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Original Research Article

Evaluation of effectiveness of practical assessment by objective structured practical examination and its comparison with traditional pharmacology practical examination among II MBBS students: a cross-sectional study

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ABSTRACT

Background: The undergraduate medical curriculum in India has adopted a competency-based medical education (CBME) model emphasizing cognitive, affective, and psychomotor domains to produce competent Indian medical graduates. Traditional pharmacology practical assessments, based on written exercises and viva voce, often lack objectivity and clinical relevance. The objective structured practical examination (OSPE) offers a structured, reliable, and competency-based alternative aligning with CBME principles.
Methods: This prospective cross-sectional educational study was conducted from March - July 2025 among 150 II MBBS students at Government Medical College in India. Students were randomly divided into two groups (n=75 each) and assessed through OSPE and traditional practical examination (TPE), respectively. OSPE included 11 structured stations evaluating cognitive, psychomotor, and affective domains using validated checklists, while TPE followed conventional methods. Quantitative data were analyzed using the unpaired Student's t-test, and student perceptions were collected through a structured feedback questionnaire.
Results: Students assessed by OSPE scored significantly higher (mean±SD = 40.45±4.74) than those assessed through TPE (36.80±5.63; $p<0.001$). Over 90% of students found OSPE well-structured, fair, and relevant; 67.1% perceived it as less stressful, though 21.1% reported anxiety and 32.9% desired more faculty support. Reliability of feedback tools was high (Cronbach's $\alpha=0.96$ and 0.80).
Conclusions: OSPE is a valid, objective, and student-preferred assessment tool that enhances the evaluation of pharmacological competencies. Its wider implementation, supported by faculty training and student orientation, can significantly strengthen CBME-based pharmacology education.

Keywords: CBME, OSPE, Student perception, Traditional practical examination

INTRODUCTION

The undergraduate medical curriculum in India aims to produce Indian medical graduates (IMGs) with the knowledge, skills, values and responsiveness needed to serve as physician of first-contact. It focuses on teaching, learning, assessment and evaluation. India has adopted the competency-based medical education (CBME) model as per the National Medical Commission (NMC), in line with global trends. CBME emphasizes all three learning domains- cognitive, affective and psychomotor.[1-8]

Assessment is a vital part of learning. It evaluates whether students have met learning objectives, theory papers,

practical and viva voce are commonly used tools. However, for assessment to be effective, it must be structured, valid, reliable and feasible.[2]

In pharmacology, practical exams traditionally involve written exercises and viva voce by multiple examiners. These methods are often subjective, lack standardization and do not test clinical or communication skills.[3] Skills are not directly observed.

To address these gaps, newer tools like the objective structured practical examination (OSPE) have emerged. OSPE is objective, structured, valid and student-friendly.[4] It assesses a wide range of skills, promotes fairness and gives feedback to students.[9,10]

The objective structured clinical examination (OSCE) was first introduced by Harden in 1975.[5] OSPE is its adaptation for pre and para-clinical subjects. It uses stations with checklists and allows feedback and self-evaluation.[6]

OSPE is not yet widely used due to technical challenges. But the CBME rollout by NMC in 2019 supports its use in pharmacology.[7,8] OSPE helps assess real-world tasks like ADR reporting, prescription analysis, counselling and problem-solving aligned with "shows how" level of Miller's pyramid.

Many colleges including ours still use traditional methods that emphasize knowledge recall. This study was done.

Aim

This study aimed to introduce the OSPE as a novel method for assessing pharmacology practical competencies among II MBBS students (2023 batch) and to compare its effectiveness against the traditional practical examination (TPE).

Objectives

To evaluate the effectiveness and acceptability of OSPE as an assessment tool through student feedback. To compare student performance scores between OSPE and TPE formats.

