

## ORIGINAL RESEARCH

# Exploring Educational Strategies: Evaluating Case-Based Learning versus Didactic Lectures in Antimicrobial Resistance for Phase 2 MBBS Students

<sup>1</sup>Dr. Loveleena Agarwal, <sup>2</sup>Dr. Aarushi Agarwal, <sup>3</sup>Dr. Mridulesh Kumar Yadav, <sup>4</sup>Dr. Rajesh Kumar Yadav

<sup>1</sup>Associate Professor & HOD, Department of Microbiology, Dr SLP ASMC Pratapgarh, India

<sup>2</sup>MBBS student, Phase 3, Apollo Institute of Medical Sciences and Research, Hyderabad, India

<sup>3</sup>Assistant Professor, Department of Community Medicine, Dr SLP ASMC Pratapgarh, India

<sup>4</sup>Professor & HOD, Department of Microbiology, Prasad Institute of Medical Sciences, Lucknow, India

### Corresponding author

Dr. Rajesh Kumar Yadav

Professor & HOD, Department of Microbiology, Prasad Institute of Medical Sciences, Lucknow, India

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### ABSTRACT

**Background:** While antibiotics transformed the field of medicine during the 20th century, their misuse has resulted in the rise of bacteria and other pathogens that are resistant to these drugs. This research tackles the urgent problem of antimicrobial resistance, which the World Health Organization has identified as a major global health concern. The study explores how effective case-based learning and traditional lectures are in educating phase 2 MBBS students about antimicrobial resistance. **Materials & Methods:** The research was carried out at the Department of Microbiology, Dr. Sone Lal Patel Autonomous State Medical College, Pratapgarh, Uttar Pradesh among phase 2 MBBS students. The research design incorporated a computer-based simple randomization process to impartially allocate students into group I and group II. Group I actively participated in case-based discussions on Antimicrobial Resistance whereas Group II adhered to a traditional didactic lecture format aligning with the Competency-Based Medical Education guidelines. Post-tests administered to both groups after lecture and case-based discussions immediately and another 6 weeks later. **Results:** The mean test score for first test scores for Case based learning (CBL) was 6.73 and for lecture was 6.65. The difference was non-significant ( $P > 0.05$ ). The mean second test score conducted 6 weeks later for CBL was 6.39 and for lecture was 6.86. The difference was non-significant ( $P > 0.05$ ). When analysing CBL method separately, the p-value is high (0.739), indicating no significant difference in mean scores between the first and second tests for CBL. For the Lecture method, the p-value is also high (0.64), suggesting no significant difference in mean scores between the first and second tests. **Conclusion:** A conclusion of no effect in statistical terms signifies that the observed impact is indistinguishable from a variation that could occur randomly. Essentially, it suggests that a program may be equally effective when compared to the program it was pitted against. Reflecting on the potential reasons for a lack of effect can offer valuable input for enhancing the program and generating hypotheses for future research endeavours

**Keywords:** Antibiotics, antimicrobial resistance, Case-based learning

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### INTRODUCTION

Antibiotics, once hailed as medical marvels, now face a growing threat: antimicrobial resistance (AMR). AMR allows microorganisms to survive drugs meant to eliminate them, leading to more severe and deadly infections. Recognized as a major global health threat, AMR demands urgent action to preserve the effectiveness of existing treatments. Education is crucial in this battle, with efforts focused on raising awareness and promoting responsible antimicrobial use. Case-based learning (CBL) emerges as an

effective educational strategy, surpassing traditional didactic lectures in fostering comprehension and retention.<sup>1-3</sup> By immersing students in real-life scenarios, CBL encourages active learning, problem-solving, and analytical skills development. Embracing educational innovations like CBL, alongside broader awareness campaigns, equips healthcare professionals and the public with the knowledge needed to combat AMR effectively. This proactive approach is essential in safeguarding the efficacy of antibiotics and ensuring a healthier future for all.<sup>4-6</sup> With the aim to

enhance the teaching of antimicrobial resistance for phase 2 MBBS students the present study was conducted to assess to compare outcome of case-based learning and didactic lecture in context of antimicrobial resistance for phase 2 MBBS students.

## MATERIALS & METHODS

The research was carried out at the Department of Microbiology, Dr. Sone Lal Patel Autonomous State Medical College (Dr SLP ASMC) Pratapgarh, Uttar Pradesh. The study spanned from September 2023 to December 2023, covering a period of four months.

