



Evaluation of teaching–learning methods and mentoring in pharmacology among second-year MBBS students: A cross-sectional study.

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Abstract

Background:

Pharmacology is a pivotal discipline in medical education, bridging the gap between basic sciences and clinical practice. As the subject continues to evolve with rapid drug development and therapeutic innovations, teaching methodologies must also adapt to ensure effective student learning. Several educational reforms have been proposed and implemented in recent years, yet understanding students' perspectives remains crucial for identifying gaps and improving pedagogical strategies.

Objectives:

The present study aimed to assess undergraduate medical students' perceptions of pharmacology and to obtain structured feedback on the effectiveness of current teaching and learning methods.

Methods:

A cross-sectional study was carried out among 150 undergraduate medical students after obtaining approval from the Institutional Ethics Committee. A prevalidated questionnaire covering various aspects of pharmacology teaching was administered to the participants following informed consent. Responses were systematically collected, compiled, and analyzed.

Results:

Out of 150 students approached, 129 completed the survey (response rate: 86%). The majority were females (64.3%), with an age range of 18–22 years (mean $\pm$ SD: 19.8 ± 0.9 years). Most respondents hailed from urban backgrounds (58%) and were hostel residents (62%). Central nervous system pharmacology was perceived as the most interesting topic (35.7%), followed by cardiovascular and autonomic pharmacology. Regarding teaching preferences, students favored case-based learning (34%) and blackboard teaching (29%), while audiovisual aids and didactic lectures were rated least engaging. A substantial proportion (90.4%) endorsed structured mentoring, preferably by senior faculty members.

Conclusion:

This study underscores the value of regularly obtaining student feedback to refine and implement effective teaching-learning strategies in pharmacology.

Recommendations:

Incorporating case-based discussions, interactive activities, digital tools, periodic quizzes, and structured faculty mentoring can significantly enhance pharmacology education and improve long-term knowledge retention.

Keywords: Pharmacology, Teaching, Learning, Mentoring, Reforms

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Introduction

Pharmacology is the scientific discipline that encompasses the study of drugs in all their aspects, including discovery, mechanisms of action, therapeutic applications, and safety profiles. It is recognized both as a vital healthcare discipline and an academic specialty, and no medical school curriculum is complete without a department dedicated to pharmacology [1].

As both a basic and applied science, pharmacology is among the most dynamic and rapidly evolving branches of medicine. It not only advances biomedical research through the discovery and characterization of bioactive compounds but also provides insights into cellular and organismal functions in response to these agents. Importantly, the prescribing competence of newly graduated doctors relies heavily on their understanding of pharmacological principles. Thus, the primary objective of teaching pharmacology at the undergraduate level is to equip medical students with the knowledge and skills required to make rational and evidence-based therapeutic decisions in clinical practice [2].

In recent years, several reforms have been introduced to enhance the teaching and learning of pharmacology. Traditional didactic lectures are increasingly complemented or replaced by diverse approaches such as audio-visual-assisted lectures, small-group discussions, self-directed learning modules, computer-assisted instruction, and competency-based medical education frameworks. These changes aim to improve conceptual clarity, clinical relevance, and student engagement.

Understanding students' perceptions and attitudes toward these evolving teaching-learning methods is crucial for evaluating their effectiveness and guiding future curricular innovations. Feedback from learners not only highlights strengths and gaps in existing pedagogical practices but also provides direction for restructuring medical education to better meet the needs of future healthcare professionals. In this context, the present study was undertaken to explore the perceptions of second-year MBBS students regarding teaching-learning strategies and mentoring in pharmacology, to identify approaches that foster meaningful learning and skill development.

Materials and Methods

Study Design and Setting

This was a questionnaire-based, cross-sectional study conducted in the Department of Pharmacology, RVM

Institute of Medical Sciences and Research Centre, Laxmakkapally. The study included second-year MBBS students who had completed eight months of the pharmacology curriculum. Data collection was carried out from March 2019 to April 2019.

Study Population and Sampling

The study targeted all second-year MBBS students (N = 150). Questionnaires were distributed in three successive practical sessions: 50 students on the first day, 50 students on the next day, and the remaining 50 students on the third day. Out of 150 students approached, 129 completed the survey, resulting in a response rate of 86%.

