

## Original Research Article

# PEER-ASSISTED LEARNING- A TRANSFORMATIVE APPROACH IN MEDICAL EDUCATION

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## ABSTRACT

**Background:** Medical education necessitates interactive learning strategies to ensure effective comprehension of complex subjects. Peer-Assisted Learning (PAL), wherein students learn from each other under faculty supervision, has gained recognition in medical education. It enhances active participation, knowledge retention, and critical thinking. **Aim:** To assess the impact of Peer-Assisted Learning (PAL) on knowledge retention, engagement, and confidence levels of first-year MBBS students in Department of Biochemistry. **Objectives:** 1. Compare PAL with traditional lecture-based learning. 2. Analyze students' conceptual understanding before and after PAL implementation. 3. Evaluate student engagement, motivation, and satisfaction with PAL. 4. Assess the role of PAL in enhancing communication and teamwork skills. 5. Determine faculty perceptions regarding PAL's feasibility in medical education.

**Materials and Methods:** A quasi-experimental study was conducted on 200 first-year MBBS students of year 2023-24 at Dr. VMGMC, Solapur. The students were randomly divided into two groups: 1. Group A (PAL Group): 100 students engaged in peer-assisted learning. 2. Group B (Control Group): 100 students received traditional lectures. **Assessment tools included:** 1. Pre-test & Post-test for knowledge retention. 2. Student Feedback Questionnaire for engagement analysis. 3. Faculty Observations for teaching effectiveness. 4. Statistical Analysis using paired t-tests and Chi-square tests.

**Results:** The PAL group exhibited a significant improvement in knowledge retention and student engagement. The post-test scores showed a higher mean improvement in the PAL group than in the control group ( $p < 0.001$ ).

**Conclusion:** PAL enhances learning, confidence, and communication skills in medical students. The findings suggest PAL should be integrated into Biochemistry education as a complementary approach.

**Keywords:** Peer-Assisted Learning (PAL), Medical education.

## INTRODUCTION

Medical education demands active participation and critical thinking for effective knowledge acquisition.<sup>[1]</sup> Traditional lecture-based methods often lead to passive learning and limited student engagement.<sup>[2]</sup> To counteract these limitations, active learning strategies such as Peer-Assisted Learning (PAL) have been introduced in medical curricula.<sup>[3]</sup> PAL involves students taking on dual roles as learners and peer educators, promoting interactive learning and reinforcing knowledge.<sup>[4]</sup>

Research has shown that PAL fosters teamwork, enhances communication, and improves retention.<sup>[5,6]</sup> However, despite its proven benefits, its implementation in Indian medical institutions remains underexplored.<sup>[7]</sup> This study investigates the effectiveness of PAL in Biochemistry education among first-year MBBS students at Dr. VMGMC, Solapur.

## MATERIALS AND METHODS

Study design- A quasi-experimental study was conducted over six months at Dr. VMGMC, Solapur.<sup>[9]</sup> **Participants-** A batch of 200 first-year MBBS students of year 2023-24 was divided into:

1. Group A (PAL Group): 100 students participated in peer-assisted learning.
2. Group B (Control Group): 100 students followed traditional lectures.

**Intervention:** Peer tutors were selected based on academic performance and communication skills.<sup>[12]</sup> PAL sessions covered core Biochemistry topics using case-based learning and problem-solving exercises.<sup>[13]</sup>

Selected Theory Topics for PAL Sessions:

### 1. Diabetes Mellitus – Biochemical Basis & Laboratory Diagnosis

- a. Interpretation of fasting & postprandial blood glucose levels
- b. Role of HbA1c in long-term glycemic control
- c. Pathophysiology of insulin resistance and  $\beta$ -cell dysfunction
- d. Interpretation of OGTT (Oral Glucose Tolerance Test)
- e. Importance of ketone body estimation in diabetic ketoacidosis (DKA)

### 2. Liver Function Tests (LFT) & Interpretation in Liver Disorders

- a. Biochemical markers: Serum bilirubin, SGPT, SGOT, ALP, GGT, Albumin
- b. Patterns in viral hepatitis, alcoholic liver disease, and obstructive jaundice
- c. Role of prothrombin time (PT) as a marker of liver function
- d. Significance of AST/ALT ratio in differentiating liver pathologies

### 3. Myocardial Infarction – Role of Biochemical Markers

- a. Clinical significance of Troponins (T, I), CK-MB, LDH, and Myoglobin

- b. Time-based interpretation of biomarker elevation in acute coronary syndrome
- c. Differentiating unstable angina from myocardial infarction using biomarkers
- d. Role of lipid profile and hs-CRP in cardiovascular risk assessment

### 4. Acid-Base Balance & Arterial Blood Gas (ABG) Interpretation

- a. Normal values of pH,  $pCO_2$ ,  $HCO_3^-$ , and anion gap
- b. Differentiating respiratory vs. metabolic acidosis and alkalosis
- c. Case-based interpretation of ABG reports in ICU settings
- d. Clinical significance in conditions like COPD, renal failure, and sepsis

Faculty provided structured guidance during sessions.

