

Research Article

Team-Based Learning and Collaborative Competencies among Undergraduate Medical Students

Ambreen Kalam¹, Farida Parvez^{2*}, Sobia Nawaz³, Aisha Sher⁴, Madiha Akhwand⁵, Uzma Faryal⁶

¹Lecturer, Department of Medical Education, Bahria University of Health Sciences, Karachi, Pakistan.

^{2*}Assistant Professor, Department of Medical Education, Prime Medical and Dental College, Islamabad, Pakistan.

³Assistant Professor, Department of Medical Education, Continental Medical College, Lahore, Pakistan.

⁴Assistant Professor, Department of Medical Education, Margalla College of Dentistry, Rawalpindi, Pakistan.

⁵Assistant Professor, Department of Medical Education, Rawal Institute of Health Sciences, Islamabad, Pakistan.

⁶Professor, Department of Biochemistry, Women Medical College, Abbottabad, Pakistan.

Corresponding Author: Farida Parvez

Assistant Professor, Department of Medical Education, Prime Medical and Dental College, Islamabad, Pakistan.

Email: faridaiidh@gmail.com

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ABSTRACT

Background: Team-based learning is an active learning approach that encourages active learning, student-to-student discussion, knowledge sharing, and problem solving. Collaborative competencies are crucial in medical education as they are key to how any doctor is expected to function in the future as part of a multidisciplinary health care team.

Objective: To assess team-based learning and collaborative competencies among undergraduate medical students.

Methods: The study was descriptive, cross sectional, which was carried out in Prime Medical and Dental College, Islamabad, from 1st December, 2024 to 31st May, 2025. The number of students included was 85 undergraduate medical students who were obtained by non-probability convenience sampling. The data were gathered by using a structured questionnaire which included the following information: Demographic data, students' perceptions of team-based learning, and domains of collaborative competency. Shared skills involved collaboration, communication skills, teamwork, leadership, mutual respect, shared decision making, accountability, conflict resolution, peer learning and problem solving skills. All the data was analyzed in SPSS version 26. Data were analyzed for frequencies, percentages, means and standard deviations. Where appropriate, the following tests were used: chi-square test, paired sample t-test and Pearson correlation. Statistically significant p value was < 0.05.

Results: Out of 85 students, 36 (42.4%) were male and 49 (57.6%) were female. Most students showed a positive perception of team-based learning. Overall, 54 (63.5%) students had good collaborative competency, 25 (29.4%) had moderate competency, and 6 (7.1%) had poor competency. Students with a positive perception of team-based learning were significantly more likely to demonstrate good collaborative competency compared with students having neutral or negative perception ($p = 0.001$). The mean team readiness assurance test score was higher than the individual readiness assurance test score ($p < 0.001$). A significant positive correlation was found between team-based learning perception score and overall collaborative competency score ($r = 0.61$, $p < 0.001$).

Conclusion: Team-based learning was positively associated with collaborative competencies among undergraduate medical students. Students who perceived team-based learning favorably showed better teamwork, communication, peer learning, accountability, and shared decision-making. Regular use of team-based learning in undergraduate medical education may help improve collaborative skills required for future clinical practice.

Keywords: Team-Based Learning, Collaborative Competency, Medical Students, Teamwork, Communication Skills, Undergraduate Medical Education.

INTRODUCTION

Medical teaching has undergone a slow transformation from teacher-centered to student-centered and competency-based teaching. While traditional lectures can be effective for imparting vast quantities of information, they can lack the opportunity to interact, discuss, decide and learn from peers. Today's medics are required to not only have a good grasp of theoretical knowledge but also be skilled in other professional abilities like communication, teamwork, leadership, accountability, and collaborative problem solving. Patient care in healthcare settings relies on the seamless collaboration of healthcare professionals, including doctors, nurses, and allied health staff, alongside patients and their families, and these skills are crucial in such contexts (1-3).

Team based learning is an active learning method that creates a structure where students prepare, take exams, discuss learning content with their peers, and apply knowledge to problem-based learning. TBL does not follow a standard structure as does unstructured group discussion, but typically forms a structured sequence of activities that include pre-class preparation, individual readiness assurance testing, team readiness assurance testing, feedback, and application exercises. In this format, students can compare their views with other people, analyze, justify their responses, listen to differing opinions, and arrive at common agreements. The method has been described recently as TBL, which is a teaching method in undergraduate medical education and health professions education based on evidence (4-6).