Inclusion Criteria

Second-year MBBS students
Students who provided informed consent
Students willing to participate in the study

Exclusion Criteria

Students who were absent during the data collection period.
Those with incomplete or invalid responses on the questionnaire.
Students who had previously participated in the pilot validation of the tool.

Study Tool

A prevalidated questionnaire comprising 19 items was used to assess students' perceptions of teaching-learning methods and mentoring in pharmacology. Students were instructed to complete the questionnaire within 30 minutes under supervision.

Sample Size

A total of 150 students were included, representing the entire second-year MBBS batch enrolled during the study period. Since the study aimed to obtain comprehensive feedback from all eligible students, the whole population approach was adopted. Assuming a 95% confidence level, 5% margin of error, and an estimated response proportion (P) of 50% (for maximum variability), the minimum sample size was calculated as:

$$n = (Z^2 \times P \times (1 - P)) / d^2$$

$$n = (1.96^2 \times 0.5 \times 0.5) / 0.05^2 = 384$$

However, due to logistical feasibility and the total number of students in the batch (N = 150), the entire cohort was



surveyed, which provided sufficient representation and reduced selection bias.

Data Collection

Completed questionnaires were collected at the end of each session. Out of 150 distributed questionnaires, 129 were returned and analyzed.

Measures to Minimize Bias:

To reduce selection bias, all eligible second-year MBBS students were invited, ensuring complete batch coverage. Information bias was minimized by using a prevalidated, anonymous questionnaire to encourage honest responses. Observer bias was prevented as faculty members not involved in students' teaching sessions supervised data collection. Data entry and analysis were performed independently by two investigators to minimize analytical bias.

Data Analysis

Responses were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS), version 20. Descriptive statistics were applied, and results

were presented in percentages to highlight the distribution of responses.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of RVM Institute of Medical Sciences and Research Centre. Written informed consent was obtained from all participants before data collection. Confidentiality of responses was strictly maintained, and participation was entirely voluntary without any academic or personal consequences.

Results

Participant Flow

During the study period, a total of 150 second-year MBBS students were approached for participation. Of these, 138 students returned the questionnaire, but 9 responses were incomplete and excluded. Thus, 129 valid responses were included in the final analysis, yielding a response rate of 86%. All included participants completed the questionnaire in full, and no data were missing for core variables (Figure 1).

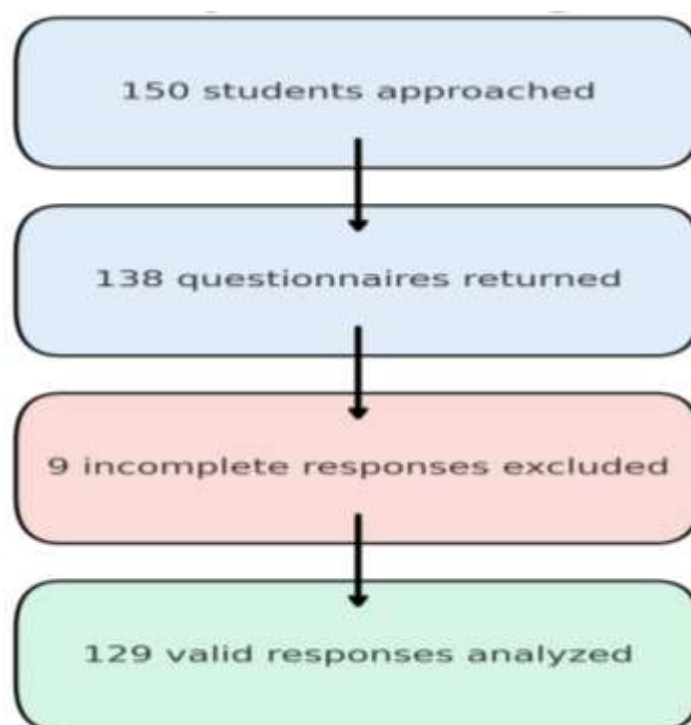


Figure 1. Participant Flow Diagram

A total of 129 students participated in the study after excluding incomplete responses. The mean age of respondents was 19.8 ± 0.9 years, ranging from 18 to 22 years. The majority were female students (64.3%), while male participants accounted for 35.7%. Most students

belonged to an urban background (58.1%), and the rest were from rural areas (41.9%). A considerable proportion (62%) were hostel residents, whereas 38% were day scholars. These baseline demographic characteristics are presented in Table 1.

