Original Article

DOI: 10.7860/NJLM/2025/81233.2940

Pathology Section

Effectiveness of Peer-Assisted Learning in Pathology: A Quasi-Experimental Study Among Second-Year Medical Students

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ABSTRACT

Introduction: Peer-assisted Learning (PAL) is a learner-driven strategy in which students take on teaching roles to enhance mutual understanding and academic growth. While PAL has shown benefits in other medical subjects, its application in pathology remains limited. The increasing emphasis on active, collaborative approaches in pathology formed the basis for this study.

Aim: To assess the effectiveness of PAL as a teaching strategy in pathology by comparing it with conventional faculty-led teaching among second-year undergraduate medical students.

Materials and Methods: A quasi-experimental study was conducted at the Department of Pathology at Kiran Medical College and Hospital, Surat, Gujarat, India, over a period of three months (September 2024-November 2024). A total of 42 second-year Bachelor of Medicine and Bachelor of Surgery (MBBS) students were divided into two groups: Group A received PAL-based instruction and group B traditional faculty-led instruction. Each practical session was followed by a Multiple Choice Questions (MCQ) test (10 questions; 1 mark each). At the end of the study, both groups were evaluated using spotters (5 slides; 2 marks each) and viva (10 marks), assessed by an independent senior faculty member. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 30.0. Descriptive statistics and an Independent t-test (95% confidence interval) were used, with statistical significance set at p-value<0.05 considered significant. Student feedback was collected using a structured questionnaire.

Results: The PAL group achieved significantly higher mean scores in both formative and summative assessments compared to the traditional group (p-value<0.05). Feedback analysis showed that 18 out of 20 students (90%) felt PAL helped them understand concepts better, 17 out of 20 students (85%) found the sessions more engaging, and 18 out of 20 students (90%) reported enhanced critical thinking. In addition, a majority of students noted improvements in communication skills (17 out of 20; 85%) and motivation for self-directed learning (16 out of 20; 80%).

Conclusion: PAL proved to be an effective complement to conventional teaching of pathology practical sessions. It fostered deeper learning, active participation, and professional skill development, making it a valuable approach in undergraduate medical education.

Keywords: Assessment, Faculty-led teaching, Medical education, Teaching strategy

INTRODUCTION

Peer-assisted Learning (PAL) refers to a teaching and learning approach where students actively facilitate the learning of their peers by temporarily taking on teaching roles. This process not only strengthens the understanding of those being taught but also deepens the knowledge of the peer tutors themselves [1]. Previous studies have consistently highlighted its benefits, including better academic performance, enhanced learner satisfaction, and contributions to both personal and professional growth [2].

Evidence from different medical education contexts suggests that PAL leads to better academic results, greater satisfaction, and overall professional development [3]. Despite its successful application in disciplines such as anatomy and clinical training, the use of this approach in pathology-especially during practical sessions has not been widely explored. Conventional pathology teaching is largely faculty-directed and may limit student engagement and collaboration. This highlights the necessity of adopting innovative, learner-focused strategies that could make pathology instruction more interactive and effective [4].

Given this context, the present study was conducted to explore the potential of PAL in pathology practical education among second-year undergraduate medical students, with the objectives of evaluating its effectiveness in improving academic performance compared to traditional faculty-led teaching, assessing students' perceptions of its usefulness and acceptability, and examining its role in fostering communication skills, teamwork, and leadership among students who served as peer tutors.

MATERIALS AND METHODS

This was an educational interventional study conducted at Department of Pathology Kiran Medical College and Hospital, Surat, Gujarat, India, over a period of three months (September 2024 -November 2024).The study was approved by the Institutional Ethics Committee (IEC No.: KMC_IEC_001_2024, dated 11/09/2024).

Sample size calculation: The participants included 42 out of a total of 150 second-year MBBS students from a single intact practical batch. As this was a pilot project, no formal sample size estimation was performed, and all available students were recruited.

Inclusion criteria: A total of 42 students of one practical batch who regularly attended weekly pathology practical classes as per the academic schedule were included after obtaining informed consent.

Exclusion criteria: Learners who missed two or more sessions were excluded from the analysis.

Students were randomly allocated 1:1 into two groups. After accounting for absenteeism, group A (intervention, PAL) included 20 students, and group B (control, traditional) included 22 students. Blinding was not feasible in this educational setting.

Intervention (Group A- PAL): Students first attended a two-hour orientation covering the principles of PAL. They were then organised into five subgroups (about four members each). For every session, one student acted as a tutor under faculty supervision, leading the demonstration and guiding peer learning. The tutor role was rotated across sessions to ensure fairness, active participation, and leadership development.

Control (Group B- Traditional): The control group received faculty-led lectures and demonstrations on identical topics, delivered for the same duration as the intervention group.

Assessments and timing: Weekly formative assessments (10 MCQs, one mark each) were conducted after every session for both groups. Summative evaluation at the end of the study consisted of a spotting test (one slide/station, total 5 stations, two marks each; total 10 marks) and a viva voce (10 marks). All evaluations were conducted by senior pathology faculty who were not directly involved in the teaching sessions.