### Assessment & Statistical Analysis:

1. Pre-test & Post-test (paired t-test) to assess knowledge gain.<sup>[15]</sup>
2. Student Feedback Analysis (Chi-square test) to compare engagement.<sup>[16]</sup>

Descriptive statistics (Mean  $\pm$  SD, percentages).<sup>[17]</sup>

## RESULTS

**1. Knowledge retention and performance:** The findings from the study demonstrated a statistically significant improvement in knowledge retention among students who participated in Peer-Assisted Learning (PAL) compared to those who underwent traditional lecture-based learning. The pre-test scores between the two groups were nearly identical (PAL Group:  $45.2 \pm 10.3$ , Control Group:  $44.8 \pm 9.8$ ;  $p = 0.78$ ), indicating a similar baseline level of understanding. However, the post-test scores revealed a significant increase in the PAL group ( $68.5 \pm 9.7$ ) compared to the control group ( $55.3 \pm 10.1$ ), with a p-value of  $<0.001$ , suggesting that PAL was significantly more effective in enhancing knowledge acquisition.

Table 1

Parameter	PAL Group (n=100)	Control Group (n=100)	p-value
Pre-test score (Mean $\pm$ SD)	$45.2 \pm 10.3$	$44.8 \pm 9.8$	0.78
Post-test score (Mean $\pm$ SD)	$68.5 \pm 9.7$	$55.3 \pm 10.1$	$<0.001$

**2. Engagement and confidence:** The study also assessed the impact of PAL on student engagement and confidence in explaining Biochemistry concepts. A substantial difference was noted in the students' self-reported confidence levels. In the PAL group, 70% of students expressed confidence in explaining concepts, compared to only 40% in the

control group ( $p < 0.001$ ). Similarly, engagement in discussions was markedly higher in the PAL group (85%) than in the control group (55%) ( $p < 0.001$ ). These results suggest that PAL fosters active participation, promotes discussion, and enhances students' ability to articulate their understanding of complex biochemical topics.

Table 2

Student Response	PAL Group (%)	Control Group (%)	p-value
Confidence in Explaining Concepts	70	40	$<0.001$
Engagement in Discussions	85	55	$<0.001$

Faculty observations further reinforced the benefits of PAL in medical education. Tutors and faculty members noted that PAL sessions encouraged critical thinking and problem-solving abilities among students. Additionally, students in the PAL group demonstrated improved communication skills and teamwork, essential attributes for future medical professionals. Faculty members highlighted the structured yet flexible nature of PAL as an effective complementary strategy alongside traditional teaching methods.

The overall effectiveness of PAL was evident in its ability to improve learning outcomes, student confidence, and engagement. The structured peer-learning approach allowed students to clarify doubts, reinforce key concepts, and develop independent learning strategies. While initial challenges such as variability in peer tutor quality and the need for faculty supervision were identified, the benefits of PAL far outweighed these limitations. The study suggests that PAL can be integrated into medical curricula as a valuable pedagogical approach to enhance both academic and professional competencies among students.

## DISCUSSIONS

Our study found that Peer-Assisted Learning (PAL) significantly improved knowledge retention and student engagement.<sup>[18]</sup> These findings align with previous studies, which highlight PAL's role in active learning and collaborative education.<sup>[19,20]</sup> Students in the PAL group reported higher confidence in explaining Biochemistry concepts, suggesting deeper understanding.<sup>[21]</sup> Previous research confirms that peer tutoring strengthens conceptual clarity and promotes self-directed learning.<sup>[22]</sup> Faculty observations revealed that PAL sessions encouraged problem-solving skills and critical thinking.<sup>[23]</sup> However, challenges such as variable tutor quality and initial resistance were noted, emphasizing the need for faculty supervision.<sup>[24]</sup>

Recent studies have further elucidated the multifaceted benefits of Peer-Assisted Learning (PAL) in medical education. A scoping review of systematic reviews synthesized existing evidence on the effectiveness of PAL in health professional education, highlighting its positive impact on both cognitive and psychomotor domains. The review emphasized that PAL not only enhances academic performance but also fosters the development of essential soft skills, such as communication and teamwork, which are crucial in medical practice.<sup>[27]</sup> Additionally, a narrative review focusing on the role of PAL in enhancing medical English proficiency underscored its potential in improving language skills among medical students. This is particularly beneficial in non-English speaking countries, where proficiency in medical English is essential for

accessing global medical literature and effective patient communication.<sup>[28]</sup> The study found that PAL activities provided a supportive environment for students to practice medical terminology and communication, thereby increasing their confidence and competence in using medical English.<sup>[30]</sup>

These findings suggest that PAL is a versatile educational strategy that not only reinforces subject matter comprehension but also contributes to the holistic development of medical students, preparing them for the multifaceted demands of their future professional roles.

Limitation and future scope: While PAL was effective, factors like peer tutor training and session standardization should be improved.<sup>[25]</sup> Future research should evaluate long-term retention and clinical applicability of PAL.<sup>[26]</sup>

## CONCLUSION

PAL is a highly effective teaching method that enhances student engagement, confidence, and knowledge retention in Biochemistry. Its integration into medical education can supplement traditional methods, making learning more interactive and efficient.

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