The participants, phase 2 MBBS students enrolled at Dr SLP ASMC, Pratapgarh, Uttar Pradesh, were assigned to two groups through computer-based simple randomization. The research initiative commenced with meticulous adherence to ethical standards, securing formal approval from the institutional ethics committee. With due consideration for ethical principles, informed consent was obtained from the participants before proceeding. The research design incorporated a computer-based simple randomization process to impartially allocate students into Group I and Group II. Group I actively participated in case-based discussions on

Antimicrobial Resistance whereas Group II adhered to a traditional didactic lecture format aligning with the Competency-Based Medical Education (CBME) guidelines. Post these interactive learning sessions, both groups underwent a comprehensive evaluation through the administration of a first post-test. This test consisted of validated multiple-choice questions (MCQs) that had undergone reliability testing, ensuring the robustness of the assessment tool. Six weeks later, a second post-test, also comprising MCQs, was administered to both groups. Various faculty members from the department were engaged in instructing both cohorts, ensuring a diverse range of expertise and teaching styles. Subsequently, the evaluation process was overseen by a third faculty member, maintaining objectivity and impartiality in the assessment. This collaborative approach ensured a comprehensive and fair evaluation of their learning outcomes. This structured approach not only ensured the methodological integrity of the study but also allowed for a comprehensive and longitudinal evaluation of the educational interventions' effectiveness over time. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

A total of 99 students enrolled in phase 2 MBBS willingly took part in both instructional approaches studied, with 81 of them completing both assessments. In the CBL session, 38 students completed both tests, while in the lecture group, 43 students completed both tests.

**Table I Comparison of first test scores for CBL and the Lecture method**

Group	N	Mean	SD	t value	P value
CBL	38	6.73	1.2	0.75	0.45
Lecture	43	6.65	1.23		

Table I shows that the mean test score for CBL was 6.73 and for lecture was 6.65. The difference was non-significant ( $P > 0.05$ ).

**Table II Comparison of second test scores for CBL and the Lecture method**

	N	Mean	SD	t value	p value
CBL	38	6.39	1.83	0.25	0.8
Lecture	43	6.86	1.8		

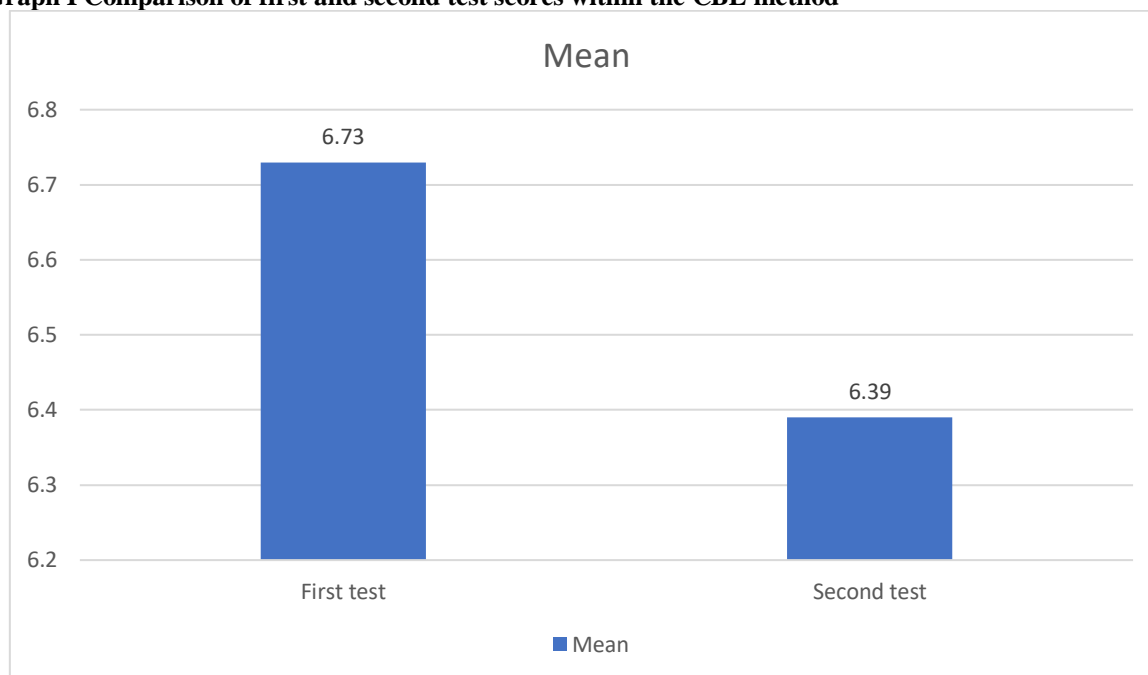
Table II shows that the mean test score for CBL was 6.39 and for lecture was 6.86. The difference was non-significant ( $P > 0.05$ ).

**Table III Comparison of first and second test scores within the CBL method**

Test	N	Mean	SD	t value	p value
First test	38	6.73	1.2	0.335	0.739
Second test	38	6.39	1.83		

When analysing CBL method separately, the p-value is high (0.739), indicating no significant difference in mean scores between the first and second tests for CBL.

