

Team Based Learning (TBL) in Undergraduate Medical Education

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ABSTRACT

Objective: To determine if modified Team Based Learning (TBL) was more effective than Traditional Didactic Lecture (TDL) in improving knowledge outcomes about Diabetes management in fourth year medical students and to check the students' view about the TBL method in comparison with their earlier experience with TDL.

Study Design: A comparative study.

Place and Duration of Study: Lahore Medical and Dental College, Lahore, from January to February 2011 in 4 weeks.

Methodology: Modification of the original TBL method as described by Michaelsen was done to accommodate the educational system. A total of 7 sessions were allotted to teach non-communicable diseases to fourth year MBBS students. Session which was scheduled for teaching Diabetes mellitus was conducted first by TDL and three weeks later with the TBL session. MCQ based tests were administered to self paired groups of students first after the TDL session and then after the TBL session. Wilcoxon signed-rank test was used to compare post-TDL and post-TBL test scores of the students. Students' views about the TBL session compared to the TDL session were checked by using pre-tested questionnaire.

Results: Seventy two, fourth year MBBS students participated in this TBL session. Majority were females 49 (68.1%). There was improvement of test scores of students after the TBL session when compared to the test scores after TDL session ($p < 0.001$). Majority of the respondents noted that TBL session was a better learning strategy compared to TDL.

Conclusion: The 72 students included in the study achieved higher mean test scores on test questions that assessed their knowledge of Diabetes mellitus content learned using the TBL strategy compared with TDL method ($p < 0.001$). TBL learning method was favoured by a majority of medical students compared to the TDL session.

Key Words: Team based learning medical education. Traditional didactic lecture. Active learning. Medical students.

INTRODUCTION

Traditionally, the lecture method has been used for teaching in Pakistan. The passive nature of the audience and lack of feedback leads to low receptivity among students in this method.³ The important role of active learning, clinical application, and group problem solving in learning have now become more recognized in medical education.⁴ Problem based learning (PBL) is an active learning strategy but is more resource intensive, requires small student-faculty ratios which is difficult in resource limited countries like Pakistan.^{3,4}

Given the limitations of traditional teaching methods and PBL a new method of learning called Team Based Learning (TBL) is becoming popular. This mode of learning was originally developed by Michaelsen more than 20 years ago for use in business. It is a well-defined instructional strategy to promote active learning with a limited number of faculty.⁵

TBL allows a single instructor to manage multiple small groups simultaneously in a large class, and the class

time is shifted away from learning of facts to application of information.^{2,5} TBL uses strategies that ensure the effectiveness of small groups working independently with high student-to-faculty ratios (e.g., up to 200:1), without losing the benefits of faculty-led small groups.⁶ TBL consists of three repeating phases: preparation, application, and assessment. In the preparation phase, students are required to complete an out-of-class reading and then are tested at the beginning of the next session. In the application phase, teams of students practice real-world problems within small groups followed by discussion within the class and feedback by faculty members. The final phase is assessment of student learning.^{7,8}

Knowledge acquisition has been noted to be better with the TBL method compared to traditional methods such as lectures as students spend a higher percentage of class time in application of knowledge.⁹⁻¹² The measured benefits of TBL noted in various studies were increased student engagement, improved communication and increased examination scores.^{6,13} The three major stakeholders involved in the medical education (medical institutions, faculty, medical students have all rated TBL favourably.^{6-8,13-15} TBL has been increasingly used by medical colleges. TBL was started in 10 medical schools in USA in 2003 and in 2007 a repeat survey revealed that 9 of them were still using TBL.⁸

There is a dearth of local data on TBL and this study is one of the pilot studies on this topic. The aim of this

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study was to determine if modified Team Based Learning (TBL) was more effective than Traditional Didactic Lecture (TDL) in improving knowledge outcomes about Diabetes management in fourth year medical students and to check the students' views about the TBL method in comparison with their earlier experience with TDL.

METHODOLOGY

This comparative study was conducted at Lahore Medical and Dental College, Lahore, from January to February 2011. A total of 7 sessions were allotted to teach non-communicable diseases to fourth year MBBS students. Session which was scheduled for teaching Diabetes mellitus was first conducted using the traditional didactic lecture method and then by the TBL method.