METHODS

A prospective, cross-sectional educational intervention was conducted to compare the objective structured practical examination (OSPE) and the traditional practical examination (TPE) methods in pharmacology practical assessments. The study was carried out in the department of pharmacology, Government Medical College (GMC), India, in the CAL Practical Hall over six months, from March to July 2025. A total of 150 second-year (phase II) MBBS students from the 2023 batch, who were appearing for their preliminary pharmacology practical examination, participated in the study. A convenient sampling method was used. Students who attended OSPE training and provided informed consent were included, while those who skipped training or declined participation were excluded.

Prior to the study, faculty members were sensitized to the OSPE design and logistics, and students were oriented to both OSPE and TPE formats to reduce anxiety. Ethical clearance was obtained from the institutional ethics committee (IEC) and the Scientific and Technical Advisory Committee (STAC). The assessment design included thirteen stations, comprising eleven active and two rest stations, developed to cover pharmacology competencies across cognitive, psychomotor, and affective domains, targeting the "show how" level of Miller's Pyramid. Different sets of questions of comparable difficulty were used over five consecutive days, and station allocation was randomized using chit-picking, ensuring appropriate spacing between stations.

Students were randomly divided into two groups: group A (76 students) was assessed using OSPE, while group B (74 students) underwent TPE. Group A students were assessed in batches of ten through eleven stations, each carrying five marks and lasting five minutes, with a total of 60 marks. One zero station and one rest station were incorporated. The stations included procedural (skills), response (short answer), problem-based learning (application), and counselling or communication tasks related to device use. Assistant professors and senior residents acted as observers and provided oral feedback, and standardized checklists were used to maintain objectivity.

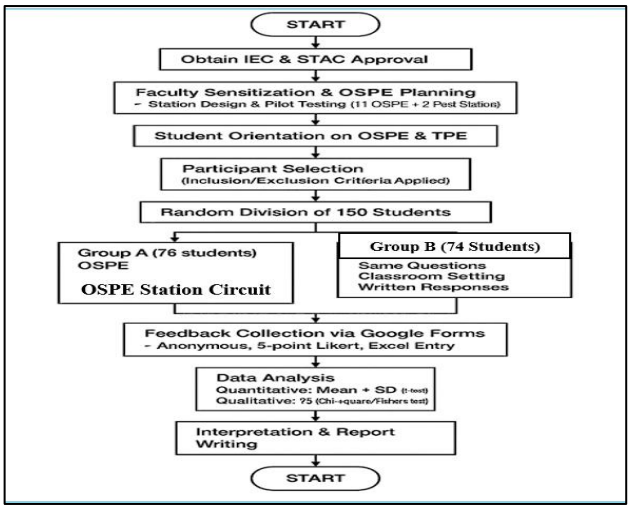

Figure 1: Flowchart showing methodology.

Group B students appeared for TPE in batches of thirty-eight. OSPE questions were presented via PowerPoint, and responses were written and evaluated by faculty on the same day. Student perceptions were collected through a validated Google Form containing ten closed-ended and five open-ended questions rated on a five-point Likert scale. Anonymity was maintained throughout, and the data were compiled in Microsoft Excel spreadsheets.

Scores were expressed as mean ± standard deviation (SD), and comparisons between OSPE and TPE scores were made using the unpaired Student's t-test, with $p<0.05$ considered statistically significant. Student feedback was analyzed using descriptive statistics with SPSS software version 21, and the reliability of the feedback questionnaire was assessed using Cronbach's alpha.

RESULTS

The mean score of students assessed through the OSPE method (40.45±4.74) was significantly higher than that of students assessed through the traditional practical examination (36.80±5.63). The difference was statistically highly significant, with a p-value of less than 0.001, indicating that the observed improvement in scores with OSPE is unlikely to be due to chance.

Table 1: Comparison of mean scores of TPE versus OSPE.

Test	Mean±SD	P value
TPE	36.80±5.63	P<0.001
OSPE	40.45±4.74	

Table 2: Analysis of student feedback on OSPE (objective structured practical examination) on close ended questions (n= 76) on Likert 5-point scale.