Table 1. Sociodemographic Profile of Respondents (n = 129)

Variable	Category	n (%)
Gender	Male	46 (35.7)
	Female	83 (64.3)
Age (years)	Mean $\pm$ SD	19.8 ± 0.9
Residence	Urban	75 (58.1)
	Rural	54 (41.9)
Accommodation	Hostel	80 (62.0)
	Day Scholar	49 (38.0)

Out of 150 students, 129 students participated in the study and completed the questionnaire. Among 129 students, 112 (86.8%) heard about the subjects of Pharmacology on entering medical college, while 17 (13.17%) came to know

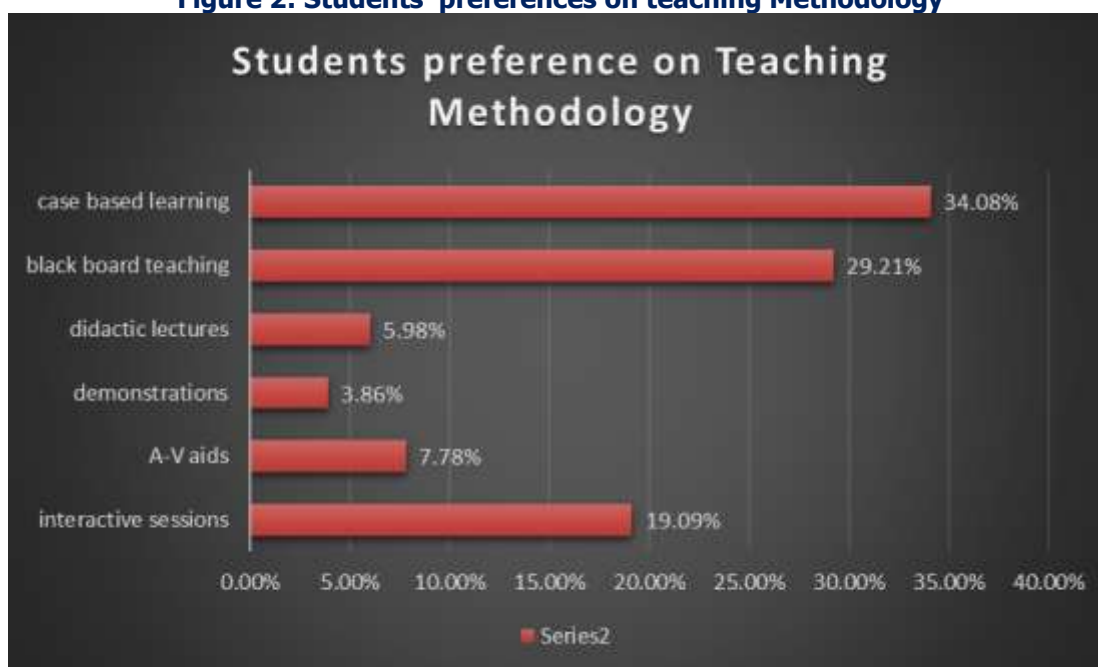
about the subject in the 2nd year. 35 students (27.13%) considered Pharmacology as important compared to other subjects, while 94 (72.86%) considered Pharmacology at par with others.

Among various topics in Pharmacology 46 students (35.65%) opined that central nervous system was most interesting and useful followed by cardiovascular system 31(24.03%), autonomic nervous system 14(10.8%), chemotherapy 13(10.1%), general pharmacology 6(4. %), autacoids 7(5.4%) and respiratory 5(3.8%) while 11(8.5%) students opinioned that all topics are equally interesting and useful.

