International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-06-95*

Effectiveness of Coupling Traditional Didactic Lecture with Small Group Teaching among Preclinical Medical Students: A Cross-Sectional Observational Study.

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Received: 10-05-2026
Revised: 29-05-2026
Accepted: 13-06-2026
Published: 16-06-2026

Abstract

Background: Traditional didactic lectures remain a common method for delivering core biomedical concepts to large groups of medical students, but learner engagement and immediate retention can be limited when teaching is predominantly teacher-centred. Combining lectures with small group tutorials can strengthen interaction, questioning, peer discussion, and clarification of difficult topics. ***Objectives:*** To assess the effectiveness of coupling a traditional didactic lecture with small group teaching in improving academic performance among first-year MBBS students. ***Methods:*** This cross-sectional observational educational study was conducted among 137 first-year MBBS students of the 2019-2020 batch at Osmania Medical College, Hyderabad. A didactic lecture on the urea cycle, deamination, and transamination was delivered first. Students then completed a pre-test using 15 multiple-choice questions on the same topic. Ten small groups were formed, and each group received topic-based tutorial teaching by an allotted tutor. A post-test using the same questions was conducted after the small group session. Pre-test and post-test scores were compared using paired t-test. ***Results:*** The mean pre-test score was 8.52 ± 2.02, while the mean post-test score increased to 14.28 ± 1.19. The mean score gain was 5.76 marks, with a statistically significant improvement after the combined teaching approach. In the pre-test, 25% of students scored below 50%, 70% scored 50-80%, and 5% scored above 80%. After the tutorial, 95% scored above 80%, and none scored below 50%. ***Conclusion:*** Coupling didactic lecture with small group tutorial teaching produced a marked improvement in immediate test performance among preclinical medical students.

Keywords: Didactic lecture; Small group teaching; Tutorial; Medical education; Preclinical students; Biochemistry; Academic performance.

INTRODUCTION

Medical education has moved from purely teacher-centred delivery toward approaches that promote active participation, self-directed inquiry, and collaborative reasoning. Despite this shift, the traditional didactic lecture continues to occupy an important place in undergraduate medical curricula because it allows a trained teacher to present a large amount of information in an organized, economical, and time-efficient manner [1]. In preclinical subjects such as biochemistry, lectures are useful for introducing concepts, outlining learning objectives, and giving students a structured map of complex pathways. However, lecture-based learning alone often provides limited opportunity for questioning, learner interaction, peer explanation, and immediate correction of misconceptions [1].

Small group teaching has gained strong academic relevance because it supports deeper engagement with the subject. In small groups, learners are encouraged to listen, question, respond, and explain concepts in their own words, which are core behaviours of effective discussion-based learning [2,3]. Small group sessions also allow the teacher to identify gaps in comprehension, adapt explanations to learner needs, and create a safer environment for students who hesitate to ask questions in large classes. Student perceptions from preclinical curricula have shown that clear goals, skilled facilitation, relevant materials, and active participation are important determinants of effective small group teaching [4].

Tutorial-based teaching is one of the common small group formats used in medical colleges. It works particularly well when a topic has already been introduced through a lecture and learners are then asked to apply, recall, and organize the same content through guided discussion. This sequencing can be useful for difficult biochemical topics, where students

must integrate definitions, pathway steps, enzymes, clinical relevance, and metabolic consequences. Evidence from health professions education indicates that small group learning promotes collaborative learning, team skills, critical thinking, and learner accountability [5,6]. Such collaborative construction of knowledge also reflects broader principles of problem-based and learner-centred educational processes [12]. Active learning approaches have been associated with better academic performance than passive reception of information in broader science education settings [13].

Assessment of short-term knowledge gain through pre-test and post-test methods is a practical way to evaluate whether a teaching method improves immediate learning outcomes. Although test scores cannot capture every dimension of learning, they provide an objective estimate of knowledge acquisition after an educational intervention, and assessment itself is known to influence student learning behaviour [8].