Statement question	Agree to strongly agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
1. OSPE well designed and planned	73 (96.1)	3 (3.9)	0	0
2. Properly informed on OSPE	65 (85.5)	11 (14.5)	0	0
3. Instructions were clear	69 (90.8)	7 (7.9)	1 (1.3)	0
4. Questions appropriately difficult	57 (75)	19 (25)	0	0
5. Marking was fair	69 (90.8)	6 (7.9)	1 (1.3)	0
6. Better than traditional method	59 (77.6)	16 (21.1)	1 (1.3)	0
7. Time at stations was enough	55 (72.4)	13 (17.1)	8 (10.5)	0
8. Covered many taught topics	69 (90.8)	7 (9.2)	0	0
9. Applied clinical skill learning	71 (93.4)	5 (6.6)	0	0
10. Examiner was fair	70 (92.1)	3 (3.9)	2 (2.6)	1 (1.3)
11. Less stressful than traditional	51 (67.1)	19 (25)	6 (7.9)	0
12. Observer made me uncomfortable	28 (36.8)	25 (32.9)	13 (17.1)	10 (13.2)
13. Satisfied with OSPE	51 (67.1)	19 (25)	6 (7.9)	0
14. OSPE should be used	63 (82.9)	13 (0.1)	0	0

Table 3: Analysis of student feedback on OSPE (objective structured practical examination) on open ended questions (n=76).

Question	Positive response count (%)	Negative/neutral count (%)
Q1. Applied pharmacology skill to clinical practice	75 (98.7)	1 (1.3)
Q2. Felt unsure or anxious at any station	16 (21.1)	60 (78.9)
Q3. Needed faculty support	25 (32.9)	51 (67.1)
Q4. Suggestions for improvement	29 (38.2)	47 (61.8)
Q5. Any other comments/suggestions	5 (6.6)	71 (93.4)

The feedback from students revealed a generally positive perception of the OSPE format. A very high proportion (90% and above) agreed that the OSPE was well designed, fairly marked, had clear instructions and covered relevant topics (Q1, Q3, Q5, Q8, Q9), reflecting strong approval of its structure and content. Additionally, 85.5% of students felt they had been properly informed and trained about the OSPE in advance (Q2), indicating that the preparatory efforts were largely effective.

Most students (between 75% and 78%) felt that the difficulty level of the OSPE was appropriate and that it was a better assessment method compared to traditional assessments (Q4, Q6). However, time management appeared to be a more divided issue while 72.4% of students agreed that the time allotted at each station was sufficient, 10.5% disagreed (Q7), suggesting that timing could be reviewed for potential adjustment.

Regarding the stressfulness of the assessment, 67.1% of students felt that the OSPE was less stressful than traditional exams, but around 8% expressed disagreement (Q11), highlighting that anxiety was still a factor for some. When asked about the presence of an observer, only 36.8% felt uncomfortable, whereas 30.3% disagreed or strongly disagreed with this statement (Q12), showing mixed

feelings on the impact of being observed during the assessment.

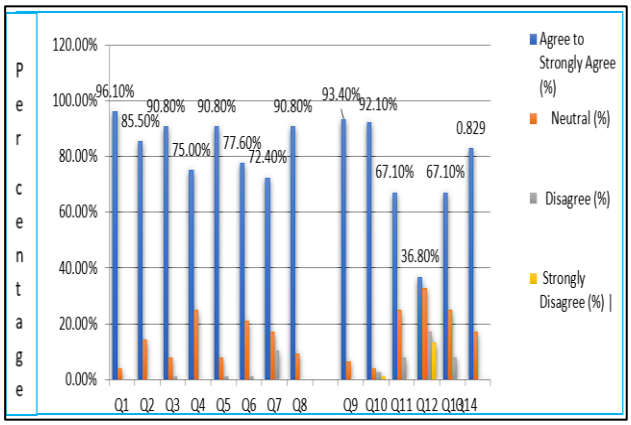

Figure 2: Bar diagram showing percentage of student responses for each question.