The ideal teaching method helpful in learning pharmacology by students was based learning (34%), blackboard teaching

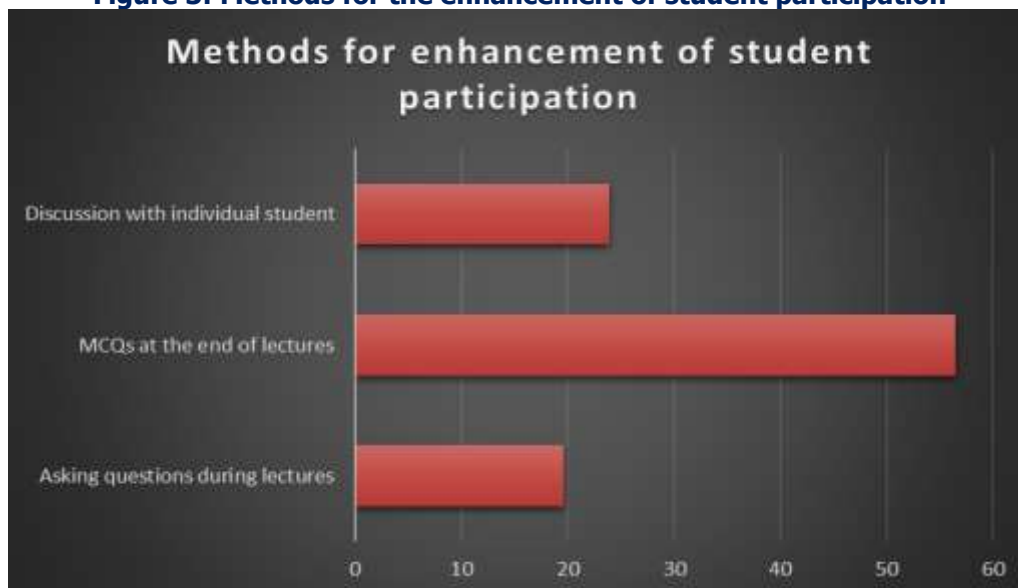
(29%), interactive sessions (19%), followed by audio-visual aids (7%), didactic lectures (5.98%), and demonstrations (3.86%) (**Figure 2**). 104 students (79.38%) opined that classes of Pharmacology were interesting, but a few boring, while 15 students (11.5%) opined that classes were boring but some interesting, 11 students (8.39%) rated Pharmacology teaching sessions as always interesting, and only 1 student (0.76%) rated it as always boring.

Figure 2: Students' preferences on teaching Methodology



Regarding how one could enhance active student participation in the class, we are asking MCQs at the end of the lectures (56.52%), discussing with the individual students (23.9%), and asking questions during lectures (19.56%) (**Figure 3**).

Figure 3: Methods for the enhancement of student participation



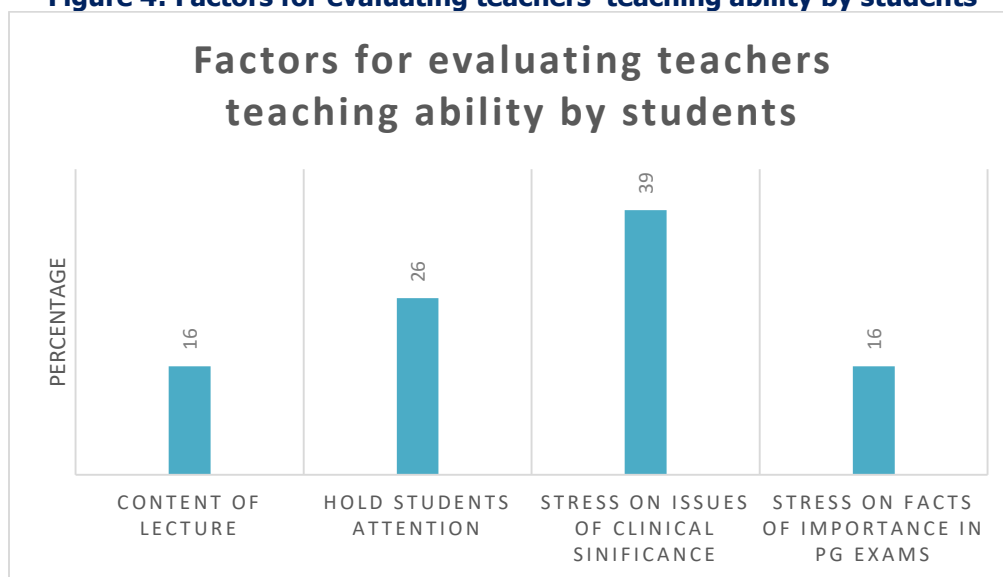
Regarding practicals in Pharmacology, 34.78% of students considered clinical problems as interesting, while 31.88% and 23.91% of students considered prescription writing and prescription audit as interesting, respectively, followed by 9.42% who opted that computer-aided learning was interesting.

