International Journal of Community Medicine and Public Health
Turankar A et al. Int J Community Med Public Health. 2026 Jan;13(1):296-300
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20254440

Original Research Article

Utilizing SWOC analysis as a thinking tool for enhancing understanding of pharmacology in second year MBBS students as part of preparation for the NEXT examination

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Received: 27 October 2025
Accepted: 12 December 2025

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ABSTRACT

Background: This study assessed how well second-year MBBS students studying for the national exit test (NEXT) understood pharmacology using SWOC (strengths, weaknesses, opportunities, challenges) analysis.
Methods: 239 students from Government Medical College in Nagpur participated in a cross-sectional, parallel-group study. While the CD batch (n=121) did not receive SWOC instruction, the AB batch (n=117) did. A case-based MCQ test in the NEXT format was finished by both groups. Kendall Tau correlation and independent t-tests were used to assess the scores.
Results: The CD Batch outscored the AB Batch by a large margin ($p<0.001$). There was little correlation ($\tau=0.212$, $p=0.014$) between MCQ performance and SWOC chart scores.
Conclusions: SWOC analysis may help with critical thinking in difficult situations, however it did not enhance MCQ performa.

Keywords: Competency-based medical education, National exit test, Pharmacology education, SWOC analysis

INTRODUCTION

Pharmacology is a critical discipline in medical education, serving as a bridge between the foundational sciences and clinical practice. It equips medical students with the knowledge and skills necessary for safe and effective use of medications, which is essential for patient care. However, traditional pedagogical approaches often fail to adequately engage students or foster the analytical and problem-solving skills required in the clinical setting. This challenge is particularly relevant in the context of India's national exit test (NEXT), which emphasizes competency-based learning and case-based scenarios and demands a higher level of integration between theoretical knowledge and clinical application.

To address these challenges, innovative teaching methodologies such as SWOC analysis (strengths, weaknesses, opportunities, challenges) are being explored. Originally, SWOC analysis, a strategic planning tool in business, was adapted for educational purposes to enhance critical thinking and problem-solving skills. It has shown promise for curriculum evaluation, student self-assessment, and case-based learning in medical education. For instance, it has been used to improve curriculum design by identifying gaps and opportunities for enhancement, as well as to help students systematically analyze complex topics and develop clinical reasoning skills.[1-3]

The focus of the NEXT examination on case-based learning further underscores the need for tools that

promote analytical thinking, such as SWOC analysis. By applying SWOC analysis to pharmacology topics, students can better organize their knowledge, identify key concepts, and approach clinical problems systematically. This aligns with global trends in competency-based medical education, which emphasizes active learning strategies, such as case- and problem-based learning, to prepare students for real-world clinical challenges.[4-6]

This study aimed to evaluate the effectiveness of SWOC analysis as a thinking tool to enhance second-year MBBS students' understanding of pharmacology topics in preparation for the national exit test (NEXT). By integrating this innovative approach into the pharmacology curriculum, this study seeks to contribute to the evolving landscape of medical education in India, while fostering deeper engagement and critical thinking among students.

METHODS

Study design

This was a cross-sectional, parallel-group, interventional study conducted to assess the effectiveness of SWOC analysis as a thinking tool for enhancing second-year MBBS students' understanding of pharmacology topics.

Study setting and duration

The study was carried out in the department of pharmacology at tertiary care teaching hospital in central India, over four months, from October 2024 to January 2025 after taking approval from the institutional ethics committee with IEC approval number EC/Pharmac/GMC/NGP/3563 dated 13th September 2024.

Eligibility criteria

The study included second-year MBBS students enrolled at a tertiary care teaching hospital in central India who provided electronic consent for participation. Students who were absent on the day of the assessment or unable to complete the online questionnaire within the given timeframe were excluded from the study.

