Original Research Article

Case Based Learning in Undergraduate Pathology – A Study to Assess its Efficacy and Acceptability as Teaching-Learning Tool

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Abstract

Background: An innovative paradigm, of teaching-learning (TL) method, like Case Based Learning (CBL) in a paraclinical subject like Pathology is considered essential, which would bring about learning of pathological and clinical features of diseases in an integrated easy manner, resulting in growing of interest in undergraduate medical students to learn pathology with better retention of knowledge.

Aim: To evaluate the efficacy of CBL as a TL method in Pathology and to assess perception of students and teachers to CBL.

Materials and methods: Study involved 86 students from 2nd professional MBBS course. Two common diseases viz. microcytic hypochromic anemia and pulmonary tuberculosis were taught in two phases respectively. Students were equally divided into two large groups of 43 each – Didactic lecture (DL) and CBL groups. DL group was taught with conventional DL by Pathology-faculties and CBL group was taught with CBL tool jointly by pathology and relevant clinical faculties. Teaching method was interchanged between large groups for two diseases. Pretest and post-test were conducted before and after intervention (DL/CBL) respectively. In addition, to test for knowledge retention one late post-test was also conducted in 2nd phase. Lastly, students' and teachers' feedbacks on perception to CBL were obtained.

Results: Significant increase in mean-scores of post-tests than from pretests in both phases was observed with post-test mean-scores of CBL group significantly higher than that of DL group, although the difference in pretest mean-scores of the groups was not significant. Comparison of mean-scores of late post-test and immediate post-test of CBL group in 2nd phase showed no significant difference, whereas the same for DL group showed significantly lower mean-score in late post-test. Feedbacks of students and teachers revealed that they were more satisfied with CBL than DL.
Conclusion: CBL is more effective and highly acceptable TL tool than DL in Pathology.

Key words

Case based learning, Didactic lecture, Teaching-learning, Pretest, Post-test, Pathology.

Introduction

The usual method of medical undergraduate (UG) teaching in Pathology is didactic lectures and conventional practical classes. But it seems to be not enough, because medical teaching-learning (TL) is mostly an andragogy. An innovative paradigm like CBL is considered essential which would increase the interest of students to learn pathology as it would involve learning of pathology in clinical context and thereby would help students to remember the facts more easily and for a longer duration too. During last one or two decades it was attempted to be introduced as a TL tool with varied success [1-4]. As CBL has not been made mandatory by regulatory bodies in medical education so far, naturally it is not practiced in most of the medical colleges in our country. With this background, the present study was undertaken with the aim of evaluating the efficacy and acceptability of CBL in UG Pathology TL process.

Materials and methods

The study was performed in 2015 involving the second professional MBBS students during their 4th and 5th semester tenures. A total of eighty six (86) students who volunteered to participate and attended all the sessions of interventions and assessments were included in the study. Two common diseases viz. microcytic hypochromic anemia and pulmonary tuberculosis were taught in 1st and 2nd phases respectively. Those 86 students were equally divided into two large groups with 43 students in each group (Roll No. wise – 43 from first half of total students' strength i.e., from Roll no. 1 to 50 and another 43 from the second half i.e., from Roll No. 51 to 100). One group (DL group) was taught with conventional didactic lectures by Pathology faculties and the other group (CBL group) was further subdivided into 4 small groups of 10/11 students each and was taught with CBL tool jointly by Pathology faculties and Clinical faculties from the departments of Medicine (in first phase) and Respiratory Medicine (in second phase).

Teaching method was interchanged in two large groups for teaching two diseases. One pretest was conducted for all the 86 students before undertaking intervention (DL/CBL) and two post-tests were conducted after intervention - one (immediate) post-test within 2/3 days of intervention and another late post-test 2 weeks after intervention. Late post-test was conducted for the purpose of testing retention of knowledge. During the first phase, holding of late post test was not possible owing to non-availability of students due to weeklong college cultural festival. Those pre and post tests were MCQ based (15-item MCQ tests of single best response type). Those tests were aimed at assessing the knowledge on the topic/ disease before and after the intervention.

