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The Role of Peer-Assisted Learning in Enhancing Medical Students' Academic Performance

Khaliq Aman[1], Farida Parvez[2*], Sadaf Saleem[3], Hassan Ayub[4], Sarah Amin[3] and Ruhina Salman[5]

[1]Department of Medical Education, Rawal Institute of Health Sciences, Islamabad, Pakistan
[2]Department of Medical Education, Frontier Medical and Dental College, Abbottabad, Pakistan
[3]Department of Medical Education, National University of Sciences and Technology, School of Health Sciences, Islamabad, Pakistan
[4]Department of Dental Education, Bashir College of Dentistry, Islamabad, Pakistan
[5]Department of Community Dentistry, HBS Dental College, Islamabad, Pakistan

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***Corresponding Author:**
Farida Parvez
Department of Medical Education, Frontier Medical and Dental College, Abbottabad, Pakistan
faridaiiah@gmail.com

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ABSTRACT

Peer-assisted learning (PAL) has gained recognition as an innovative and interactive educational strategy in medical education. **Objectives:** To evaluate the impact of PAL on the academic performance and satisfaction of undergraduate medical students. **Methods:** A comparative quasi-experimental study was conducted at Rawal Institute of Health Sciences, Islamabad, over six months. A total of 106 students participated, including 76 who attended PAL sessions and 30 who did not. Pre- and post-tests were administered to assess academic performance. PAL sessions were conducted twice weekly for four weeks and were led by trained senior students. Student satisfaction was measured using a structured questionnaire. Data were analyzed using SPSS version 25.0. Independent-samples and paired-samples t-tests were used to assess between-group and within-group differences. A p-value of less than 0.05 was considered statistically significant. **Results:** Pre-test scores were similar between groups. However, PAL participants achieved significantly higher post-test scores (Mean ± SD = 73.81 ± 9.00) and greater improvement (Mean = 18.95%) compared to non-participants (Mean = 6.82%, p = 0.001). Satisfaction levels were notably high among PAL participants, with over 90% reporting an enhanced understanding, increased exam preparedness, and increased academic confidence. **Conclusions:** It was concluded that PAL had a positive impact on both academic performance and student satisfaction. These findings support the integration of PAL as a complementary educational approach within medical curricula.

INTRODUCTION

Medical education is evolving rapidly to meet the demands of an increasingly complex healthcare system [1]. With the rise of competency-based curricula and the shift from passive knowledge acquisition to active learning, educational strategies must be restructured to foster deeper understanding, critical thinking, and collaboration among students. Traditional lecture-based methods, although still relevant, often fall short in addressing individual learning needs, particularly in settings where large class sizes and limited faculty availability hinder personalized instruction. Consequently, there has been a growing emphasis on incorporating interactive, learner-centred approaches into undergraduate medical education [2, 3]. One such approach gaining global attention is peer-assisted learning (PAL), an educational model in which students support the learning of their peers, typically under the guidance of faculty. In PAL, senior or academically stronger students serve as peer tutors, facilitating discussions, clarifying difficult concepts, and creating a less intimidating learning

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environment. Numerous studies have demonstrated that PAL enhances knowledge retention, boosts academic confidence, and improves examination performance [4]. It is also associated with improved communication skills, leadership development, and increased learner satisfaction. The horizontal relationship between peer tutors and learners often encourages more open discussions and the use of relatable language, making complex topics more accessible [5, 6]. Despite its well-documented benefits, PAL remains underutilized in many low- and middle-income countries, including Pakistan. In many institutions, didactic lectures continue to dominate the educational landscape, leaving limited space for structured peer-led teaching. Moreover, few medical colleges in the region have formally evaluated the academic impact of PAL or explored student perceptions in a structured format. Existing studies from South Asia are often limited by small sample sizes, unstructured PAL delivery, or a lack of objective performance evaluation [7, 8]. This lack of robust evidence creates uncertainty regarding the integration of PAL into mainstream medical curricula, particularly in resource-constrained environments where educational innovation is urgently needed. The rationale for this research lies in the need for locally relevant evidence to support educational reform. If proven effective, PAL could serve as a scalable, low-cost complement to traditional teaching, particularly beneficial in settings with limited faculty resources. By examining both objective academic outcomes and subjective student feedback, this study offers a comprehensive assessment of PAL's potential role in undergraduate medical education and provides a foundation for its broader adoption in similar institutions nationwide.