Up to 61.9% of the students responded that their pattern of studying Pharmacology is regular during weekly tests, while 25.37% read during internal assessment exams, 8.95% of students read during tutorials, and 3.73% during viva. For

preparing and learning Pharmacology during exams, 76.97% of the students prefer standard textbooks, 20.86% prefer notes, while 2.15% prefer a book or guides. 63.23% of students learn by understanding and memorizing, 28.67% by understanding the subject, 7.35% learn only by memorizing, and 0.73% of students opted that they cannot learn Pharmacology.

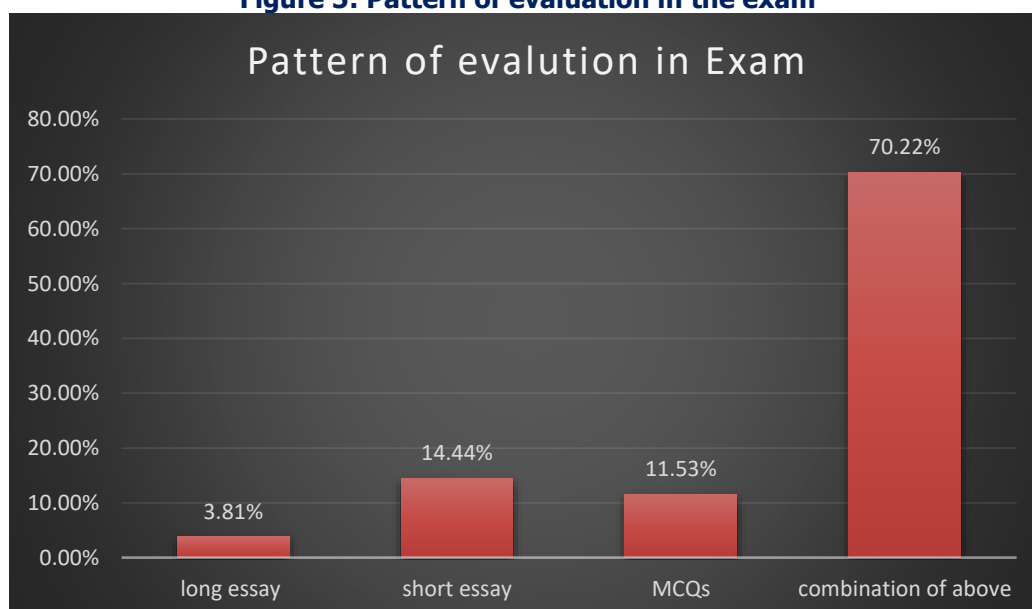
Students preferred teachers who stress issues of clinical significance (39%) and those who hold students' attention (Figure 4).

Figure 4: Factors for evaluating teachers' teaching ability by students



Regarding the pattern of evaluation in examination, 70.22% of students opined that a combination of long essay and short essay is better than short essay (14.5%) or long essay (3.81%), or MCQs (11.53%) given alone (**Figure 5**).