Finally, after completion of interventions of two phases, students' and involved teachers' feedbacks were obtained on their perception to CBL through pre-designed questionnaires. Studies by Kaur, et al. and Zhang, et al. were

followed with little modifications in preparing and analyzing the questionnaires [1, 3].

The interventional sessions

Didactic lectures

One group of 43 students (DL group) was taught through two didactic lectures of one hour duration each taken in two subsequent weeks by pathology faculties using power point and blackboard in combination.

There was group change-over in two phases i.e., the CBL group during first phase with microcytic hypochromic anemia sessions became DL group during second phase with pulmonary tuberculosis sessions and the vice versa.

CBL sessions

Teaching through CBL, again was completed for each phase in two sittings of one hour duration each, taken in two subsequent weeks. Here, the sessions were conducted in small groups and during this process of CBL a nested pattern of integrated teaching was followed [5, 6]. For each small group there were two teachers, one each from Pathology and from a clinical discipline namely General Medicine (for microcytic hypochromic anemia) and Respiratory Medicine (for pulmonary tuberculosis). The learning objectives for didactic lectures and CBL sessions with respect to the particular disease were the same.

Collection of feedbacks

At the end of the entire activity, feedback questionnaires were administered to the involved students and teachers and their responses were recorded. The feedback questionnaires were pre-designed according to 5-point Likert Scale where responses varied from 'Strongly agree' (score value = 5) to 'Strongly disagree' (score value =1) with a neutral midpoint response of 'Not sure' (score value =3).

Statistical analysis

Analysis of MCQ test scores

The answer scripts of MCQ based pre and post-tests were evaluated and the scores obtained by students were entered in SPSS data sheet.

To find out the efficacy of CBL the mean scores of the students in pre and post tests were compared by using paired samples 't' test and the mean scores of the students of DL and CBL groups in post tests of each phase were compared by using independent (unpaired) samples 't' test. A p-value of < 0.05 was considered statistically significant.

Analysis of feedback questionnaires scores

The scores against the responses of feedback questionnaires collected from students and teachers were entered in Excel sheet and from the total score against each question's response by the students/ teachers, mean scores and finally overall mean score were calculated.

Results

Total number of participant students and teachers were 86 and 12 respectively. Effectiveness of DL and CBL in 1st phase (sessions on microcytic hypochromic anemia) (Paired 't'-test; CI 0.95) was as per **Table - 1**. Effectiveness of DL and CBL in 2nd phase (sessions on pulmonary tuberculosis) (Paired 't'-test; CI 0.95) was as per **Table - 2**. Comparison of effectiveness of DL and CBL in 1st phase (sessions on microcytic hypochromic anemia) (Independent 't'-test, CI 0.95) was as per **Table - 3**. Comparison of effectiveness of DL and CBL in 2nd phase (sessions on pulmonary tuberculosis) (Independent 't'-test, CI 0.95) was as per **Table - 4**. Students' Feedback Questionnaire scores analysis was as per **Table – 5**. Teachers' Feedback Questionnaire scores analysis was as per **Table – 6**.

Discussion

It is widely believed that success of TL sessions greatly depend on active involvement of students in classroom discussions. Scope for adequate discussion or interaction is very limited during didactic lecture sessions and students are also not

much interested to involve themselves very actively in the TL process during the class. On the other hand, case based learning can effectively provide a broad base for discussion resulting in significant development of learners' problem solving and decision making skills [7]. But in the past it was also observed on occasions that, this TL tool of CBL sometimes had been criticized on the points of time consuming case presentation, failure to meet the diverse needs of the learners or failure to result in adequate learning etc. [4]. This study helped to explore the efficacy of CBL as a TL tool along with attempts to revisit the lacunae in it, if any.

Table - 1: Effectiveness of DL and CBL in 1st phase (sessions on microcytic hypochromic anemia) (Paired 't'-test; CI 0.95).

TL method	Evaluation tests (by MCQ)	Mean Score ± SD (Full marks =15)	Significance (n=43)
DL	Pre-test	10.12 ± 1.77	p = 0.003
	Post-test	10.95 ± 2.30	
CBL	Pre-test	10.07 ± 1.77	p < 0.001
	Post-test	11.95 ± 1.83	

Table - 2: Effectiveness of DL and CBL in 2nd phase (sessions on pulmonary tuberculosis) (Paired 't'-test; CI 0.95).