This study aims to evaluate the academic outcomes of a structured PAL program implemented at the Rawal Institute of Health Sciences, Islamabad. Specifically, to assess the effectiveness of PAL in improving academic performance through standardized pre- and post-testing and to compare outcomes between students who did and did not participate in the intervention. Additionally, also to conduct a satisfaction survey to explore student perceptions of PAL in terms of conceptual understanding, exam readiness, and overall academic experience.

METHODS

The quantitative, comparative quasi-experimental design was conducted at the Rawal Institute of Health Sciences, Islamabad, within the departments of basic medical sciences, over six months from December 2024 to May 2025. Ethical approval was taken from Rawal Institute of Health Sciences, Islamabad, with IRB no: RIHS/IRB/30/2024. This study evaluates the impact of peer-assisted learning (PAL) on the academic performance of undergraduate medical students. It compared pre- and post-test performance between students who participated in PAL sessions and those who did not. Additionally, student satisfaction with the PAL intervention was assessed through a structured questionnaire. PAL sessions were incorporated into the students' regular academic schedules under faculty supervision. The sample size was calculated using G*Power software for an independent two-sample t-test, assuming a two-tailed alpha of 0.05, 80% power, and an effect size of 0.7, based on findings from literature by Gros *et al.*, who reported large gains in academic performance associated with peer-assisted interventions in healthcare students [9]. This yielded a minimum sample size of 98 students (49 per group). To accommodate potential dropouts, the final sample was increased to 106, with 76 students participating in PAL and 30 serving as the comparison group. Participants were selected using a non-probability purposive sampling technique. Inclusion criteria included MBBS students enrolled from the first to final year who consented to participate in both pre- and post-assessments. For inclusion in the PAL group, students had to attend at least one session. Students who had previously taken part in formal peer-teaching programs, were absent from both assessments, or withdrew consent were excluded. Participation was voluntary, and written informed consent was obtained from all participants after explaining the study objectives. Confidentiality was maintained throughout the process. Data were stratified based on academic year and gender to reduce potential confounding, but no randomization was employed. Before the PAL intervention, all participants completed a standardized pre-test comprising multiple-choice and case-based questions aligned with the ongoing module content. Over the following four weeks, PAL sessions were conducted twice weekly for 60–90 minutes. These sessions were facilitated by trained final-year medical students, who led small-group discussions, clarified key concepts, and supported clinical reasoning. All sessions followed a semi-structured format aligned with the formal curriculum and were conducted under faculty oversight. After the intervention, a post-test mirroring the pre-test in structure and difficulty was administered. To minimize assessment bias, post-tests were anonymized and scored blindly. A structured satisfaction questionnaire was distributed to PAL participants, evaluating four domains: conceptual clarity, exam readiness, academic confidence, and willingness to recommend PAL. The questionnaire used Yes/No responses and was pilot-tested on a small group for clarity. All test items were reviewed by subject experts for content validity. Peer tutors were standardized through preparatory training. Internal consistency of the

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academic test was confirmed using Cronbach's alpha, which yielded a coefficient of 0.82. Data were analyzed using IBM SPSS Statistics version 25.0. Descriptive statistics were reported as means, standard deviations, frequencies, and percentages. The normality of continuous variables was assessed using the Shapiro-Wilk and Kolmogorov-Smirnov tests. As assumptions for parametric analysis were met, independent-samples t-tests were used to compare pre- and post-test scores between groups, and paired-samples t-tests were used for within-group comparisons. Satisfaction data were summarized using frequency distributions. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 106 undergraduate medical students participated in the study. Gender distribution was equal, with 53 male (50.0%) and 53 female (50.0%). Most students were aged 21–23 years (56; 52.8%), followed by those aged 18–20 years (47; 44.3%), and a smaller group aged ≥24 years (3; 2.8%). In terms of academic level, the majority were in their 3rd year (32; 30.2%) and final year (28; 26.4%), with others from 2nd year (26; 24.5%) and 1st year (20; 18.9%). Most participants were hostel residents (70; 66.0%), while the rest were day scholars (36; 34.0%) (Table 1).

