

Research Article

Comparison of Academic Performance and Perceptions of Medical Students in Open Book and Close Book Examination

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ABSTRACT

Background: Assessment plays a critical role in medical education as it is a crucial tool used to assess what students know, understand, and have the ability to apply concepts learned. Closed books tests are usually employed in medical colleges and primarily test recall and memorisation. Open book exams on the other hand, provide students with the means to use learning tools during the assessment process and may promote conceptual understanding, critical thinking and problem-solving.

Objective: To compare academic performance and perceptions of medical students regarding open-book and closed-book examinations.

Methodology: This is a comparative cross sectional study carried out in Akhtar Saeed Medical College, Rawalpindi. The total number of medical students involved in the study were 85. Students took two exams, one open book and one closed book, on similar academic material. The assessment of academic performance was done by comparing examination scores, pass rate and grade distribution. A structured questionnaire was used to evaluate the perceptions of students on the preference, stress level, fairness, confidence, conceptual understanding, memorization, and critical thinking. SPSS version 25 was used to analyze data. Results with p value < 0.05 was taken as statistically significant.

Results: The mean score was higher in the open-book examination (78.42 ± 8.36) compared with the closed-book examination (70.58 ± 9.21), and the difference was statistically significant ($p < 0.001$). The pass rate was also higher in the open-book examination (92.9%) than in the closed-book examination (81.2%). Most students preferred open-book examinations (62.4%) and reported that they were less stressful, improved conceptual understanding, encouraged critical thinking, and increased confidence during assessment. Closed-book examinations were more commonly associated with memorization and higher stress.

Conclusion: Open-book examinations were associated with better academic performance, lower examination stress, and more favorable student perceptions compared with closed-book examinations. However, both assessment methods have educational value. A balanced assessment approach using open-book and closed-book formats may provide a more comprehensive evaluation of medical students' knowledge, understanding, and clinical reasoning skills.

Keywords: Open-Book Examination, Closed-Book Examination, Medical Students, Academic Performance, Student Perception, Medical Education, Assessment.

INTRODUCTION

Assessment is a key element in medical education since it not only evaluates students' learning outcomes but also has an impact on their study habits and study behavior. Medical students should acquire factual knowledge, and also should learn how information can be understood, interpreted and applied to medical situations. Thus, assessments must measure the recall of knowledge as well as higher order thinking skills. Closed book examinations have been long adopted by medical colleges as a method of assessing student performance and are one of the most popular means of assessment (1-3).

In closed-book exams, students will solve problems without having their textbooks, notes, or other learning materials with them. This approach is helpful for measuring memory, knowledge and readiness. It prompts students to remember key facts and use the text to make amendments. Closed book tests can also be associated with rote learning, however, particularly if the questions are primarily recall questions. Under these circumstances, pupils might be more likely to memorize than think and understand, or use their knowledge to solve problems. This can be a constraint in medical education because clinical decision-making sometimes involves interpretation, reasoning and application of information (4-6). An alternative assessment approach is the open book exam in which students may use approved learning resources during the exam. The format is not about testing if a student can find the answer in a book, but also about testing whether a student can understand the information, select relevant information and apply knowledge to solve questions. Open-book assessment might be especially relevant to medical education, as physicians in clinical practice have many guides, textbooks, research journals, and electronic databases to help them make decisions. Thus, open book exams can better simulate real world learning and problem solving (7-9).

A further consideration in assessment is its impact on pupil confidence and stress. Examination-related stress is a common problem among medical students, particularly in high-stake closed book exams. Too much stress can impact performance and decrease learning quality. Open book exams could help alleviate the pressure that arises from not knowing what to study or how much to. This can make them concentrate on comprehension and use, instead of on memorizing facts. But,

good preparation, time management, and understanding how to interpret information are all key factors in an open book exam (10).

Perception is critical in the introduction and comparison of assessment methods when it comes to students. Positive attitudes towards an examination method is likely to be fostered if students see the method as fair and helpful to learning. The open-book exam can be considered more student-centered as they can learn independently, and think. However, others may prefer the closed book examination due to the fact that they are used to this type of testing and feel that it is the better way to assess each student's preparation. Comparing academic achievement with students' perceptions of the utility of each assessment method can yield a more comprehensive view of the usefulness of each (11, 12).