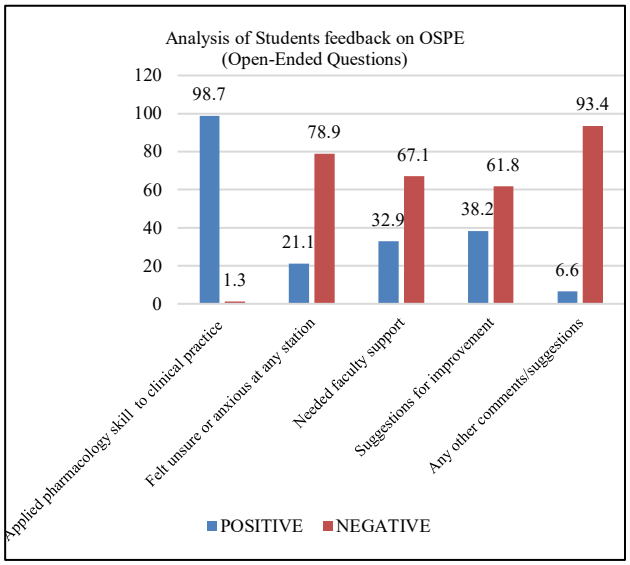

Figure 3: Bar graph comparing positive and negative/neutral responses per question.

Overall satisfaction with the OSPE was high (Q13), with 67.1% of students expressing that they were happy and satisfied with the new method of assessment and 82.9% supported the continuation of OSPE as a preferred method for future evaluations (Q14).

The Cronbach's alpha for the student OSPE feedback responses is 0.96, indicating excellent internal consistency and reliability of the questionnaire. This suggests that the items on the survey consistently measure students' perceptions and experiences with the OSPE.

A significant majority 98.7% of students expressed that the OSPE effectively helped them apply pharmacology skills in clinical contexts. Many students appreciated the practical orientation of the exam and welcomed the new assessment pattern, noting that it enhanced their understanding, retention and ability to apply knowledge and skills in real-life scenarios.

However, 21.1% of students reported experiencing anxiety during the OSPE. While this was not a widespread concern, a few students identified specific stations as anxiety-inducing. These included tasks such as promotional drug literature criticism, preparation of the P-drug list, prescription criticism and correction, ADR form filling, drug dose calculations, graph interpretation and long prescription writing. These areas appear to be more cognitively demanding and may require additional preparation or support.

There was also a perceived need for increased faculty support. About 32.9% of students felt that more guidance from faculty would have enhanced their performance. Their suggestions for improvement included allotting more time per station, providing clearer instructions and incorporating more hands-on training during classroom sessions to better prepare for the OSPE format.

Similarly, 32.9% of students offered constructive suggestions for refining the OSPE experience. The most common recommendations were to increase the time available at each station, reduce the overall number of stations, introduce more clinically relevant stations, revisit elements of the old assessment pattern and expand opportunities for practice before the final assessment.

Only a small proportion, 6.6% of students, provided additional feedback in the open-ended section. These comments ranged from positive reinforcement such as "good and keep it," to critical suggestions like 'increase time,' 'old better' and in one instance, a concern about perceived bias.

Overall, the feedback suggests that while the OSPE was largely successful in promoting clinical application of pharmacological knowledge, targeted improvements in station design, timing and preparatory support could further enhance its effectiveness and reduce student stress.

The Cronbach's alpha for the 5-point Likert Scale feedback was 0.80, which indicates good internal consistency. This suggests that the items reliably measure related aspects of student experience regarding application, anxiety, support needs, suggestions and additional comments.

DISCUSSION

The current study aimed to compare the effectiveness of the objective structured practical examination (OSPE) and the traditional practical examination (TPE) in assessing pharmacology competencies among II MBBS students. It also explored student perceptions of OSPE through close and open-ended feedback questionnaire.

