. Post-test scores in CBL group and Didactic lecture were compared by “Unpaired t test”. Student responses on perception about case-based learning on 5-point Likert scales were analysed using percentages. A value of $p < 0.05$ was considered to be statistically significant.

4.Results

Total 186 students from 5th semester MBBS participated in the study. Total 97 II MBBS students participated in session on

Antiamoebic drugs while 89 students participated in session on Antileprotic drugs.

As shown in Table No.I & Figure No.II, both CBL and didactic lecture groups have shown significant improvement in post-test scores as compared to pre-test scores in topic of Antiamoebic drugs ($p < 0.0001$). Pre-test scores in CBL group and didactic lecture group did not differ significantly in topic of Antiamoebic drugs ($p > 0.05$). However, Post-test scores in CBL groups have shown significant improvement as compared to Post-test scores in didactic lecture group ($p < 0.0001$).

Antiamoebic drugs N=97	CBL group		Didactic lecture group		CBLVs Didactic lecture		
	Pre-test score	Post-test score	Pre-test score	Post-test score	Post-test score	Post-test score	
	Mean	3.015	10.320	2.730	7.395	10.320	7.395
	S.D	1.412	3.788	1.551	3.431	3.788	3.431
	P value	P < 0.0001		P < 0.0001		P < 0.0001	

Table I: Comparison of Pre-test & Post-test scores of Antiamoebic drugs

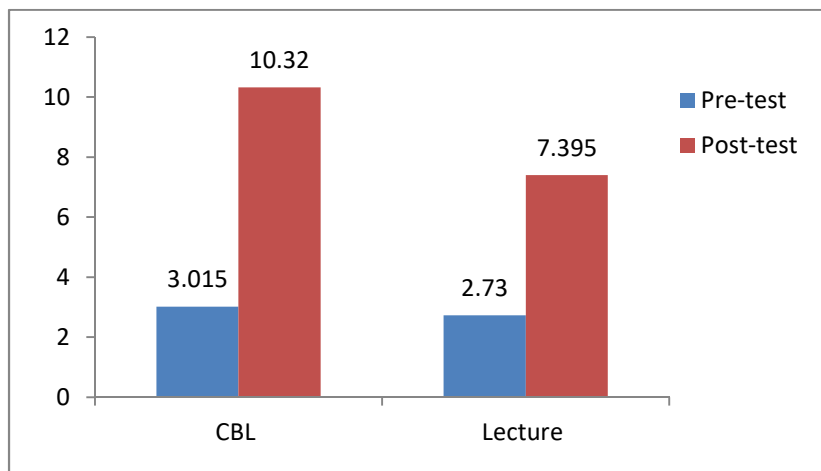


Fig.II: Comparison of Pre-test & Post-test scores of Antiamoebic drugs

As shown in Table No.II & Figure No.III, both CBL and didactic lecture groups have shown significant improvement in post-test scores as compared to pre-test scores in topic of Antileprotic drugs ($p < 0.0001$). Pre-test scores in CBL group and didactic lecture group did not differ significantly in topic of Antileprotic drugs ($p > 0.05$). However, Post-test scores in CBL groups have shown significant improvement as compared to Post-test scores in didactic lecture group ($p < 0.0001$).

Antileprotic drugs N=89	CBL group		Didactic lecture group		CBLVs Didactic lecture		
	Pre-test score	Post-test score	Pre-test score	Post-test score	Post-test score	Post-test score	
	Mean	1.680	11.710	1.602	9.29	11.710	9.29
	S.D	1.403	4.646	1.176	2.46	4.646	2.46
	P value	P < 0.0001		P < 0.0001		P < 0.0001	

Table II: Comparison of Pre-test & Post-test scores of Antileprotic drugs

Student feedback on six different prevalidated questionnaire about perception of CBL has been shown in detail in Table No.III.

		Student feedback on different aspects of Case Based learning						
			Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total agree+strongly agree
1	The CBL sessions improved my ability to apply concepts of basic sciences to clinical situations	Amoebiasis N=97	2 (2.06%)	1(1.03%)	10 (10.3%)	44(45.36%)	40(41.23%)	88 (86.59%)
		Leprosy N=89	1(1.12%)	0(0%)	2(2.24%)	43(48.31%)	43(48.31%)	86(96.62%)
2	CBL facilitated self-directed learning in Pharmacology	Amoebiasis	2(2.06%)	2(2.06%)	9(.27%)	43(44.32%)	42(43.29%)	85(87.62%)
		Leprosy	1(1.12%)	0(0%)	4(4.495)	42(47.19%)	42(47.19%)	84(94.38%)
3	My learning of facts, diagnostic and therapeutic skills as well as rational drug therapy knowledge were significantly enhanced by CBL sessions	Amoebiasis	1(1.03%)	2(2.06%)	15(15.46)	48(49.48%)	31(31.95%)	79(81.43%)
		Leprosy	1(1.12%)	2(2.24%)	5(5.61%)	44(49.43%)	37(41.56%)	81(90.99%)
4	CBL sessions will be helpful for final university exam preparation	Amoebiasis	1(1.03%)	4(4.12%)	16(16.49%)	43(44.32%)	32(32.98%)	75(77.3%)
		Leprosy	1(1.12%)	3(3.37%)	9(10.11%)	39(43.82%)	37(41.56%)	76(85.38%)
5	CBL sessions increased my involvement & arouse interest in teaching learning process of Pharmacology	Amoebiasis	1(1.03%)	6(6.18%)	15(15.46%)	35(36.08%)	40(41.23%)	75(77.31%)
		Leprosy	1(1.12%)	0(0%)	5(5.61%)	30(33.7%)	53(59.55%)	73(93.25%)
6	CBL is good teaching learning method which increased my understanding of subject and I am satisfied with it	Amoebiasis	1(1.03%)	2(2.06%)	16(16.49%)	41(42.26%)	37(38.14%)	78(80.4%)
		Leprosy	1(1.12%)	0(0%)	8(8.98%)	33(37.07%)	47(52.8%)	80(89.87%)