TL method	Evaluation tests (by MCQ)	Mean Score ± SD (Full marks =15)	Significance (n=43)
DL	Pre-test	7.33±1.86	p < 0.001
	Post-test	9.12±1.97	
CBL	Pre-test	7.98±2.02	p < 0.001
	Post-test	11.49±2.08	

Table - 3: Comparison of effectiveness of DL & CBL in 1st phase (sessions on microcytic hypochromic anemia). (Independent 't'-test, CI 0.95).

Tests	Groups	Mean Score± SD	Significance
Pre-test	DL	10.12 ± 1.77	p = 0.904
	CBL	10.07 ± 1.77	
Post-test	DL	10.95 ± 2.30	p = 0.029
	CBL	11.95 ± 1.83	

Table - 4: Comparison of effectiveness of DL & CBL in 2nd phase (sessions on pulmonary tuberculosis). (Independent 't'-test, CI 0.95).

Tests	Groups	Mean Score± SD	Significance
Pre-test	DL	7.33±1.86	
	CBL	7.98±2.02	p = 0.125
Post-test	DL	9.12±1.97	
	CBL	11.49±2.08	p < 0.001

Table - 5: Students' Feedback Questionnaire scores analysis (Figure in parenthesis indicates score for that choice).

Sr. No.	Questions	Strongly agree (5)	Agree (4)	Not sure (Neither agree, nor disagree) (3)	Disagree (2)	Strongly Disagree (1)	Mean score (N = 86)
1	CBL stimulated my desire to learn.	43 (50.0%)	42 (48.8%)	1 (1.2%)	0 (0.0%)	0 (0.0%)	**4.5**
2	I feel confident to apply basic science and pathology concepts to solve clinical cases.	45 (52.3%)	37 (43%)	3 (3.5%)	1 (1.2%)	0 (0.0%)	**4.5**
3	CBL is good method to practice integration of knowledge and skill.	47 (54.6%)	38 (44.2%)	1 (1.2%)	0 (0.0%)	0 (0.0%)	**4.5**
4	CBL improved my clinical reasoning ability	51 (59.3%)	31 (36%)	4 (4.7%)	0 (0.0%)	0 (0.0%)	**4.6**
5	I don't think CBL is better than traditional teaching.*	38 (44.2%)	26 (30.2%)	19 (22.1%)	3 (3.5%)	0 (0.0%)	**4.1**
6	I was motivated to learn pathology by CBL	52 (60.5%)	26 (30.2%)	7 (8.1%)	1 (1.2%)	0 (0.0%)	**4.5**
7	The emphasis on clinical concept was detrimental to learning pathology. *	41 (47.7%)	34 (39.5%)	8 (9.3%)	2 (2.3%)	1 (1.2%)	**4.3**
8	The CBL helped to reinforce concepts taught in class	56 (65.1%)	26 (30.2%)	4 (4.7%)	0 (0.0%)	0 (0.0%)	**4.6**
9	CBL is time-consuming and hinders the normal speed of the classes.*	39 (45.4%)	26 (30.2%)	19 (22.1%)	2 (2.3%)	0 (0.0%)	**4.2**
10	CBL promoted myself directed learning skills.	39 (45.4%)	41 (47.6%)	6 (7.0%)	0 (0.0%)	0 (0.0%)	**4.4**
11	CBL has increased my self-confidence and attitude towards learning.	41 (47.7%)	37 (43.0%)	7 (8.1%)	1 (1.2%)	0 (0.0%)	**4.4**
12	I was not comfortable during CBL discussion sessions.*	53 (61.6%)	27 (31.4%)	2 (2.3%)	4 (4.7%)	0 (0.0%)	**4.5**
13	CBL improved my communication skill and team work	43 (50.0%)	36 (41.9%)	5 (5.8%)	2 (2.3%)	0 (0.0%)	**4.4**
14	I would recommend CBL to other departments at our institution.	49 (57.0%)	30 (34.9%)	7 (8.1%)	0 (0.0%)	0 (0.0%)	**4.5**
15	I was satisfied with CBL approach of ning.	42 (48.8%)	38 (44.2%)	6 (7.0%)	0 (0.0%)	0 (0.0%)	**4.4**
Overall Mean Score							**4.4**

*****As items in Sl. No. 5, 7, 9 and 12 are negatively-keyed; the actual responses were reverse-scored and entered for computing.