There is a need to evaluate whether open-book examinations provide better academic outcomes and more favorable student perceptions compared with closed-book examinations in local medical education settings. The present study was therefore conducted to compare academic performance and perceptions of medical students regarding open-book and closed-book examinations at Akhtar Saeed Medical College, Rawalpindi. The findings may help medical educators plan assessment strategies that promote conceptual understanding, reduce unnecessary stress, and support meaningful learning among medical students.

METHODOLOGY

This comparative cross-sectional study was conducted at Akhtar Saeed Medical College, Rawalpindi, to evaluate and compare academic performance and student perceptions regarding open-book and closed-book examinations among medical students. The study was carried out over a period of Jan 2025 to June 2025. The main purpose of the study was to determine whether open-book examination was associated with better academic achievement, reduced examination stress, and more favorable student perceptions compared with the traditional closed-book examination method.

A total of 85 medical students were included in the study. The number of students in the sample was determined based on the number of students available for the study period who met the eligibility requirements. A non-probability sampling technique (convenience sampling) was used to obtain a sample of

students. Students from medical schools who volunteered for the study and who had undertaken both open book and closed book examination were included. Omitted students, students who did not complete questionnaires and those who refused to respond were not included in the final analysis.

The aims of the research were discussed with all the participants prior to collecting data. All students gave informed consent and confidentiality of the data collected was preserved. Students were told that their answers would be kept confidential for research only and they were entirely free to choose whether to participate or not. The study got approval from the institutional ethical review committee of Aktar Saeed Medical College, Rawalpindi, prior to the commencement of the study.

Assessment consisted of two different types of exams: an open book and a closed book. Both assessments had been written from the same academic content area so as to be comparable. The content of the questions aimed at measuring knowledge, understanding, application and problem-solving skills. The closed book examination was of the traditional type, i.e. students could not take any books or notes or anything else with which they might be able to learn during the examination. The open book exam was administered separately and students were permitted to use textbooks, notes or approved academic resources during the open book exam. Both exams were given in exam session in order to foster fairness and academic discipline.

Students' academic achievement was measured by the scores they obtained in the two types of assessment. Marks were totalled and expressed as percentages to allow for comparisons. The students were also divided into four groups on the basis of their performance of poor, average, good and excellent. To compare and contrast academic achievement between the two types of exams, the mean score of the open book

examination was compared with the mean score of the closed book examination.

Students' perception on both the examination methods were also taken into consideration by using a structured questionnaire, apart from academic scores. Questions focused on examination preference, perceived difficulty, stress, perceived fairness, confidence, conceptual understanding, memorization, critical thinking, and satisfaction with the assessment method were included in the questionnaire. Depending on the type of question, responses were captured in categorical forms (e.g., agree/disagree, yes/no, low/moderate/high). Prior to data collection, the questionnaire was checked for clarity to ensure that students could understand and answer all the items in the questionnaire.

The data are entered and analysed with SPSS version 25. Data for quantitative variables (e.g., age, examination scores) were described as mean and standard deviation. Qualitative data like gender, year of study, pass/fail, grade category, and examination preference and stress level and perception responses were reported in frequency and percentage. The paired sample t-test was used to compare the average academic scores of students' open book and closed book exams. The chi-square test was used to examine the relationships among categorical variables like examination type, examination pass rate, stress levels and student preferences. A p value of < 0.05 was deemed statistically significant.

RESULTS

There were 85 medical students involved in the study. The mean age of the students was 21.34 ± 1.52 years. The ages of the participants were almost uniformly in the 21-23 age group. Out of 85 students, 47 (55.3%) were females and 38 (44.7%) were males. Regarding academic year, 29 (34.1%) students were from 2nd year, 31 (36.5%) from 3rd year, and 25 (29.4%) from final year MBBS.

Table 1. Demographic Characteristics of Medical Students

Variable	Frequency (n)	Percentage (%)
Age group		
18–20 years	19	22.4
21–23 years	54	63.5
>23 years	12	14.1
Gender		
Male	38	44.7
Female	47	55.3
Year of study		

2nd year MBBS	29	34.1
3rd year MBBS	31	36.5
Final year MBBS	25	29.4

Academic results of students were compared between open book and closed book examination. The average score for the open book examination was 78.42 ± 8.36 and the closed book examination was 70.58 ± 9.21 . There was a statistically significant difference

between the two assessment methods with a higher performance in the open-book examination ($p < 0.001$). In a like manner, the pass rate was better in the open book than in the closed book exam.