All students of fourth year MBBS attending community medicine rotation were offered to be enrolled in the study. Seventy two students agreed to participate.

Students who refused participation in the study and students who were not present for the entire study were excluded.

Data collection tool was a structured pre-tested questionnaire. The first part of the questionnaire was used to obtain the demographic data and the second part was used to check students' views about the TBL learning experience. Traditional lecture (TDL) on Diabetes mellitus was delivered. Each student in the class had a test after the lecture. Three weeks later (to mitigate any carry over effect from the lecture), Team Based Learning session (TBL) on Diabetes mellitus was conducted. Post-TBL test was taken. The scores of each student was compared with their own TDL scores (paired match groups) Wilcoxon signed-rank test was used to compare TDL and TBL test scores of the students. Students' responses were obtained about the TBL session using structured questionnaire. Initially, a pilot study on 15 students was conducted and necessary modifications in the questionnaire were made.

Data analysis was carried out with Statistical Package for the Social Sciences (SPSS) version 17.

Modification of the original TBL method as described by Michaelsen was done to accommodate the current educational system.^{6,8,11,16}

In the first phase, which was conducted one week prior to the actual TBL session, students of the 4th year MBBS class were randomly distributed using lottery method into 6 teams and modified TBL procedure was explained to them. Each group was given handouts for preparation containing the following information: (1) clinical information about Diabetes mellitus, (2) six clinical case histories and related questions and (3) previous university examination questions on Diabetes mellitus. Each team member was required to do self study. Six clinical scenarios based MCQ test related to Diabetes mellitus management was administered as a pre-TBL test before phase 2.

Phase 2: For the TBL session, six student teams were randomly assigned one of the six clinical case histories. There was a presentation by a group member selected randomly from the group. This was followed by individual and team discussion on each question and immediate feedback and a brief review of topics at the end by the instructor.

Phase 3: Post-TBL test was administered using again six clinical scenarios based MCQs about Diabetes mellitus. Blinding of students was done to study design and they were not aware of post-test testing. To check the primary outcome that is knowledge acquisition of Diabetes mellitus, we checked individual student's pre and post-modified TBL test score. We also measured self-reported student views about TBL as a secondary outcome using a questionnaire with 11 items on a five-point Likert scale. The strengths of this study design are learner homogeneity, prevention of observer bias by using a single observer, randomization of student groups, matching of students taking pre and post-TBL test and high attrition rate (100%).

Table I: Medical students' views of the TBL sessions compared to the TDL session.

Variables (responses)	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)
1. TBL was better learning strategy.	43 (59.7)	24 (33.3)	1 (1.4)	3 (4.2)	1 (1.4)
2. TBL helped better time management for learning.	31 (43.1)	29 (40.3)	6 (8.3)	5 (6.9)	1 (1.4)
3. TBL method was more effective in fulfilling the learning objectives.	36 (50.0)	27 (37.5)	6 (8.3)	3 (4.2)	0
4. TBL method encouraged independent student learning.	23 (31.9)	33 (45.8)	8 (11.1)	6 (8.3)	2 (2.8)
5. TBL method had better content coverage.	36 (50.0)	23 (31.9)	9 (12.5)	2 (2.8)	2 (2.8)
6. TBL method enabled greater student participation.	32 (44.4)	26 (36.1)	10 (13.9)	4 (5.6)	0
7. TBL method improved my motivation to learn.	32 (44.4)	22 (30.6)	12 (16.7)	4 (5.6)	2 (2.8)
8. TBL method challenged me to learn.	32 (44.4)	26 (36.1)	11 (15.3)	2 (2.8)	1 (1.4)
9. TBL method facilitated student learning.	40 (55.6)	20 (27.8)	9 (12.5)	1 (1.4)	2 (2.8)
10. More TBL method sessions should be organized in future.	36 (50.0)	25 (34.7)	8 (11.1)	1 (1.4)	2 (2.8)
11. Students are satisfied with TBL method.	36 (50.0)	28 (38.9)	4 (5.6)	2 (2.8)	2 (2.8)

Ratings: 1-Strongly agree, 2-Agree, 3-Neutral, 4-Disagree, 5-Strongly disagree.