Sample size and group allocation

The total cohort consisted of 250 second-year MBBS students, who were divided into two groups based on their existing batch allocations. The AB batch, comprising 125 students, served as the intervention group and received training on SWOC analysis, while the CD Batch, also comprising 125 students, served as the control group and did not receive any such training. Out of the total cohort, 239 students participated in the final assessment, with 117 students from the AB batch and 121 students from the CD batch completing the process.

Study procedure

The intervention group, comprising students from the AB batch, attended two dedicated sessions in October and November 2024 that introduced them to the principles of SWOC analysis and its application as a thinking tool. These sessions included practical exercises to help students apply SWOC analysis to pharmacology topics covered during lectures. To ensure a uniform baseline understanding, all participants, including both AB and CD batches, attended standardized lectures on pharmacology topics related to diabetes and hypertension.

In January 2025, all participants were presented with a complex clinical case scenario based on diabetes and hypertension, which they were given 15 minutes to review. In addition to this, students in the AB Batch were required to complete a SWOC analysis chart for the case within an additional 10 minutes. Following this, both groups completed a Google form-based questionnaire comprising ten NEXT-style questions derived from the case scenario. The questionnaire was time-bound, automatically closing submissions after 10 minutes. Each correct answer carried one mark, with no negative marking, and the maximum possible score was 10.

All three components- the baseline teaching session, the case scenario assessment, and the online questionnaire assessment- were conducted simultaneously at different venues.

Outcome measures

The primary outcome of the study was the comparison of mean scores between the intervention group (AB batch) and the control group (CD batch) on the post-intervention assessment, aimed at evaluating the students' comprehension and application of pharmacology concepts. Secondary outcomes included the analysis of student feedback regarding the utility and applicability of SWOC analysis as a learning tool, as well as examining the correlation between SWOC scores and overall performance within the intervention group.

Data collection and blinding

The completed SWOC charts from the AB batch were evaluated by the principal investigator using a standardized scoring rubric on a scale of 1 to 10. To ensure unbiased assessment, the evaluator was blinded to the identities of the students. Assessment scores from both the intervention and control groups were then collected for statistical comparison.

Statistical analysis

Descriptive statistics were used to summarize the data obtained from both the intervention and control groups. To determine statistical significance in the mean scores between the two groups, an independent sample t-test was

employed. Additionally, correlation analysis using the Kendall Tau method was performed to evaluate the relationship between SWOC chart scores and questionnaire performance within the intervention group.

Ethical considerations

The study was conducted in adherence to the ethical principles outlined in the Declaration of Helsinki and good clinical practice (GCP) standards. Prior to the commencement of the study, approval was obtained from the institutional ethics committee. All participants provided electronic informed consent, and confidentiality was maintained throughout the research process. This methodological framework ensured a systematic and ethically sound evaluation of SWOC analysis as an educational intervention, upholding both scientific rigor and ethical integrity.

RESULTS

This study evaluated the effectiveness of SWOC analysis as a thinking tool to enhance the understanding of pharmacology topics among second-year MBBS students. A total of 239 students participated in the study, with 117 students in the AB batch (trained in SWOC analysis) and 121 students in the CD batch (untrained). The scores of both the batches are mentioned in the Figure 1.

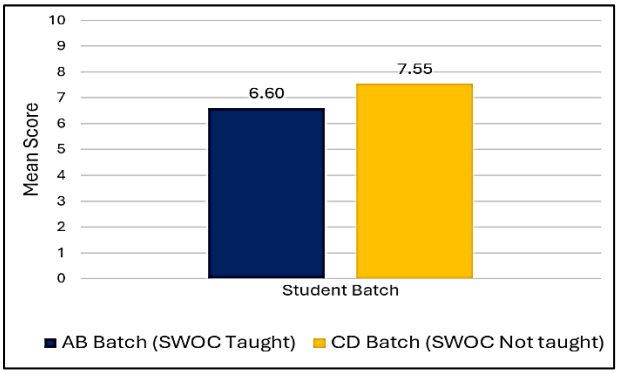

Figure 1: Comparison of scores between groups.
*p-value <0.001, Independent sample t-test.