Feedback procedure: Feedback was collected only from group A using a validated questionnaire aligned with Kirkpatrick's Level-1 evaluation model. The survey addressed aspects such as concept clarity, engagement, communication, teamwork, and overall satisfaction. Responses were captured on a five-point Likert scale and analysed in terms of percentages [5].

Outcome measures: The primary outcome was the composite academic score (sum of MCQs, spotting, and viva). Secondary outcomes included student perceptions and acceptability of PAL.

STATISTICAL ANALYSIS

Quantitative data were presented as mean±SD, while categorical data were expressed as counts and percentages. Group comparisons for total scores were conducted using an Independent-samples t-test, and categorical variables were analysed with the Chi-square test. Data analysis was performed using IBM SPSS Statistics version 30.0, with statistical significance set at p-value<0.05.

RESULTS

A total of 42 students were included in the study, with 20 allocated to the PAL intervention group (group A) and 22 to the traditional teaching group (group B).

Academic performance: Students in group A (PAL) achieved a mean total score of 51.18±6.32, compared to 47.23±5.40 in group B (traditional method). Individual scores for both groups are summarised in [Table/Fig-1,2]. Statistical comparison revealed a significant difference between the two groups (p-value=0.035) [Table/Fig-3].

Feedback on PAL (Group A only): Based on Kirkpatrick's Level-1 feedback, the majority of students responded positively. Total of 18 students (90%) felt that PAL improved their conceptual understanding, 17(85%) found it more engaging compared to faculty-led sessions, and 18 (90%) reported gains in critical thinking and problem-solving abilities. In addition, a large proportion indicated that PAL enhanced their communication skills, teamwork, and motivation for self-directed learning [Table/Fig-4].

DISCUSSION

The present study showed that students exposed to PAL performed significantly better than those taught through conventional faculty-led sessions. This statistically significant improvement supports existing evidence that interactive and student-driven methods enhance knowledge retention, comprehension, and analytical skills. These outcomes highlight PAL as a promising approach for teaching pathology practical sessions.

The findings of this study are consistent with earlier work. Grover S et al., (2017) reported that PAL in pathology promoted greater student interest and engagement [1]. Similarly, Glynn LG et al., (2006) highlighted improvements in examination scores and peer support through PAL [2]. Beck A et al., (2016) demonstrated better

Sr no.	Test 1 (10)	Test 2 (10)	Test 3 (10)	Test 4 (10)	Test 5 (10)	OSPE (Objective structure practical exam) (10)	Viva (10)	Total (70 marks)	Percentage
1	9	9	10	6	9	9	8	60	85.71%
2	10	8	7	7	9	7.5	6	54.5	77.86%
3	7	10	9	7	10	6.5	4	53.5	76.42%
4	7	7	8	6	10	6	5	49	70.00%
5	Absent	8	7	7	9	7.5	7	45.5	65.00%
6	9	8	7	7	10	7	6	54	77.14%
7	7	8.5	6	5	9	6.5	5	47	67.14%
8	9	9	7	6	Absent	6.5	7	44.5	63.57%
9	10	7	9	7	9	8	5	55	78.57%
10	9	7	8	5	9	8.5	5	51.5	73.57%
11	10	8.5	8	8	9	9	8	60.5	86.42%
12	10	9	9	6	10	9	7	60	85.71%
13	Absent	7	7	6	9	7	6	45	64.28%
14	7	7	7	6	9	6.5	6	50	71.42%
15	8	10	10	7	9	8	6	57	81.42%
16	9	8	8	5	7	7.5	6	51.5	73.57%
17	8	7	7	5	8	5.4	6	48.5	69.28%
18	8	8	8	6	9	4	5	46.5	66.42%
19	10	9	9	7	7	7	7	55	78.57%
20	Absent	6	6	6	7	1.5	6	35	50.00%

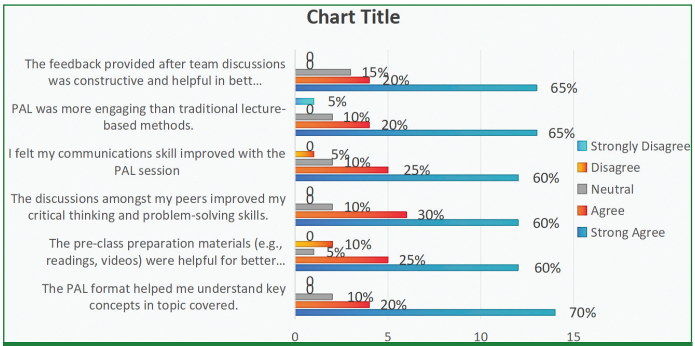
[Table/Fig-1]: Individual performance scores of group A students (intervention group- peer-assisted learning).
Presents detailed marks and percentages for each assessment component in Group A