Table 2. Comparison of Academic Performance in Open-Book and Closed-Book Examinations

Academic performance variable	Open-book examination	Closed-book examination	p-value
Mean score	78.42 ± 8.36	70.58 ± 9.21	<0.001
Passed	79 (92.9%)	69 (81.2%)	0.026
Failed	6 (7.1%)	16 (18.8%)	0.026
Students scoring $\geq 75\%$	56 (65.9%)	38 (44.7%)	0.006
Students scoring $<50\%$	3 (3.5%)	9 (10.6%)	0.071

Grade distribution revealed that the open-book examination resulted in higher grades in students' performances. The open-book assessment resulted in 34 (40.0%) students getting excellent grades, while 21 (24.7%)

students got excellent grades in the closed-book assessment. A higher percentage of students had poor performance in the closed book exam.

Table 3. Grade Distribution of Students in Both Examination Methods

Grade category	Open-book examination n (%)	Closed-book examination n (%)
Poor	6 (7.1%)	16 (18.8%)
Average	23 (27.1%)	30 (35.3%)
Good	22 (25.9%)	18 (21.2%)
Excellent	34 (40.0%)	21 (24.7%)
Total	85 (100.0%)	85 (100.0%)

The students' perception on both the methods of examination were also evaluated. The majority of students indicated that open book exams were less stressful and facilitated more conceptual learning. The association with

memorization and examination anxiety was greater for closed-book examinations. In general, 53 (62.4%) students preferred open book examinations, and 32 (37.6%) students preferred closed book examinations.

Table 4. Students' Perceptions Regarding Open-Book and Closed-Book Examinations

Perception variable	Open-book examination n (%)	Closed-book examination n (%)	p-value
Preferred examination method	53 (62.4%)	32 (37.6%)	0.001
Perceived as less stressful	61 (71.8%)	24 (28.2%)	<0.001
Improved conceptual understanding	67 (78.8%)	39 (45.9%)	<0.001
Encouraged critical thinking	63 (74.1%)	36 (42.4%)	<0.001
Encouraged memorization	29 (34.1%)	68 (80.0%)	<0.001
Considered fair assessment method	58 (68.2%)	43 (50.6%)	0.019
Increased confidence during examination	60 (70.6%)	38 (44.7%)	0.001

Regarding the levels of stress, 49 (57.6%) students said they had low stress during open-book examination while only 21 (24.7%) said low stress during closed-book examination. The

closed book examination group had a higher rate for high stress (31 (36.5%) students) than did the open book examination group (11 (12.9%) students).

Table 5. Comparison of Stress Level during Open-Book and Closed-Book Examinations

Stress level	Open-book examination n (%)	Closed-book examination n (%)
Low stress	49 (57.6%)	21 (24.7%)
Moderate stress	25 (29.4%)	33 (38.8%)
High stress	11 (12.9%)	31 (36.5%)
Total	85 (100.0%)	85 (100.0%)

Students who prefer open book examinations had a higher percentage of excellent academic performance when compared to those who prefer closed book examinations. 27 (50.9%) students preferred open book exams, and 7

(21.9%) students preferred closed book exams, with excellent grades obtained by the students in both cases. This was a statistically significant association ($p = 0.013$).

Table 6. Association between Preferred Examination Method and Academic Performance

Academic performance category	Preferred open-book n (%)	Preferred closed-book n (%)	p-value
Poor	3 (5.7%)	3 (9.4%)	
Average	12 (22.6%)	11 (34.4%)	
Good	11 (20.8%)	11 (34.4%)	
Excellent	27 (50.9%)	7 (21.9%)	0.013
Total	53 (100.0%)	32 (100.0%)	

Overall, the findings showed that open-book examinations were associated with higher academic scores, better pass rate, lower stress, and more positive student perceptions. Closed-book examinations were perceived as more

stressful and more dependent on memorization. These results suggest that open-book assessment may support conceptual understanding and critical thinking among medical students.