In the present study, the same cohort of first-year MBBS students was exposed to a didactic lecture followed by topic-based small group tutorial teaching. The objective of the study was to compare student performance after combined didactic lecture and small group teaching with performance after didactic lecture alone among preclinical medical students.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional observational educational study with a within-student pre-test and post-test assessment component. The study was conducted in the Department of Biochemistry, Osmania Medical College, Hyderabad, among first-year MBBS students of the 2019-2020 academic batch. The teaching-learning activity focused on selected core biochemical topics, namely the urea cycle, deamination, and transamination, which require conceptual understanding, sequential recall, and application of metabolic relationships.

Study population and sample size

A total of 137 first-year MBBS students participated in the study. All students from the 2019-2020 batch who were present during the teaching session and agreed to participate were included. Students who did not provide consent or who were absent during either the pre-test or post-test were not included in the final assessment. The sample size was based on the total number of eligible and consenting students available in the batch during the study activity.

Teaching intervention

Initially, a traditional didactic lecture was delivered on the selected topic. The lecture covered the core biochemical mechanisms, relevant definitions, and important conceptual links. After completion of the lecture, a pre-test was conducted using 15 multiple-choice questions prepared from the same topic. The purpose of the pre-test was to measure student performance after the lecture-based component alone.

Small group teaching procedure

After the pre-test, students were divided into 10 small groups. Each group was allotted a tutor for tutorial-based teaching. The tutor facilitated discussion, encouraged students to clarify doubts, reviewed important points from the lecture, and guided students through the conceptual steps of the topic. The tutorial method was used because small group teaching is most effective when learners are actively involved, discussion is structured, and clear learning objectives are maintained [2,6,7].

Outcome assessment

The primary outcome was improvement in student performance from pre-test to post-test. After the small group teaching session, the same 15 multiple-choice questions were administered as the post-test. Using the same question set allowed direct comparison of scores before and after the tutorial component. Marks were summarized as mean ± standard deviation. Students were also classified according to percentage marks as below 50%, 50-80%, and above 80%. Objective assessment was used to capture immediate academic gain after the teaching intervention [8].

Statistical analysis

Data were entered in Microsoft Excel and analysed using SPSS version 10. Pre-test and post-test scores were compared using the paired t-test because the same students were assessed before and after the small group intervention. A p value less than 0.05 was considered statistically significant. Results were presented as descriptive tables and narrative interpretation suitable for an original educational research manuscript.

Ethical considerations

Participation was voluntary, and only students who agreed to participate were included. No identifying student information was reported in the analysis or manuscript.

RESULTS

A total of 137 first-year MBBS students participated in the educational assessment. The teaching-learning sequence consisted of a traditional didactic lecture on the urea cycle, deamination, and transamination, followed by a pre-test, tutorial-based small group teaching, and a post-test using the same multiple-choice questions. The overall study and intervention profile is shown in Table 1.

Table 1. Study and teaching-intervention profile

Parameter	Description
Study design	Cross-sectional observational educational study with pre-test and post-test assessment
Study setting	Department of Biochemistry, Osmania Medical College, Hyderabad
Study population	First-year MBBS students of the 2019-2020 batch
Sample size	137 students
Topic taught	Urea cycle, deamination, and transamination
Initial teaching method	Traditional didactic lecture
Assessment tool	15 multiple-choice questions
Small group teaching format	10 tutorial groups with one allotted tutor for each group
Statistical test	Paired t-test

The mean pre-test score after the didactic lecture was 8.52 ± 2.02 marks. After small group tutorial teaching, the mean post-test score increased to 14.28 ± 1.19 marks. The absolute mean gain was 5.76 marks, indicating a clear improvement in immediate academic performance after the combined teaching strategy. The paired comparison showed a highly significant difference between pre-test and post-test scores ($p<0.00001$), as shown in Table 2.

Table 2. Comparison of pre-test and post-test scores

Assessment	Mean ± SD score	Mean score percentage	p value
Pre-test	8.52 ± 2.02	56.8%	
Post-test	14.28 ± 1.19	95.2%	<0.00001
Mean gain	5.76	38.4 percentage points	Highly significant

The distribution of students across score categories also showed a marked shift after small group teaching. In the pre-test, one-fourth of students scored below 50%, while the majority scored between 50% and 80%. Only 5% of students scored above 80% after the lecture alone. In contrast, after the small group tutorial, no student remained below 50%, only 5% were in the 50-80% category, and 95% scored above 80%. This category-wise improvement is presented in Table 3.