**Graph I Comparison of first and second test scores within the CBL method**

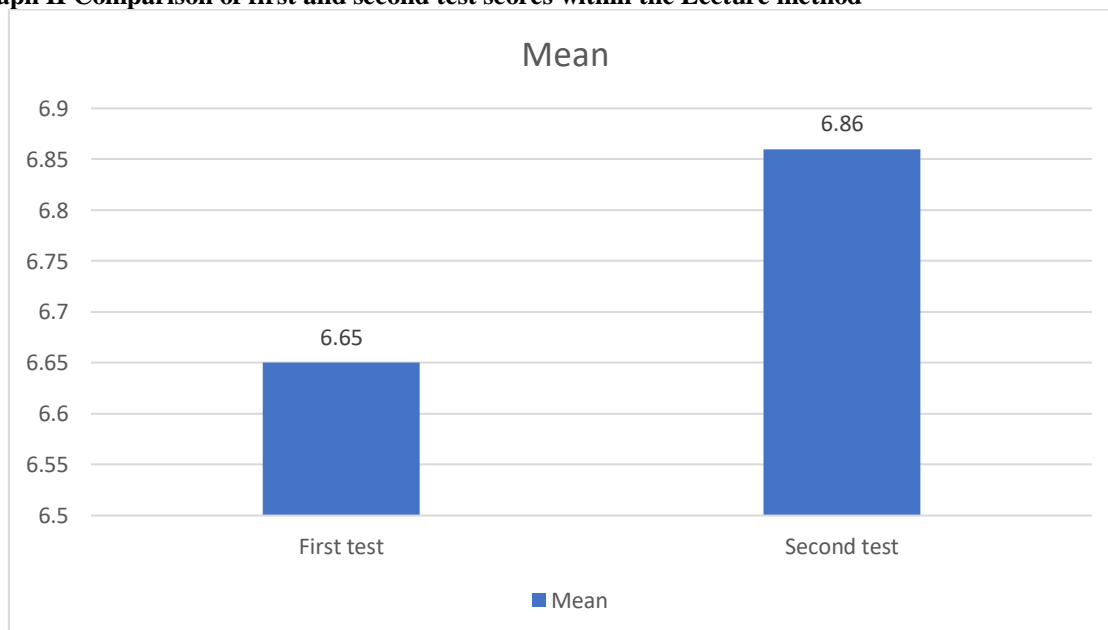


**Table IV Comparison of first and second test scores within the Lecture method**

Test	N	Mean	SD	t value	p value
First test	43	6.65	1.23	0.47	0.64
Second test	43	6.86	1.8		

Table IV shows that for the Lecture method, the p-value is also high (0.64), suggesting no significant difference in mean scores between the first and second tests.

**Graph II Comparison of first and second test scores within the Lecture method**



**DISCUSSION**

The conventional approach followed across medical colleges involves delivering information through 1-hour lecture sessions. While this method has proven effective for imparting knowledge in large group settings, it is not without its limitations. Sustaining student engagement throughout the entire lecture

duration poses a considerable challenge for educators. To address these challenges and enhance the teaching of clinical microbiology, it is imperative to explore innovative methods that foster problem-solving skills, encourage analytical thinking, and spark interest in learning.

In recent decades, there has been a concerted effort to improve traditional teaching methods in higher education institutions.<sup>8</sup> Various teaching-learning approaches have been introduced to enhance the overall learning experience for students, contributing to advancements in patient care. Active learning, which involves higher-order thinking, has gained recognition as an effective strategy. It is widely acknowledged that the retention of learned material is more successful when learning is centred on realistic problems. Case-Based Learning (CBL) emerges as an interactive, student-centred approach that explores real-life situations.<sup>9</sup> Recognizing the potential of CBL, the present study was conducted to evaluate its effectiveness and acceptability as a tool for promoting active learning in AMR among undergraduate students. The utility and effectiveness of this teaching methodology was assessed by analysing students' performance in both immediate and post- tests.

Several investigations have provided evidence supporting the efficacy of CBL as a teaching and learning method in accomplishing specific educational goals.<sup>10-11</sup> A research study conducted in India introduced CBL and documented comparable outcomes.<sup>12-13</sup> The findings of this study diverge from those of other research, and several factors could account for this discrepancy. The use of simple computer-based randomization might not have evenly distributed students, potentially leading to a concentration of high-achieving students in the lecture group. The sample size, being relatively small, raises questions about the reliability of the results. Additionally, the dropout rate could be a contributing factor impacting the overall study outcomes.

Moreover, students' interactions with their peers or seniors may have influenced the results, as curiosity might have prompted discussions seeking answers. In the digital age, the accessibility of information through platforms like Google or discussions with friends could also have played a role in shaping students' responses.

Both teaching methods might have been delivered with equal proficiency or the design of the curriculum and instructional materials for both CBL and didactic lectures may have been well-aligned, ensuring that key concepts were adequately covered in both settings. Despite the different instructional techniques, students might have remained equally engaged and motivated in both CBL and didactic lecture settings, leading to comparable levels of understanding and retention.

It's essential to consider the element of chance in the outcomes. In certain instances, unexpected results may stem from random fluctuations rather than any consistent or systematic effect. Examining these diverse factors provides a more nuanced understanding of the study's outcomes and highlights

the complexity of educational research in today's dynamic learning environment.

## CONCLUSION

A conclusion of no effect in statistical terms signifies that the observed impact is indistinguishable from a variation that could occur randomly. Essentially, it suggests that a program may be equally effective when compared to the program it was pitted against. Reflecting on the potential reasons for a lack of effect can offer valuable input for enhancing the program and generating hypotheses for future research endeavours.

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