Figure 5: Pattern of evaluation in the exam

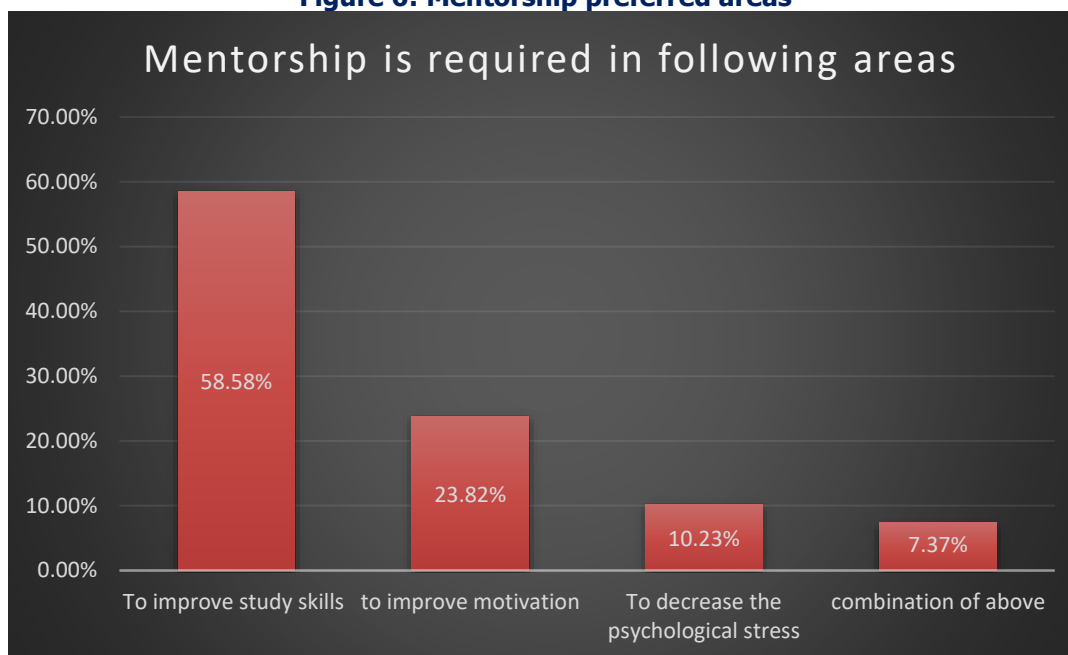




90.4% of students gave their opinion that mentoring in the subject of pharmacology will be useful, while 9.6% said that it is not. Mentoring by senior faculty was preferred by 60% students, followed by 30% by junior faculty and 10% by senior students. 68.5% of students preferred one-to-one

mentoring, while 31.5 % preferred group mentoring. 58.58% of students want mentoring in improving their study skills, followed by 23.82% of students to improve motivation, 10.23% to decrease psychological stress, and 7.37% want easy ways to remember drugs (Figure 6).

Figure 6: Mentorship preferred areas



Discussion

Pharmacology is a cornerstone of the medical curriculum, as the prescribing skills of newly graduated doctors depend largely on their understanding of the subject. The primary goal of pharmacology teaching is to equip undergraduate medical students with the ability to make rational and evidence-based therapeutic decisions in clinical practice [3]. Understanding students' perceptions and attitudes toward teaching-learning methods is therefore essential for improving curricular design and restructuring medical education.

In the present study, 129 second-year MBBS students participated. A majority (86.8%) reported having prior knowledge of pharmacology before entering the second year. Previous research indicates that early familiarity with the subject positively influences conceptual learning [4]. Most

students graded pharmacology as an important subject, which is consistent with earlier reports emphasizing its relevance in medical training [5].

Central nervous system, cardiovascular system, autonomic pharmacology, and chemotherapy were identified as the most interesting areas. This differs from earlier studies where general pharmacology was more frequently favored [6]. It is, however, crucial to emphasize that all domains of pharmacology are interlinked and complementary, each contributing to a comprehensive understanding of the subject [7].

Case-based learning, blackboard teaching, group discussions, and interactive sessions were preferred over audiovisual aids, didactic lectures, and demonstrations. Students also suggested that incorporating multiple-choice question (MCQ) discussions at the end of lectures would



improve exam preparedness, particularly for postgraduate entrance examinations, a finding that aligns with previous literature [5]. Furthermore, many students stated they would engage in regular study during weekly tests and internal assessments, underscoring the importance of continuous learning in medical education. Standard textbooks were the most commonly used study resource, followed by notes, whereas earlier studies reported a preference for a combination of textbooks and lecture notes [8].