Table 1: Demographic Characteristics of Participants (n=106)

Variables	Category	Frequency (%)
Gender	Male	53 (50.0%)
	Female	53 (50.0%)
Age Group	18–20 Years	47 (44.3%)
	21–23 Years	56 (52.8%)
	≥24 Years	3 (2.8%)
Year of Study	1st Year	20 (18.9%)
	2nd Year	26 (24.5%)
	3rd Year	32 (30.2%)
	Final Year	28 (26.4%)
Living Status	Hostel Resident	70 (66.0%)
	Day Scholar	36 (34.0%)

Out of the total sample, 76 students (71.7%) reported attending PAL sessions, while 30 students (28.3%) did not. Among PAL attendees, 44 (57.9%) participated occasionally (<75% attendance), and 32 (42.1%) attended regularly (≥75%) (Table 2).

Table 2: Participation in PAL Sessions (n=106)

Variables	Category	Frequency (%)
Attended PAL Sessions	Yes	76 (71.7%)
	No	30 (28.3%)
Frequency of Attendance (n=76)	Occasional (<75%)	44 (57.9%)
	Regular (≥75%)	32 (42.1%)

An analysis of academic performance showed no significant difference in pre-test scores between PAL participants (Mean = 62.16 ± 7.92) and non-participants (Mean = 61.24 ± 7.44, p = 0.587), indicating a comparable starting level for both groups. However, post-test scores were significantly higher in the PAL group (Mean = 73.81 ± 9.00) than in the non-PAL group (Mean = 65.26 ± 6.83, p = 0.001). Furthermore, the mean score improvement was markedly greater among PAL participants (18.95% ± 5.25) compared to non-participants (6.82% ± 3.91, p = 0.001), confirming a statistically significant academic benefit (Table 3).

Table 3: Comparison of Academic Performance (PAL vs Non-PAL)

Performance Metric	PAL Participants (n=76)	Non-PAL Participants (n=30)	p-Value
Mean Pre-Test Score	62.16 ± 7.92	61.24 ± 7.44	0.587
Mean Post-Test Score	73.81 ± 9.00	65.26 ± 6.83	0.001
Score Improvement (%)	18.95 ± 5.25	6.82 ± 3.91	0.001

Among PAL participants, satisfaction levels were high. A majority of students (70; 92.1%) reported improved conceptual understanding, (74; 97.4%) felt better prepared for exams, (72; 94.7%) experienced enhanced academic confidence, and (71; 93.4%) were willing to recommend PAL to peers (Table 4).

Table 4: Student Satisfaction with PAL Sessions (n=76)

Satisfaction Area	Agree, n (%)
Improved Understanding of Topics	70 (92.1%)
Boosted Exam Preparation	74 (97.4%)
Felt More Confident Academically	72 (94.7%)
Would Recommend PAL To Others	71 (93.4%)

The study presents a bar chart comparing the mean pre-test and post-test scores, as well as the percentage score improvement, between students who participated in PAL and those who did not. The data reveal that PAL participants had a significantly higher mean post-test score (73.81) compared to non-participants (65.26). Both groups began with comparable pre-test scores (62.16 vs. 61.24), suggesting similar academic baselines. However, the PAL group demonstrated a notably greater percentage improvement (18.95%) than the non-PAL group (6.82%), highlighting the effectiveness of PAL in enhancing academic performance (Figure 1).

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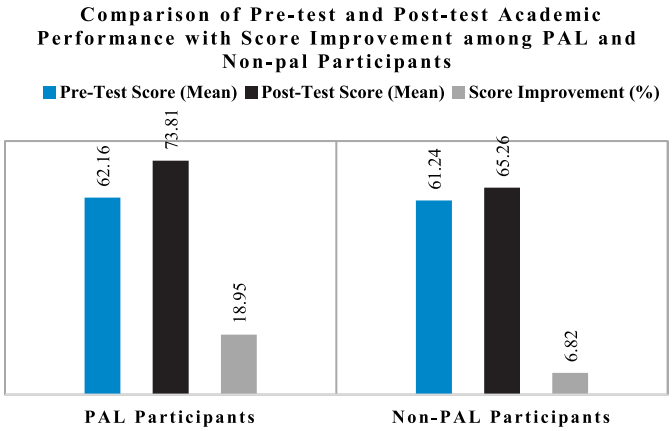