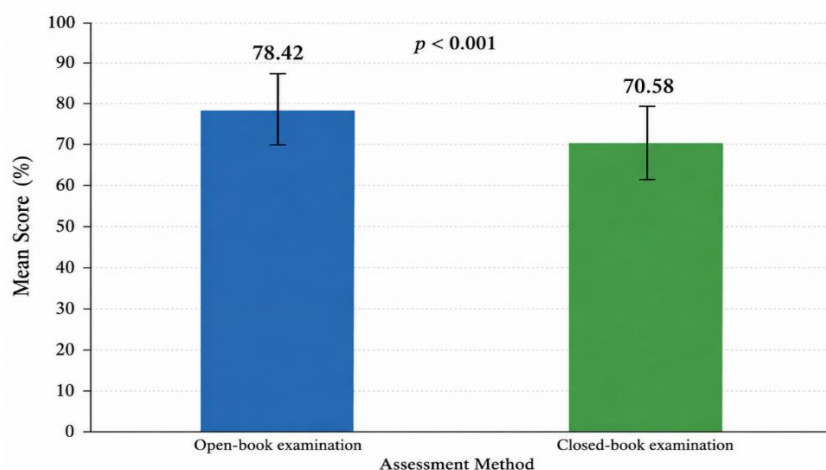


Figure 1. Comparison of Mean Academic Scores between Open-Book and Closed-Book Examinations among Medical Students

The mean score was higher in the open-book examination (78.42 ± 8.36) compared with the closed-book examination (70.58 ± 9.21), and the difference was statistically significant ($p < 0.001$).

DISCUSSION

The present study compared academic performance and perceptions of medical

students regarding open-book and closed-book examinations. The findings showed that students performed better in the open-book examination than in the closed-book examination. The mean score was higher in the open-book assessment, and the difference was statistically significant. This suggests that open-book examinations may help students use knowledge more effectively, especially when

questions are designed to assess understanding, application, and reasoning rather than simple recall. In medical education, where students are expected to interpret information and apply concepts in clinical situations, open-book assessment may provide a useful method for evaluating higher-order learning (13-15).

The higher pass rate and greater proportion of excellent grades in the open-book examination indicate that students may feel more confident when they are allowed to use academic resources during assessment. This does not necessarily mean that open-book examinations are easier. Instead, it may reflect that students are better able to organize information, understand concepts, and apply knowledge when they are not limited by memorization alone. Open-book examinations can encourage students to focus on comprehension and problem-solving, which are important skills for future clinical practice (16, 17).

The other significant result of this study was examination stress. Students found the open book exams to be less stressful than closed book exams. Closed book assessments had a higher rate of high stress. This may be because in closed book exams students are expected to recall information in the absence of the learning material and under exam pressure. Open-book exams might alleviate needless concern and enable students to focus more on interpretation and application of knowledge. But lower stress doesn't mean lower rigor in school. If questions are well designed and are focused on clinical reasoning, analysis and decision-making, open-book exams can be difficult (18, 19).

Closed-book tests have proven to have merit in medical education, but despite the positive results. They can also be used to evaluate the fundamentals of knowledge, facts and preparedness, which are vital to medical students. Thus, the use of open book examinations should not supplant closed book examinations entirely. Alternatively, a balanced evaluation system could be employed, with closed book exams for knowledge and open book exams for understanding, application and critical thinking. The outcomes of this study confirm the possibility of using open-book examinations as an assessment tool in medical education (20).

This study had some limitations. It was carried out in one medical college and number of students involved was relatively small (85 students) so the results may not be representative of all medical students.

Perceptions by students were self-reported and may have contained response bias. Moreover, the long-term retention of knowledge was not evaluated. Further studies involving more participants across various institutions and longitudinal assessment of academic performance and learning behavior after open-book and closed-book exams are suggested to provide more credible evidence of the long-term effects of open-book and closed-book exams.

CONCLUSION

The study concluded that medical students achieved higher academic scores in open-book examinations compared with closed-book examinations. Open-book assessment was also associated with better student perception, lower examination stress, improved confidence, and greater emphasis on conceptual understanding and critical thinking. Closed-book examinations were perceived as more stressful and more dependent on memorization. However, both assessment methods have educational value. A combined assessment approach using both open-book and closed-book examinations may provide a more comprehensive evaluation of medical students' knowledge, understanding, and clinical reasoning skills.

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