Collaborative competency is the student's ability to engage in cooperative work among a team. It involves communication, mutual respect, leadership, joint decision making, responsibility, conflict resolution and problem-solving. The skills are important for medical students because in clinical practice they will be continually interacting with healthcare teams and patients. Lack of collaboration can result in missed communication, inefficiency and substandard patient care. As such, the medical colleges require teaching methods that will help them to acquire academic knowledge and develop communication skills (7-9).

Team based learning can enhance the collaborative skills as it demands active role of learners in group activities. Students should: explain their reasoning, listen to other team members, resolve disagreements, and participate in a joint decision in a TBL session.

This process can help to establish confidence, peer learning, accountability, and communication. From the perspective of health professions education, evidence indicates that TBL has the potential to enhance process outcomes, including critical thinking and teamwork-related abilities; satisfaction; and learning outcomes (10).

The use of TBL has been gaining more attention in undergraduate medical education due to its active participation and application of knowledge. A recent scoping review revealed that TBL has been applied in clinical disciplines in undergraduate medical education, but how and what effect TBL implementation has in other institutions and disciplines might differ. An additional recent study found that the TBL process can be used to enhance the learning process in undergraduate medical education; however, there are concerns about variations in implementation. The results of this study suggest the importance of local institutional studies to investigate the perception of TBL from students and whether it is correlated with collaborative skills (11).

Pakistan has shifted toward the interactive approach of teaching and learning in medical education while many medical colleges still rely on the lectures as the primary mode of teaching. It is important to evaluate the potential of team-based learning to foster collaborative skills among medical students and assess the impact of this approach on collaborative skills in local educational contexts. Students' perception of TBL and its relationship to teamwork skills can be utilized to enhance medical teaching sessions and to reinforce competency-based education.

The present study was conducted at Prime Medical and Dental College, Islamabad, to assess team-based learning and collaborative competencies among undergraduate medical students. The study aimed to determine students' perceptions regarding TBL, evaluate their collaborative competency levels, and assess the association between TBL perception and collaborative competency.

METHODOLOGY

This descriptive cross-sectional study was conducted at Prime Medical and Dental College, Islamabad, from December 2024 to May 2025. The study was designed to assess the association of team-based learning with collaborative competencies among undergraduate medical students. Team-based learning was evaluated as an active learning

strategy, while collaborative competencies were assessed through students' responses related to teamwork, communication, leadership, peer learning, accountability, mutual respect, shared decision-making, conflict resolution, and problem-solving skills.

Eighty-five undergraduate medical students participated in the study. The number of students selected for the sample was determined by the number of students available for the study period who met the eligibility requirements. The aforementioned students from undergraduate medical classes who have come to the class for the team-based learning sessions and were willing to give informed consent were included. Incomplete questionnaires or refusal to allow the data collection were the reasons that students were not included in the analysis. Students were excluded from analysis if they were absent when data was collected, refused to participate, or had incomplete questionnaires.

The participants were selected by using a non-probability convenience sampling technique. The aim of the study was explained to all students prior to data collection. Students were made aware of the confidentiality of their responses and the fact that it would only be used for academic and research purposes and thus participation was voluntary. All participants gave written informed consent prior to participation. Small group team-based learning sessions were held. Students were put into groups to discuss content, solve problems, and make joint decisions about learning content and academic or clinical problems. The TBL process entailed four elements of preparing for class, assessing individual readiness, assessing team readiness, discussing in groups, and engaging in application-based learning activities. These sessions aimed to involve students in the activity, listen to others, explain their ideas and make a contribution to decision making by teams.

A structured questionnaire was used to collect data. The questionnaire had three major sections. The first part contained the

RESULTS

The total number of undergraduate medical students involved in the study were 85 students. The mean age of the students was 21.36 ± 1.42 years. Out of 85 students, 36 (42.4%) were male and 49 (57.6%) were female. Majority of students were from clinical years, 29 (34.1%) were from third year, 31

demographic data (age, gender, academic year, residence, and previous experience with team-based learning). In the second section, the students' perception of team based learning, such as involvement, understanding of the topic, confidence in group discussion, peer learning, and preference of TBL compared to traditional lectures were measured. The third section evaluated team working skills such as communication, team working, leadership, respect, common decision making, accountability, conflict management, peer learning, problem solving. The answers to questions about team-based learning and collaborative skills were captured using a Likert scale. Higher scores reflected more positive perceptions of TBL and collaborative competency. The overall collaborative competency scores were obtained by adding up scores from various competency domains. Students were classified as poor, moderate and good in collaborative competency based on the total score. This classification was useful for the identification of the overall pattern of collaborative skills of the undergraduates of medical schools.