The mean score of the AB batch, which was trained in SWOC analysis, was significantly lower than that of the CD batch, which did not receive SWOC training (p value <0.001). The median score for the AB batch was 7, while that for the CD batch was 8. Although this difference was statistically significant, it lacked practical significance, indicating that SWOC analysis training did not translate into improved performance on case scenario-based MCQs.

The description of the SWOC score for the AB batch is mentioned in the Figure 2.

The mean score for the SWOC charts completed by the AB batch was 7.55 out of 10. Over 60% of students in this group scored more than 8 on their SWOC charts, demonstrating their ability to effectively apply the framework to analyze complex topics. The correlation between the total score and SWOC score of the AB Batch is shown in Figure 3.

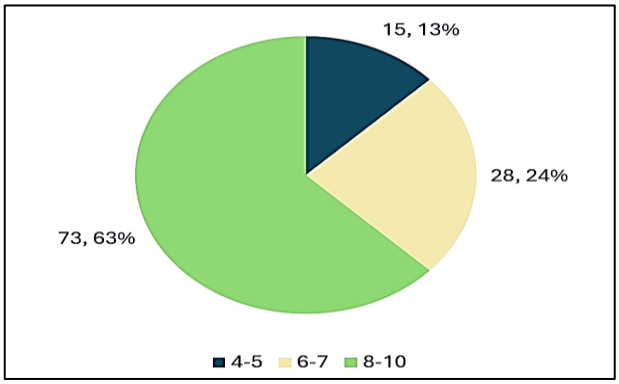

Figure 2: SWOC analysis scores in the AB batch.

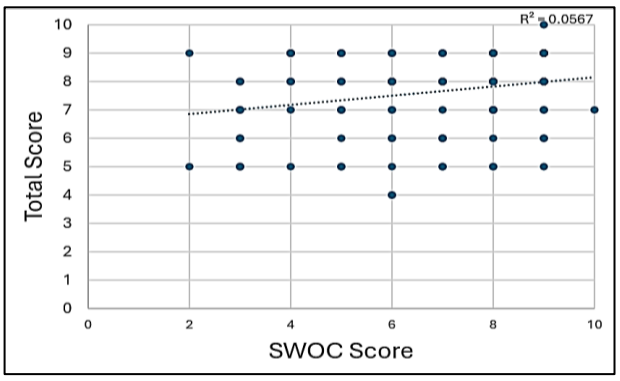

Figure 3: Correlation between SWOC scores and total scores.

A Kendall Tau correlation analysis between the SWOC scores and total assessment scores in the AB batch revealed a correlation constant of 0.212 (p value =0.014). While this correlation was statistically significant, it was weak and not meaningful, suggesting that higher proficiency in completing SWOC charts did not correspond to better performance on the case scenario-based MCQs.

DISCUSSION

This study evaluated the effectiveness of SWOC analysis as a thinking tool for enhancing the understanding of pharmacology topics, specifically chemotherapy, among second-year MBBS students. Despite its theoretical promise as a learning strategy, the results did not demonstrate a significant benefit of SWOC analysis in improving performance on case scenario-based MCQ questions. These findings raise critical considerations about the applicability of SWOC analysis in medical education, particularly in the context of competency-based assessments like NEXT.