Sr no.	Test 1 (10)	Test 2 (10)	Test 3 (10)	Test 4 (10)	Test 5 (10)	OSPE (Objective structure practical exam) (10)	Viva (10)	Total (70 marks)	Percentage
1	8	9	10	6	8	8	7	56	80.00%
2	9	10	9	7	Absent	8	7	50	71.42%
3	7	7	8	7	7	6	5	47	67.14%
4	Absent	6	8	4	9	2.5	5	34.5	49.28%
5	10	7.5	8	7	6	7	5	50.5	72.14%
6	6	8.5	8	6	10	4.5	3	46	65.71%
7	9	9.5	7	7	9	4	4	49.5	70.71%
8	4	7	8	7	7	7.5	5	45.5	65.00%
9	8	7.5	9	8	10	9.5	4	56	80.00%
10	10	8	8	6	5	4.5	5	46.5	66.42%
11	7	Absent	6	4	8	8	4	37	52.85%
12	9	Absent	9	8	9	6.5	5	46.5	66.42%
13	7	6	6	6	8	7	4	44	62.85%
14	10	6	8	7	8	8.5	6	53.5	76.42%
15	Absent	9.5	7	6	9	5	4	40.5	57.85%
16	5	7.5	5	6	9	5.5	6	44	62.85%
17	7	7	5	5	9	8	5	46	65.71%
18	10	7	5	5	9	8	5	49	70.00%
19	Absent	10	7	6	9	7.5	5	44.5	63.57%
20	9	8.5	7	8	9	3	5	49.5	70.71%
21	8	9	9	7	8	6	6	53	75.71%
22	7	9	9	6	6	7	6	50	71.42%

[Table/Fig-2]: Individual performance scores of group B students (control group- regular teaching).
Detailed marks and percentages for each assessment component in Group B

Parameters	Intervention (PAL) group	Control group
Number of students	20	22
Mean (Total Score)	51.175	47.227
Standard deviation	6.323	5.404
Standard error of mean	1.413	1.152
Mean percentage	73.11%	67.47%

[Table/Fig-3]: Comparison of academic performance between Group A and Group B.
Summarises the statistical measures for Groups A and B, enabling direct comparison of total scores and percentages; The p-value is 0.0351; Confidence interval: The mean of Test group minus Control group equal 3.948; 95% confidence interval of this difference: from 0.289 to 7.606



[Table/Fig-4]: Student feedback on PAL sessions (n=20) (Kirkpatrick Level-1 evaluation)

histopathology outcomes among students taught by peers [3]. Burgess A and Nestel D (2014) also noted its role in strengthening professional identity and collaborative learning [6]. More recently, Divya R et al., (2021) documented enhanced results with near-peer PAL among first-year students [7]. Collectively, evidence from these studies underscores the academic and professional value of PAL across diverse medical settings.

Student feedback in the intervention arm further reinforced these outcomes. Most participants agreed that PAL improved understanding, increased engagement, and strengthened critical thinking and problem-solving abilities. Many also acknowledged improvements in communication through tutor participation. These observations align with Koch LK et al., (2021), who emphasised PAL's role in boosting confidence and social congruence in pathology teaching [4], and with Nicholas et al., (2015), who reported that peer tutors were perceived as approachable and responsive to learner needs [8]. While Nicholas T et al., (2015) recommended an academic gap of 2-3 years between tutors and tutees, the present findings suggest that same-year peers may also be effective, possibly due to closer social and cognitive alignment [8].

However, not all literature supports these findings. For instance, Hall S et al., (2014) observed no significant difference in student perceptions of approachability between near-peer tutors and junior doctors [9]. This indicates that tutor-learner dynamics may vary depending on Institutional, cultural, or disciplinary contexts, suggesting the need for broader, multi-institutional research.

Key strengths of this study include the innovative application of PAL to pathology practical sessions, the use of both objective academic outcomes and Kirkpatrick's Level-1 feedback for evaluation, and the structured rotation of tutor roles, which promoted equal participation and engagement among students.

Limitations(s)

Nevertheless, several limitations must be acknowledged. The short three-month duration restricted the assessment of long-term knowledge retention and skill acquisition. Variation in peer tutors' confidence and teaching skills, as they were from the same batch, may have influenced results. Moreover, the study evaluated only immediate academic performance without examining broader outcomes such as clinical application or professional behaviour. Future investigations involving larger, multi-centre samples, longer follow-up, and feedback from both intervention and control groups are recommended to strengthen and expand these findings.

CONCLUSION(S)

The findings of the present study suggest that PAL offers a valuable alternative to conventional lecture-based teaching for pathology practicals. For effective implementation, it is essential to select suitable topics and ensure that students are oriented to PAL principles. The approach not only enhances conceptual understanding but also supports active participation and deeper learning. Importantly, in settings with limited faculty resources, PAL can serve as a practical strategy to enrich undergraduate training and prepare students for their journey toward becoming competent Indian Medical Graduates (IMGs).

Acknowledgement

The authors would like to thank their departmental colleagues, the faculty of the medical education unit of Kiran Medical College, Surat, Gujarat, India for their support and the students who participated in the study.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jun 15, 2025
- Manual Googling: Sep 19, 2025
- iThenticate Software: Sep 26, 2025 (4%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jun 14, 2025**
Date of Peer Review: **Jul 31, 2025**
Date of Acceptance: **Sep 27, 2025**
Date of Publishing: **Oct 01, 2025**