The data obtained were entered and analyzed in SPSS version 26. Quantitative variables like age, individual readiness assurance test score, team readiness assurance test score and collaborative competency score were displayed as mean and standard deviation. Qualitative variables were put forward as frequency and percentage of the participants, which included gender, academic year, residence, previous exposure to TBL, perception of TBL and level of collaborative competency. The chi-square test was used to test the relationship between perception of team based learning and level of collaborative competency. The individual and team readiness assurance test scores were compared using paired sample t-test. Pearson correlation was used to determine the correlation between TBL perception score and collaborative competency score. Statistically significant was defined as a p-value of < 0.05 .

(36.5%) were from fourth year and 25 (29.4%) were from final year MBBS. As far as the place of stay was concerned 46 students (54.1%) were day scholars and 39 students (45.9%) were hostel students. Thirty-three (38.8%) students reported having some prior exposure to team based learning, while 52 (61.2%) students reported no prior exposure.

Table 1. Demographic Characteristics of Undergraduate Medical Students

Variable	Frequency (N)	Percentage (%)
Age Group		
19–20 Years	18	21.2
21–22 Years	49	57.6
23–24 Years	18	21.2
Gender		
Male	36	42.4
Female	49	57.6
Academic Year		
Third Year MBBS	29	34.1
Fourth Year MBBS	31	36.5
Final Year MBBS	25	29.4
Residence		
Day Scholar	46	54.1
Hostel Resident	39	45.9
Previous Exposure To TBL		
Yes	33	38.8
No	52	61.2

There was a positive response by students to team-based learning in general. Overall, the majority of participants expressed that the TBL method increased their active participation, fostered more discussion, and enabled them to learn the course material from their peers.

Overall, 67 (78.8%) students said that TBL increased engagement and 64 (75.3%) students said that it increased peer learning. Likewise, 60 (70.6%) students chose TBL over traditional lectures for certain topics.

Table 2. Students' Perceptions Regarding Team-Based Learning

Statement	Agree N (%)	Neutral N (%)	Disagree N (%)
TBL Increased My Active Participation In Class	67 (78.8)	12 (14.1)	6 (7.1)
TBL Improved My Understanding Of The Topic	65 (76.5)	14 (16.5)	6 (7.1)
TBL Encouraged Peer Learning	64 (75.3)	15 (17.6)	6 (7.1)
TBL Improved Confidence During Group Discussion	62 (72.9)	16 (18.8)	7 (8.2)
TBL Was More Engaging Than Traditional Lectures	60 (70.6)	17 (20.0)	8 (9.4)
I Would Prefer TBL For Future Teaching Sessions	61 (71.8)	15 (17.6)	9 (10.6)

Collaborative competencies were evaluated in a variety of areas such as communication, teamwork, leadership, shared decision making, accountability, conflict resolution, and problem solving. Teamwork ability (4.18 ± 0.63) was the

highest mean score followed by peer learning (4.11 ± 0.68) and communication skills (4.06 ± 0.71). Conflict resolution was the lowest mean score (3.72 ± 0.79), but the score was still generally considered a positive competency.

Table 3. Collaborative Competency Scores among Students

Collaborative COMPETENCY DOMAIN	Mean SCORE $\pm$ Sd
Communication SKILLS	4.06 ± 0.71
Teamwork ABILITY	4.18 ± 0.63
Leadership SKILLS	3.84 ± 0.76
Mutual RESPECT AMONG TEAM MEMBERS	4.02 ± 0.69
Shared DECISION-MAKING	3.91 ± 0.73
Accountability WITHIN THE TEAM	3.96 ± 0.70
Conflict RESOLUTION	3.72 ± 0.79
Peer LEARNING	4.11 ± 0.68
Problem-SOLVING ABILITY	3.98 ± 0.72

Overall COLLABORATIVE COMPETENCY SCORE	3.98 ± 0.58
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Students were placed into three categories: poor, moderate, and good level of collaborative competency, based on the overall collaborative competency score. A majority of students

exhibited a good teamwork ability. Of 85 students, 63.5% (54) had good collaborative competency, 29.4% (25) moderate, and 7.1% (6) poor.