Table 3. Distribution of students according to percentage marks

Percentage marks category	Pre-test	Post-test
<50%	25%	0%
50-80%	70%	5%
>80%	5%	95%

Overall, the results demonstrated that adding small group tutorial teaching to a conventional lecture was associated with a substantial improvement in student scores. The post-test performance reflected better immediate recall, stronger conceptual consolidation, and improved ability to answer objective questions on the selected biochemical topic.

DISCUSSION

The present study showed a significant improvement in student performance after coupling a traditional didactic lecture with small group tutorial teaching. The mean score increased from 8.52 ± 2.02 in the pre-test to 14.28 ± 1.19 in the post-test, with a mean gain of 5.76 marks. The score category distribution also shifted strongly toward higher performance, as 95% of students achieved more than 80% marks after the tutorial session. These findings indicate that the addition of structured small group teaching contributed to better immediate knowledge consolidation among first-year MBBS students. Traditional lectures remain useful in medical education because they provide a coherent and economical method for introducing large amounts of content to many learners [1].

In the present study, the lecture created the initial framework for understanding the urea cycle, deamination, and transamination. However, the lower pre-test scores suggest that exposure to lecture content alone was not sufficient for

optimal short-term performance. This observation is consistent with educational concerns that large group teaching can restrict interaction, reduce feedback opportunities, and leave individual misconceptions unaddressed [1,2].

Small group teaching added a more active layer to the learning process. During tutorials, students had an opportunity to revisit difficult concepts, listen to peer explanations, ask questions, and receive focused guidance from tutors. These processes are central to effective small group learning, where listening, questioning, and responding strengthen understanding [3,5]. Meo emphasized that small group sessions require clear objectives, defined tasks, active learner participation, and proper facilitation [6]. Mir et al. also highlighted the need for structured planning and student-centred facilitation when small group teaching is implemented in medical schools [7].

The findings are supported by earlier studies reporting favourable learner perceptions and educational benefits of small group teaching. Steinert observed that students value goal clarity, tutor behaviour, teaching materials, and assessment methods in small group environments [4]. Sahu et al. reported positive perceptions of small group teaching in a hybrid curriculum [9], while Nayak et al. found that tutorial classes improved engagement among undergraduate medical students [10]. Guraya and Almaramhy also reported that small group teaching improved knowledge and skills acquisition [11].

The strong post-test improvement in this study should be interpreted as evidence of immediate learning gain rather than long-term retention. Nevertheless, immediate assessment is useful in curriculum planning because it reflects whether a teaching strategy helps students grasp the topic at the time of instruction. Active learning literature also supports the principle that learner engagement improves academic performance [13,14]. Therefore, a blended approach in which lectures introduce core concepts and small group tutorials reinforce them can be a practical model for preclinical medical education, especially in content-heavy subjects such as biochemistry.

Limitations

This study was conducted in a single institution and included only first-year MBBS students from one academic batch. Long-term retention was not assessed, and the post-test used the same questions as the pre-test. Student perceptions, tutor variability, prior topic familiarity, and inter-group differences were not measured, limiting deeper interpretation of learning behaviour and broader applicability across other preclinical subjects and institutions.

CONCLUSION

Coupling a traditional didactic lecture with small group tutorial teaching significantly improved immediate academic performance among first-year MBBS students. The marked increase in mean scores and the shift of most students into the highest score category show that tutorials can strengthen comprehension after lecture-based instruction.

For preclinical subjects such as biochemistry, this combined method offers a practical, feasible, and learner-centred approach without replacing the value of structured lectures. Regular integration of small group tutorials after selected difficult topics can enhance student engagement, clarify misconceptions, and improve short-term knowledge consolidation in undergraduate medical education. Future studies should assess retention, learner satisfaction, and implementation across larger batches, topics, and institutions over time.

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