Students primarily relied on understanding and memorizing for learning pharmacology, while others focused exclusively on comprehension or rote memorization. Clinical problem-solving, prescription writing, and prescription audits were rated as more interesting and useful than computer-assisted learning for experimental pharmacology, a pattern supported by earlier findings [9].

Regarding reforms, 18.2% of students recommended reducing class duration, adding quizzes, incorporating animated videos, and using mnemonics to enhance retention. In evaluating teaching effectiveness, students placed the greatest importance on clinical relevance, followed by the ability to maintain attention, the clarity of lecture content, and emphasis on examination-oriented points. Earlier studies have also highlighted that students value clinical contextualization of pharmacology teaching [10].

Mentoring was perceived as highly beneficial. One-to-one mentoring by senior faculty was preferred, as it was considered more effective in enhancing study skills, improving motivation, and reducing psychological stress. Students highlighted that experienced mentors could provide better academic guidance as well as personal support in managing challenges during medical training.

Generalizability

This study provides valuable insights into the Teaching and learning methods within the Siddipet district. The findings may have limited generalizability as the sample involved only students from one medical college. The study was conducted at a medical college with a tertiary care teaching hospital. Larger, multi-center studies across diverse geographical areas are recommended to confirm and broaden the applicability of these findings.

Conclusion

This study highlights the importance of obtaining regular feedback from students to design and implement effective methodologies for teaching, learning, and mentoring in

pharmacology. Continuous feedback serves as a valuable tool to identify gaps in current pedagogical practices and to adapt strategies that align with learners' needs. Mentoring emerged as a crucial component, offering not only academic guidance but also professional socialization and personal support, thereby fostering student confidence and success in medical training. By systematically analyzing student feedback, priority areas can be identified, enabling the formulation of innovative and practical educational approaches that enhance engagement, clinical relevance, and long-term knowledge retention.

Limitations

This study has several limitations. Primarily, this is a cross-sectional study, which cannot track changes in teaching, learning, or mentoring over time. Participants may misunderstand questions or provide unclear responses, leading to misinterpretations. Questionnaires are often limited in their ability to provide in-depth qualitative insights into the experiences of participants.

Recommendations

To strengthen pharmacology education, a multi-faceted approach is essential. Active learning strategies such as case-based discussions, problem-solving sessions, and interactive assessments should be prioritized to promote critical thinking and application of concepts. Mentoring programs led by experienced faculty can provide individualized guidance, enhance study skills, and reduce academic stress, thereby fostering professional growth. The integration of technology through digital platforms, quizzes, animations, and simulation-based modules can make learning more engaging and effective. Regular student feedback should be systematically incorporated to refine methodologies, ensuring a learner-centered curriculum that improves both knowledge retention and long-term clinical competence.

Acknowledgement

I would like to appreciate the institution for allowing the conduct of the study among 2nd year MBBS students of RVMIMS, Siddipet.

List of Abbreviations:

CNS – Central nervous system
ANS – Autonomic nervous system
CVS – Cardiovascular system



SPSS - statistical package for social sciences
MCQ – Multiple choice questions
PG – Post Graduate
MBBS – Bachelor of Medicine and Bachelor of Surgery

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

MRP-Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. **RB**-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript, revision of the manuscript. **PLM**-Review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation.

Data availability

Data is Available upon request

Author Biography

Dr. Mary Rohini Pentareddy is currently serving as an Associate Professor in the Department of Pharmacology, Government Medical College, Yadadri Bhuvanagiri. She worked as an Assistant Professor at RVMIMS&RC for a period of 3 years. She also served as an Assistant Professor at Gandhi Medical College for 5 years, after which she was promoted to Associate Professor at Yadadri Bhuvanagiri. She has successfully guided her Undergraduate students in ICMR STS projects and postgraduate students in their Thesis work. She has teaching experience of 10 years, and has authored 12 Publications in Reputed journals focusing on Pharmacology. She did oral and poster presentations at various conferences. **ORCID ID:** <https://orcid.org/0000-0001-8593-1637>

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