Table 4. Level of Collaborative Competencies among Undergraduate Medical Students

Level Of Collaborative Competency	Frequency (N)	Percentage (%)
Poor	6	7.1
Moderate	25	29.4
Good	54	63.5
Total	85	100.0

Collaborative competency was also measured by the association with team based learning perception. Students who had a positive perception of TBL were more likely to demonstrate good collaborative competency compared with those who had neutral or negative perceptions. The percentage of

students with a positive perception of TBL who had good collaborative competency was 47 (74.6%) students and 7 (31.8%) students with neutral or negative perception had a good collaborative competency. This correlation was highly statistically significant ($p = 0.001$).

Table 5. Association between Perception of TBL and Collaborative Competency Level

Perception Of TBL	Poor/Moderate Competency N (%)	Good Competency N (%)	Total	P-Value
Positive Perception	16 (25.4)	47 (74.6)	63	
Neutral/Negative Perception	15 (68.2)	7 (31.8)	22	
Total	31 (36.5)	54 (63.5)	85	0.001

An analysis of the academic performance revealed mean individual readiness assurance test score of 72.45 ± 8.36 and a mean team readiness assurance test score of 84.18 ± 6.92 . There was a significant difference between the

team score and the individual score ($p < 0.001$), suggesting that students' performance in TBL sessions was enhanced by discussion in groups and decision making as a team.

Table 6. Comparison of Individual and Team Readiness Assurance Test Scores

Test Score	Mean ± SD	P-Value
Individual Readiness Assurance Test Score	72.45 ± 8.36	
Team Readiness Assurance Test Score	84.18 ± 6.92	<0.001

The overall collaborative competency score had a positive correlation with the students' perception score for the TBL ($r = 0.61$, $p < 0.001$). This indicates that students who had a

positive perception of TBL were more likely to experience positive teamwork, communication, shared decision making, and accountability abilities.

Table 7. Correlation between TBL Perception and Collaborative Competency Score

Variables	Correlation Coefficient	P-Value
TBL Perception Score And Overall Collaborative Competency Score	$R = 0.61$	<0.001

The results overall indicated that team-based learning was positively correlated with collaborative competencies in undergraduate

medical students. Students who experience TBL reported that they were more confident in their groups, more confident in the academic

activities of their groups, more confident in communicating with their group, and more confident in working with their peers.

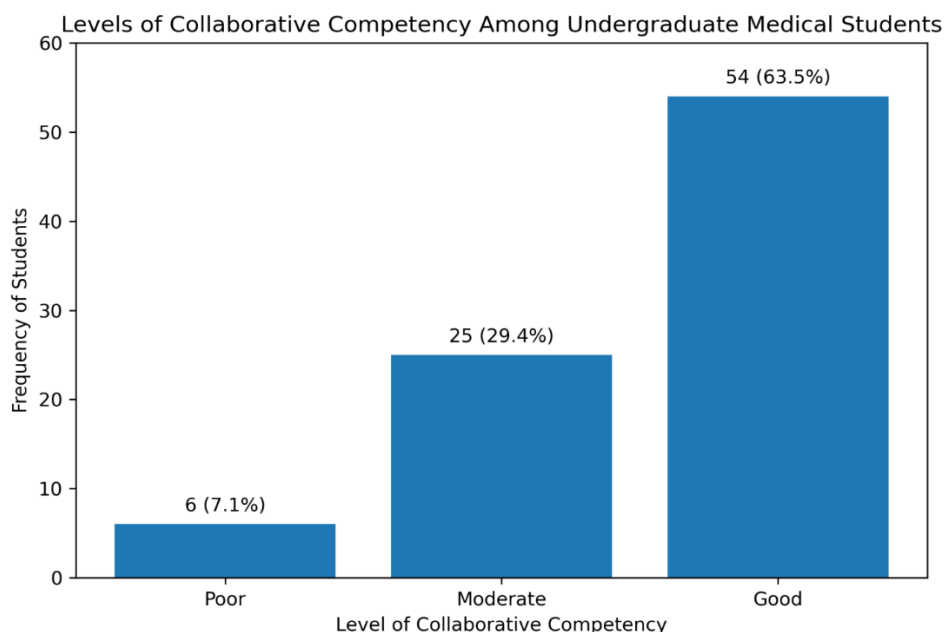


Figure 1. Levels of Collaborative Competency among Undergraduate Medical Students

The graph shows that most students had good collaborative competency 54 (63.5%), followed by moderate competency 25 (29.4%), while only 6 (7.1%) had poor competency.