Table – 6: Teachers' Feedback Questionnaire scores analysis (Figure in parenthesis indicates score for that choice).

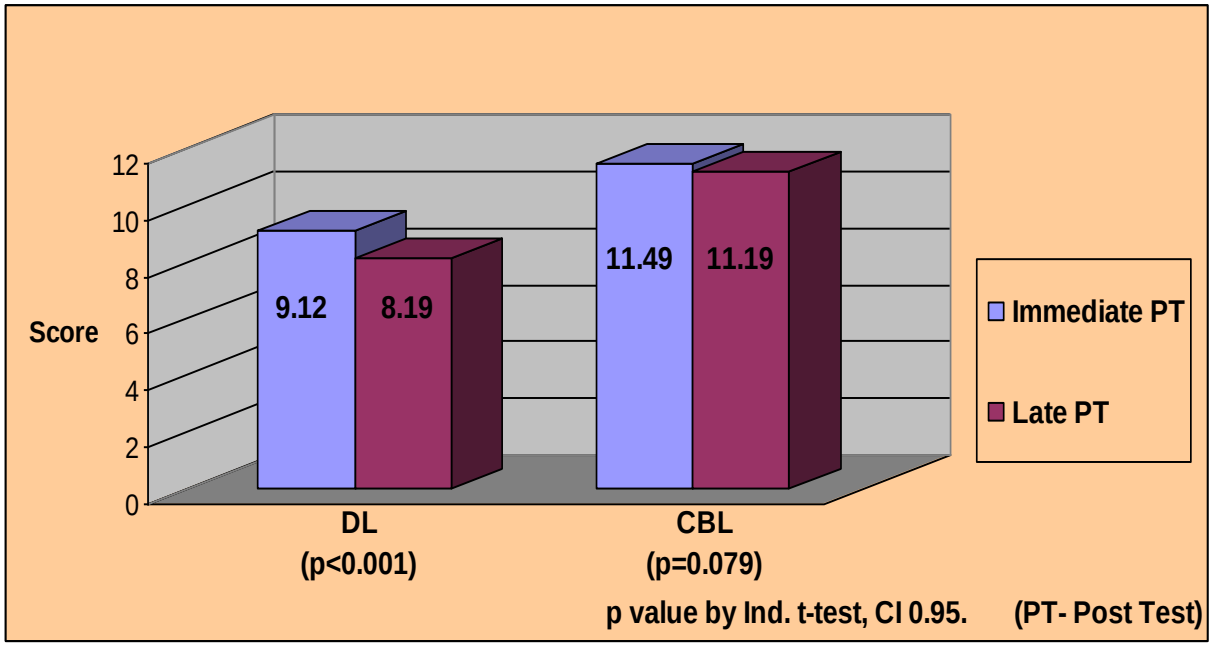
Sr. No.	Questions	Strongly agree (5)	Agree (4)	Not sure (3)	Disagree (2)	Strongly Disagree (1)	Mean Score (n=12)
1	CBL stimulated students' desire to learn.	5 (41.7%)	6 (50%)	1 (8.3%)	0 (0%)	0 (0%)	**4.3**
2	Students felt confident to apply basic science and pathology concepts to solve clinical cases.	6 (50%)	5 (41.7%)	1 (8.3%)	0 (0%)	0 (0%)	**4.4**
3	CBL is good method to practice integration of knowledge and skill.	4 (33.3%)	7 (58.4%)	1 (8.3%)	0 (0%)	0 (0%)	**4.3**
4	CBL increased students' clinical reasoning ability	7 (58.4%)	5 (41.6%)	0 (0%)	0 (0%)	0 (0%)	**4.6**
5	I don't think CBL is better than our present traditional routine pattern of teaching. **	5 (41.7%)	5 (41.7%)	2 (16.6%)	0 (0%)	0 (0%)	**4.3**
6	Students were motivated to learn pathology by CBL.	3 (25%)	8 (66.7%)	1 (8.3%)	0 (0%)	0 (0%)	**4.2**
7	The emphasis on clinical concept was detrimental to learning pathology for the students. **	4 (33.3%)	7 (58.4%)	1 (8.3%)	0 (0%)	0 (0%)	**4.2**
8	The CBL helped to reinforce concepts taught in class	8 (66.7%)	3 (25%)	1 (8.3%)	0 (0%)	0 (0%)	**4.6**
9	CBL is time-consuming and hinders the normal speed of the classes. **	4 (33.3%)	5 (41.7%)	2 (16.6%)	1 (8.3%)	0 (0%)	**4.0**
10	CBL improved students' desire and skill in teaching themselves of new materials through self directed learning (SDL).	3 (25%)	7 (58.4%)	2 (16.6%)	0 (0%)	0 (0%)	**4.1**
11	CBL has improved the students' attitude towards learning.	3 (25%)	7 (58.4%)	1 (8.3%)	1 (8.3%)	0 (0%)	**4.0**
12	Students were not comfortable during CBL discussion sessions. **	5 (41.7%)	6 (50%)	1 (8.3%)	0 (0%)	0 (0%)	**4.3**
13	I was not comfortable with the CBL system of teaching. **	3 (25%)	8 (66.7%)	1 (8.3%)	0 (0%)	0 (0%)	**4.2**
14	CBL improved students' communication skill.	0 (0%)	8 (66.7%)	3 (25%)	1 (8.3%)	0	**3.6**
15	I was satisfied with CBL approach of teaching-learning.	4 (33.3%)	6 (50%)	1 (8.3%)	1 (8.3%)	0 (0%)	**4.1**
16	I would recommend CBL to other departments at our institution.	3 (25%)	9 (75%)	0 (0%)	0 (0%)	0 (0%)	**4.3**
Over all Mean Score							**4.2**