Quantitative analysis revealed that the mean score of students assessed through OSPE (40.45±4.74) was

significantly higher than those students assessed through TPE (36.80±5.63), with a p value <0.001, indicating a highly statistically significant difference favoring the OSPE method. These findings are in agreement with studies by Vyas et al and Jindal et al who also reported improved performance outcomes in pharmacology practical using the OSPE method.[14,16]

Student feedback on the OSPE was overwhelmingly positive. Over 90% of students agreed that OSPE was well-designed, fair, clearly instructed, and clinically relevant. These findings are similar to those reported by Bhatnagar et al. and Selvam et al who observed high student acceptability and perceived relevance of OSPE stations.[9,11] Despite some concerns about time constraints and the presence of observers, most students found the OSPE less stressful and supported its continued use. This is in agreement with studies by Hodges and Pierre et al where OSPE reduced stress and enhance student comfort during assessments.[12,13]

The significantly higher performance and scoring in OSPE reflect its structured and objective approach to assessment. This is consistent with findings by Barman[4] and Harden et al.[5], who emphasized the reliability and validity of OSPE in evaluating clinical competencies.[4,5] Similar improvements in student scores and skill application through OSPE were observed by Badyal and Sing and Vyas et al, supporting the effectiveness of this method in pharmacology examinations.[3,16]

Regarding student perceptions, over 90% of students affirmed the clarity of instructions, fairness of marking, and relevance of the stations. This aligns with findings by Rajani and Ghewade, who reported that structured stations in OSPE provided clarity, reduced subjectivity and enhanced student confidence. Similarly, Deori et al and Sai et al noted positive student engagement and higher satisfaction levels with OSPE-based assessments.[18-22]

Notably, 67.1% of students found OSPE less stressful than traditional examinations, a sentiment also captured in studies by Shetty et al and Carolin and Devi, where OSPE reduced performance anxiety due to transparency and predictability.[21,23] However, the 21.1% of students who reported anxiety and the 32.9% requesting more faculty support suggest that OSPE may still pose challenges when students are inadequately prepared or face time limitations. Similar concerns were raised by Mitra et al, who emphasized the need for optimal station time and training for students and faculty.[15]

Regarding cognitive load, students identified stations involving ADR reporting, drug dose calculations, and promotional literature criticism as more stressful. These findings are corroborated by studies such as those by Bhat et al and Patil et al, which documented that tasks requiring critical thinking and synthesis often contribute to examination stress.[17,20] Thus, preparatory sessions with hands-on demonstrations and practice scenarios are essential.

The internal consistency of the feedback instruments was robust, with a Cronbach's alpha of 0.96 for the closed-ended questionnaire and 0.80 for the open-ended responses, confirming the reliability of the findings. The high internal consistency (Cronbach's alpha >0.9) of the feedback instrument reinforces the reliability of the data, mirroring findings from previous validation studies by Norcini et al and Harden et al that stress the importance of tool consistency in educational assessments.[2,5]

As this was a single-centre study, the generalizability of the findings is limited. The study did not assess long-term retention of knowledge or the application of skills in real clinical settings. Additionally, performance anxiety reported by 21.1% of students and discomfort due to the presence of observers experienced by 36.8% of participants may have influenced their performance outcomes. Furthermore, some faculty members could not be fully motivated to participate in the OSPE process, as it requires extensive planning, coordination, and additional effort compared to traditional assessment methods.

CONCLUSION

The present study demonstrates that the objective structured practical examination (OSPE) is more effective method of assessing pharmacological practical skills than the traditional examination (TPE) and is also preferred by students. OSPE ensures standardized and objective evaluation and integration of clinical competencies. The significantly higher student scores and the positive feedback underscore OSPE's capacity to enhance learning outcomes and align assessments with the goals of the competency-based medical education (CBME) curriculum introduced by the NMC.

While students generally appreciated the format and content, a minority reported time constraints, performance anxiety and a need for increased support, suggesting the importance of structured orientation sessions, faculty training and piloting OSPEs. Addressing these aspects could further improve the assessment process and ensure its smoother implementation in the pharmacological practical assessment.

Thus, OSPE emerges as a valid, reliable and student-centered method that should be encouraged across pharmacology departments in medical colleges.

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