DISCUSSION

The present study assessed team-based learning and collaborative competencies among undergraduate medical students at Prime Medical and Dental College, Islamabad. The findings showed that most students had a positive perception of team-based learning, and a considerable proportion demonstrated good collaborative competency. In this study, 54 (63.5%) students had good collaborative competency, while 25 (29.4%) had moderate competency and only 6 (7.1%) had poor competency. These findings suggest that TBL may support the development of important interpersonal and group-based skills among medical students, especially teamwork, peer learning, communication, shared decision-making, and accountability (12-14).

High teamwork, TBL, and communication scores suggest that TBL gave a learning opportunity for students to engage with each other in an active way instead of learning passively. This is significant in medical education because doctors are required to function well with other medical staff, nurses, allied health workers, patients and families.

Pires et al. (2025) reported that students who were exposed to TBL had high competence in interpersonal communication and felt that TBL was helpful in their communication skills (15). The results of the present study corroborate the findings of students who have positive perception of TBL had good collaborative competency.

In the present study, students with a positive perception of TBL had significantly better collaborative competency compared with those who had neutral or negative perception. For students who have positive perception of TBL, 74.6% of the students had good collaborative competency, 7 students had neutral perception with 31.8% of students having good collaborative competency, and 7 students had negative perception with 31.8% of students having good collaborative competency. It was a statistical significant association ($p = 0.001$). The results suggest that students who embrace TBL and are actively involved with it are more likely to be positively impacted by the problem-solving elements of the approach. The systematic approach of TBL (individual preparation, team readiness assessment, group discussion, and application-based tasks) can help to prevent students from talking over each other, discussing their own solutions, and making group decisions (16).

It was also observed that team readiness assurance test was higher than the individual readiness assurance test, this difference was statistically significant. This was a finding that showed the academic performance of students during the TBL session was improved through discussion in the teams. These results are echoed in more recent literature, which indicates that TBL can increase student involvement, satisfaction and learning outcomes versus less structured methods of small group discussion. Abdullah et al. reported that TBL had a positive effect on academic achievement and satisfaction of medical students, which is an indication of the possibility of improving knowledge and classroom participation by implementing structured team learning in the classroom (17). The relationship between perception score of TBL and the SC score ($r = 0.61$, $p < 0.001$) indicated that TBL was able to enhance collaborative learning behavior. This indicated as the students' perception of TBL improved, their collaborative competency score also increased. This result is similar to the rest of the health professions education evidence. In an umbrella review, Alizadeh et al. found that TBL holds promise for improving learning outcomes for health professions education, but cautioned that more research was necessary to understand how TBL can be most effectively applied in various educational environments (18).

The present results also have implications for competency-based medical training, in which effective communication, collaboration, leadership, responsibility and problem solving are seen as key abilities of medical practitioners. These skills are essential for medical students before they go into clinical practice where the proper functioning of patient care relies on patient collaboration (19). A scoping review of TBL in the clinical disciplines showed that TBL has been applied to undergraduate medical education as an evidence-based pedagogical method, and that it could facilitate active learning in the clinical disciplines (20). Thus, the use of TBL in the undergraduate medical curriculum could be beneficial for students in terms of learning and professional collaboration practices.

Some limitations should be noted, however, in spite of these positive results. The study was carried out in a single institution and the number of students was limited (85) and hence the results might not be applicable to other medical colleges. The data collected in this

study was self-reported, which could cause the students to overestimate their collaborative abilities. Also, the cross-sectional design allows for association, but not causation. Further research is recommended to validate the effects of TBL on collaborative skills by increasing the number of institutions, sample size, having pre- and post-assessment, and objective evaluation of teamwork skills by faculty.

CONCLUSION

The study concluded that team-based learning was positively associated with collaborative competencies among undergraduate medical students. Most students demonstrated good collaborative competency, particularly in teamwork, communication, peer learning, and accountability. Students with a positive perception of TBL were significantly more likely to have good collaborative competency. The team readiness assurance scores were also higher than individual scores, showing the academic benefit of group discussion and shared decision-making. These findings suggest that TBL is a useful active learning strategy for improving collaborative skills among medical students. Its regular inclusion in undergraduate medical education may help prepare students for effective teamwork in future clinical practice.

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