Table No.III Student feedback on questionnaire about perception of CBL

5. Discussion :

The traditional/conventional system (didactic lecture) in Pharmacology is teacher centred with very less active participation from the students and the application of knowledge of Pharmacotherapy in actual clinical posting is also minimal.^{8,9} A survey by Vasundara et al. to assess the clinical application of pharmacology knowledge in patient care found

that pharmacology teaching needs radical change. As per the Vision 2015 document of Medical Council of India (MCI), emphasis should be on the introduction of case scenarios for classroom discussion/case-based learning. Competency Based Medical Education (CBME) guidelines by MCI(now NMC) adopted in 2019 requires that we shift from didactic lectures to small group teaching

method and give early clinical exposure to students to make them more competent and skilled Indian Medical Graduates.¹⁰ Further, the new CBME emphasizes on a student - centred active approach to learning where the learners become responsible for their learning.. Keeping in this mind, we have planned this study to assess effectiveness of new innovative teaching learning method of CBL as compared to traditional didactic lecture and student perceptions about CBL. In our study, both CBL and didactic lecture groups have shown significant improvement in post-test scores as compared to pre-test scores in both topics i.e. Antiamoebic drugs and Antileprotic drugs ($p < 0.0001$).

Pre-test scores in CBL group and didactic lecture group did not differ significantly in both topics i.e. Antiamoebic drugs and Antileprotic drugs ($p > 0.05$) which indicates that both groups were comparable to each other. However, Post-test scores in CBL groups have shown significant improvement as compared to Post-test scores in didactic lecture groups in both topics i.e. Antiamoebic drugs and Antileprotic drugs ($p < 0.0001$) which indicates that CBL may be seen as effective teaching-learning method as compared to didactic lecture. Study conducted by Vora & Shah¹² also shown that CBL group have significantly increased score in both critical thinking - and recall - based short answer questions than the didactic lecture group. Similarly, Dubey et al¹¹ shown that there is highly significant increase in mean post-test score to 6.16 from pre-test score 3.64 (p value < 0.0001) after CBL sessions Our study post-test results are in agreement with Vora & Shah as well as Dubey et al study. Henceforth, learning through the means of CBL helps students to build on prior knowledge, integrate knowledge, and consider an application to future situations as compared to didactic lecture.

Six different questions focussing on different aspects of teaching-learning were asked to analyse student perception about CBL.

Pre-validated questionnaire was asked after CBL sessions on both topics i.e. antiamoebic drugs & antileprotic drugs.

86.59% students from amoebiasis topic and 96.62% students from leprosy topic feel that the CBL sessions improved their ability to apply concepts of basic sciences to clinical situations. Our results are in agreement with Dube et al.¹¹ where 80% students feel the same. This fact highlights the importance of introducing CBL to promote early clinical exposure to undergraduate students.

80.4% students from amoebiasis topic and 94.38% students from leprosy topic thought that CBL facilitated self-directed learning. Study conducted by Vora et al¹² also found that 91.17% of students agreed that CBL provides self-directed learning approach. A study conducted by Camiah et al¹³ proposed that student-centred approaches to education, such as CBL, develop critical (clinical) thinking skills more than teacher - centred approaches by involving self-directed study mode. Another study conducted by Silverman¹⁴ stated that CBL provides students with the opportunity to ask important analytical questions, consider various responses and argue for or against various situations.

81.43% students from amoebiasis topic and 90.99% students from leprosy topic agree to the fact that CBL enhanced their knowledge about diagnostic and therapeutic skills as well as rational drug therapy. Similar results were obtained by Dube et al¹¹ where 88% of students were agreeing about the same. Another study conducted by Tayem Yasin in Palestine also reported that most of students feel that CBL improved their general and independent learning skills, ability to prepare for examinations, and reasoning skills.

77.3% students from amoebiasis topic and 90.99% students from leprosy topic feel that CBL sessions will be helpful for final university exam preparation.

77.31% students from amoebiasis topic and 93.25% students from leprosy topic feel that CBL sessions increased their involvement & arouse interest in teaching learning process of Pharmacology. Kassebaum et al¹⁵. in their study showed that CBL made the learning more enjoyable and improved the interactive ability of the students. In line with our findings, Ciraj et al. reported that student communication skills and ability to work within a team were significantly improved due to CBL implementation in a microbiology course¹⁶.

80.4% students from amoebiasis topic and 89.87% students from leprosy topic feel that CBL is good teaching learning method which increased their understanding of subject and they were satisfied with it. Several researchers^{17,18} summarized that the students enjoyed the sessions and felt that it enhanced their understanding.

Our study has certain limitations also. We should have done CBL sessions for more topics in all three semesters and multi-stage assessment of changes in student perceptions would have been more reliable for measuring student attitudes towards CBL. Also, pre-test questions were short answer types only which will not give reliable conclusion about all the learning domains in a complete manner. We should have assessed their communications skills also after conducting CBL sessions.

6. Conclusion :

Case based learning appears to be more effective teaching-learning method as compared to didactic lecture and it may be used in combination with traditional didactic lecture method for more effective teaching-learning. Students feedback shown that CBL enhanced their understanding in Pharmacology, motivated them to read more as well as developed self-directed learning and problem-solving attitude in them. Moreover, the positive perceptions of students indicate that the introduction of CBL in the Pharmacology teaching in our institution will be a successful endeavour. However, CBL sessions requires in

depth preparation of topic from faculty which would require faculty sensitisation.

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