Figure 1: Comparison of Pre- and Post-Test Scores and Score Improvements Among PAL and Non-PAL Students

DISCUSSION

This study examined the impact of peer-assisted learning (PAL) on the academic performance and satisfaction of undergraduate medical students. The findings revealed that students who engaged in PAL demonstrated significantly higher post-test scores and greater overall improvement compared to their peers who did not participate. Both groups had similar pre-test scores, suggesting comparable baseline academic abilities. This supports the interpretation that the gains observed in the PAL group were attributable to the intervention itself, rather than to initial academic differences. These results align with existing literature on PAL's benefits in medical education. Studies by Amer *et al.*, and Williams *et al.*, found that PAL not only promotes engagement but also leads to better academic performance, particularly in the early clinical years [10, 11]. Similarly, Jawhari *et al.*, and Chan *et al.*, reported enhanced knowledge retention and assessment outcomes among students who received peer-led instruction [12, 13]. Current findings reinforce the evidence that PAL can serve as a valuable complement to traditional faculty-led teaching. Beyond academic scores, student satisfaction in this study highlighted the broader educational value of PAL. Most participants reported improved conceptual understanding, greater exam preparedness, and increased academic confidence. The majority also indicated a willingness to recommend PAL to their peers, demonstrating that the intervention was not only effective but also a well-received experience [14, 15]. The success of PAL may be explained through several well-established educational theories [16]. According to Vygotsky's Zone of Proximal Development (ZPD), learners benefit most when guided by individuals who are slightly more knowledgeable than themselves, exactly the dynamic created in PAL sessions. The peer tutors, being close in training level, help bridge the gap between what students can do independently and what they can achieve with support [17]. Furthermore, cognitive congruence, the idea that peers explain concepts using language and frameworks more relatable than those used by faculty may make learning more accessible and less intimidating. Peer modelling, wherein students observe and emulate the strategies and attitudes of successful peers, also contributes to the motivational and behavioural benefits of PAL. Together, these mechanisms help foster an environment that encourages active learning, immediate feedback, and shared responsibility for academic progress. The informal, non-hierarchical structure of PAL sessions may also enhance their effectiveness. Students often feel more comfortable seeking clarification and expressing uncertainty in peer-led groups than in formal lectures. This sense of psychological safety supports deeper engagement and sustained attention, contributing to the improved outcomes observed. Previous studies by Slabbert and du Plessis, Khan *et al.*, and Zakaria *et al.*, emphasized that peer relatability enables explanations to be delivered at a level that resonates more clearly with learners [18-20]. Finally, the benefits of PAL extended beyond academic improvement. High satisfaction rates suggest that PAL may also offer psychosocial advantages, including reduced performance anxiety, increased motivation, and a greater sense of community. These multidimensional effects position PAL as a particularly valuable educational strategy in resource-constrained or high-stress academic environments.

CONCLUSIONS

It was concluded that Peer-Assisted Learning (PAL) significantly improved medical students' academic outcomes, evident through higher post-test scores and notable gains in individual performance. Students also reported high satisfaction with the PAL experience, particularly appreciating its role in enhancing conceptual clarity, exam readiness, and self-confidence. Given its effectiveness and positive reception, integrating PAL into the formal medical curriculum could serve as a valuable adjunct to conventional teaching strategies. Moving forward, further research should explore the long-term retention of knowledge, evaluate the benefits of structured peer tutor training, and assess the adaptability of PAL across various medical disciplines and academic years. Overall, PAL emerges as a practical, student-centred, and resource-efficient approach to medical education.

Authors Contribution

Conceptualization: KA
Methodology: SS, SA, RS
Formal analysis: FP, SS, SA
Writing review and editing: KA, FP, SS, HA, SA, RS

All authors have read and agreed to the published version of the manuscript

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Conflicts of Interest

All the authors declare no conflict of interest.

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