****** As items in Sl. No. 5, 7, 9, 12 and 13 are negatively-keyed, the actual responses were reverse-scored and entered for computing.

Analysis of MCQ based pretest results showed that there was no significant difference in the pretest mean scores of DL and CBL groups of students, indicating existence of same quantum of pre-interventional knowledge in students. Test results analysis showed that the didactic lecture and CBL both were effective in terms of acquiring knowledge as (immediate) post-test mean scores were significantly higher than pretest mean scores in both DL and CBL groups (**Table - 1** and **Table - 2**). But very important observation was made in both phases of the study when (immediate) post-test mean scores of DL and CBL groups of learners were compared (**Table - 3** and **Table - 4**). It was found that, the post-test mean scores of CBL groups were significantly higher than that of DL groups. This clearly reflects that CBL is far better than DL as far as knowledge gain is concerned. This very fact was established in several other studies conducted during last few years in different parts of the country [8-12].

Vora and Shah; Tathe and Sing; Joshi, Nilawar and Thorat have suggested that CBL was an effective teaching method in different pre and para-clinical subjects like Pharmacology, Microbiology, Biochemistry etc. They also opined that perceptions of students and teachers to CBL were very positive and highly satisfactory [9-11]. In our study also we have found that the perceptions of students and teachers to CBL were very positive and no significant lacunae or drawbacks were revealed from their feedback responses (**Table - 5** and **Table - 6**). A strong positive perception to CBL with its high acceptability amongst the students and teachers may be mostly because of the fact that, it is a student centered TL process which effectively promote self directed learning, clinical problem solving skill with critical thinking, arousal of interest with motivation for learning non-clinical subjects etc. Another positive aspect of CBL is better retention of knowledge by the students. Our study effectively showed that the difference in the mean scores of (immediate) post-test and late post-test (where lower score was observed) following didactic lecture is significant, whereas the same following CBL was found to be insignificant (**Figure - 1**). A fact can be well shared that learning and remembering a subject become much easier when it is linked to a real life patient case [12].

Figure - 1: Column diagram showing retention of knowledge in DL and CBL groups in 2nd phase.



Conclusion

CBL is a more effective TL method than didactic lecture as it improves students' clinical reasoning ability, promotes self directed learning and communication skills, leads to better knowledge retention and most importantly motivate them to learn.

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