RESULTS

Total number of respondents were 72. A majority of students were females (n=49, 68.1%).

The mean TDL scores of students was 2.31 ± 1.36 and scores was 4.24 ± 1.41 .

Sixty seven participants had higher scores with the TBL session compared to the TDL session ($p < 0.001$). Split half reliability was checked and Spearman-Brown coefficient was noted as 0.84.

A majority of the respondents noted that TBL session was a better learning strategy, encouraged independent student learning, ensured better content coverage, enabled greater student participation and was more motivating when compared with the TDL session (Table I).

DISCUSSION

In this study, there was significant improvement in academic scores with TBL method than the TDL method.^{1,16,18,19} These results are also consistent with other studies in the literature.^{11,13,17} There is no consensus as to what would be a suitable comparator for studies assessing an active learning method like TBL. Both passive (including traditional didactic lectures)^{13,21} and active²⁰ methods have been used in the past. Some of the reasons cited by students in various studies for improvement in academic scores in TBL method were that this method encouraged them to study regularly, and at the same time they benefitted by actively teaching and learning from peers.¹³ Most students have noted TBL activities to be more engaging, effective and enjoyable than conventional didactic lectures and were noted as reasons for their improvement in their academic performance. This benefit was particularly noted in academically weaker students.¹⁸ The academic improvement of our students could also be because TBL has been shown to reinforce concepts and aid in application utilizing the active participation of students, by providing pre-class preparation and in class group discussions. Teachers act as facilitators and use constructivist theories of learning which results in improved learning process.²² In TBL also, unlike some forms of active learning, the instructor retains control of content and acts as a facilitator and content expert which may be important in the current educational system.⁴ Contrary to this study, however, a similar study reported improvement in scores restricted to some and not all topics.²⁰ Another study by Haidet *et al.* noted no significant difference in knowledge outcomes between TBL method and lectures.²¹

In this study, majority of students preferred TBL method which is consistent with data obtained in several other studies.^{14,15} A majority of students in the present study felt that the modified TBL session was a better learning strategy, encouraged independent student learning,

ensured better content coverage, enabled greater student participation and was more motivating. These results are similar to a study done in students who were learning cardiovascular module by TBL method where students and faculty had increased satisfaction.⁷ Similarly, TBL method was used to teach anatomy and the medical students reported that TBL method reinforced self-directed learning, increased motivation to learn, and team work. Interestingly, these perceptions were uniform irrespective of student course performance.¹³ Students in other studies have also noted that TBL sessions were effective, with increased engagement and enjoyment.^{11,13,16,21} TBL strategy helps self-directed learning, and has a positive impact on the learning attitudes. Students have also cited that this strategy promotes deeper learning and is an enjoyable experience.²³

In the present study, a majority of students wanted more TBL sessions organized for them. This is similar to other studies in which students preferred TBL instruction.¹⁵ In a systematic review of TBL research published from 2003 to 2011 it was noted that students were satisfied with TBL and their engagement was higher in TBL classes. Students in TBL classes scored higher on examinations.²⁴

There was no conflict of interest noted. Ethical considerations including complete disclosure about the study, voluntary participation, confidentiality and anonymity of the participants' data was assured.

The limitations of this study are the small sample size limiting the generalization of the results. MCQ questions have inherent limitations of guessing and cueing. The study did not compare TBL with other active teaching methodologies. In-depth analysis of the students responding neutral and strongly disagree on the Likert scale was not done and could be carried out by collecting qualitative data in the next study. Inherent problems of the pre-experimental study design can be improved by doing a future study with a true experimental study design: the pre-test-posttest control group design.¹

Future studies on a larger sample of students, with randomized controlled design would be valuable. Qualitative data about students and faculty perceptions would help in the in-depth analysis of the impact of this teaching method.

CONCLUSION

The 72 students included in the study achieved higher mean test scores on test questions that assessed their knowledge of Diabetes mellitus content learned using the TBL strategy compared with TDL method ($p < .001$). TBL learning method was favoured by a majority of medical students compared to the TDL session.

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