The primary outcome revealed that students trained in SWOC analysis (AB batch) scored significantly lower on the post-intervention assessment compared to those in the control group (CD batch), with a statistically significant difference in mean scores. This result suggests that while SWOC analysis may foster systematic thinking and self-reflection, it does not directly improve performance on time-constrained case-based MCQs. Similar observations have been reported in prior studies, which noted that SWOC analysis, although effective for self-assessment and curriculum evaluation, may not align well with high-stakes examination formats that prioritize rapid recall and decision-making over structured analytical approaches.[1,3] Additionally, simulation-based assessments have been suggested as an alternative for competency-based evaluations, as they better align with real-world clinical scenarios and allow for comprehensive skill assessment.[7] Interestingly, feedback from students in the intervention group highlighted the perceived utility of SWOC analysis as a learning tool. Over 60% of students achieved a score of 8 or higher on their SWOC charts, indicating their ability to effectively apply the framework to analyse complex topics. This aligns with earlier findings suggesting that SWOC analysis enhances critical thinking and organizational skills, which are vital for long-term learning and clinical reasoning.[2,4] Similarly, Silva et al reported that pharmacy students found SWOC analysis useful for identifying knowledge gaps and organizing their learning during e-learning sessions, further supporting its role as a tool for fostering self-directed learning and critical thinking.[8] The American Association of Colleges of Pharmacy (AACP) has also emphasized the importance of innovative approaches like SWOC analysis to prepare students for evolving educational demands and career pathways in healthcare.[14]

However, the weak correlation between SWOC chart scores and overall assessment performance underscores its limited direct impact on case-based, time constrained MCQ outcomes. Several factors may explain these findings. First, the structured nature of SWOC analysis may not be conducive to the rapid analytical processing required for MCQs. Second, the relatively short duration of training sessions may have been insufficient for students to fully internalize and apply the framework effectively. Thirdly, a limited time constrain to solve the MCQ question might have added extra pressure leading to poor response. Lastly, it is possible that the assessment format favoured recall-based knowledge rather than strategic problem-solving skills fostered by SWOC analysis.[5]

A previous study by Turankar et al emphasized that while SWOC analysis improves awareness and analytical skills, its application requires sustained practice and integration into curricula to achieve meaningful outcomes.[9] Despite these limitations, it is important to recognize the broader educational value of SWOC analysis. Its structured approach encourages students to systematically evaluate complex topics, identify key priorities, and develop a deeper understanding of subject matter.

These skills are particularly relevant in clinical practice, where decision-making often involves balancing multiple factors and considering long-term implications.[6] Furthermore, as competency-based medical education continues to evolve globally, integrating tools like SWOC analysis into longitudinal curricula or combining them with other active learning strategies such as problem-based learning (PBL) or team-based learning (TBL) could enhance their effectiveness.[4] For example, CBME frameworks have emphasized learner-centred approaches like PBL to promote critical thinking and adaptability in medical education.[10] Additionally, studies have shown that incorporating reflective tools like SWOC into medical education can help bridge gaps between theoretical knowledge and practical application by fostering metacognitive awareness among students.[11] This is particularly relevant given the increasing complexity of pharmacology education and its reliance on active learning strategies to improve retention and application of knowledge.[12] Such approaches can be further augmented by leveraging technology-enhanced learning environments to support innovative teaching methods.[13]

In conclusion, while this study did not find evidence supporting the use of SWOC analysis for improving performance on case scenario-based MCQs, its potential as a broader educational tool cannot be dismissed. By fostering critical thinking and systematic problem-solving skills, SWOC analysis can play a valuable role in preparing medical students for both academic success and real-world clinical challenges. Future research should explore modifications to its implementation and assessment formats that better capture its benefits within medical education frameworks.

CONCLUSION

SWOC analysis may not directly improve performance on time-constrained scenario based MCQ assessments, it remains a valuable educational tool for fostering critical thinking and systematic problem-solving. Its role in preparing medical students for real-world clinical challenges highlights its importance in competency-based medical education frameworks.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee GMC Nagpur, number EC/Pharmac/GMC/NGP/3563, dated 13/09/2024

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Cite this article as: Turankar A, Pathak S, Pandit S, Gaikwad R, Kalikar M, Shamkuwar C, et al. Utilizing SWOC analysis as a thinking tool for enhancing understanding of pharmacology in second year MBBS students as part of preparation for the NEXT examination. Int J Community Med Public Health 2026;13:296-300.