

Research Paper: Comparison of Two Methods of Dental Students Assessment(MCQ and PMP) and their correlation with the total grade-point average



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ABSTRACT

Introduction: Assessment is an integral part of the total evaluation process. Methods of assessment of students' ability are various. Multiple-Choice Questions (MCQ) have been widely used for summative assessment and they stimulate students to make a superficial and exam oriented study. Patient Management Problem(PMP)exams expose the students to a situation similar to real life and make them solve a clinical problem. The major aim of this study is to compare of these methods of dental students assessment and their correlation with the total grade-point average (GPA).

Materials and Methods: This descriptive, analytical, cross-sectional study consisted of 55 third-year dental students in endodontics department of Birjand dental school in 2020. The routine MCQ and the PMP tests was designed based on similar objectives, were carried out simultaneously and implemented in electronic method. The scoring of tests was calculated out of 100. Resulting data were analyzed using independent two sample t-test and Pearson's correlation test, ($P < 0.05$).

Results: The participantants were %62 females and %37 males. No significant correlation was observed between the mean PMP($P=0.66$) and MCQ($P=0.53$) scores of female and male students. The t-test showed statistically significant differences in the MCQ and PMP test scores of students ($P<0.001$). The Pearson's correlation test showed a significant correlation between the MCQ scores and total GPA($r=0.36$, $P=0.006$).

Conclusion: In this study, there is no significant correlation was observed between the PMP scores and total GPA. It indicates that despite high GPA and good practical information, the students were weak at clinical judgment. So using assessing methods such as clinical reasoning tests for dental students can be a good way to measure higher abilities.

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Introduction

Assessment forms an integral part of the total evaluation process.(1) Methods of assessment of students' ability are various and must be selected with respect to the objectives.(2) Since dental students are involved in people's health, evaluating their performance and clinical competence is notably important.

Most Universities of dental sciences have been assessing the students through multiple choice questions(MCQs). MCQs have been widely used for summative assessment in undergraduate dental education because of effective testing for a large number of students, convenient standardization and wide sampling of knowledge. The scoring is very easy and reliable using computer software, but the construction of good MCQs is difficult and needs expertise. Generally MCQs stimulate students to make a superficial and exam oriented study.(3,4) MCQ tests do not provide information, which would enable feedback, as they do not require students to construct the answers. MCQ does not provide any opportunity for students to express their understanding. MCQ tends to test trivia and they are not able to test complex issues.(3)

Patient management problem(PMP) method has been introduced to assess reasoning, competence, and clinical judgment of dental students. PMP is an assessment tool for students of dental and medical sciences, which has been actively developing recently. It is responsive to the concerns that existed about older methods such as MCQ. Thus, PMP exam is a reliable way to assess the students' comprehension of several aspects of disease and health. PMP exams expose the students to a situation similar to real life and make them solve a clinical problem. While in MCQ tests only correct responses count; PMP reveals also the performance result of test-taker (4,5). One of the important aspects to be evaluated in students of dental sciences is their knowledge, which is effectively possible only through MCQ examinations. Meantime, assessing the students' clinical skills requires other tools, one of the most liked of which is PMP.(6,7)The PMP is a written test beginning with a descrip-

tion of a patient's problem; the students must collect the required information through history and clinical examination and finally make a diagnosis and plan the appropriate treatment.(8)

Considering the importance of solving a clinical problem using PMP, and the need for dental students to become familiar with it and since it is an effective approach in assessment, in this research we decided to compare the results of PMP with routine MCQ tests and their correlation with the total grade-point average (GPA) in the endodontics department. To our knowledge this is the first study on PMP in dental students in Birjand university of dental school.

Materials and Methods

Ethics

Ethical approval for conducting the project was granted by the University of Birjand's Human Research Ethics Committee. (ethics code: IR.BUMS.REC.1400.310)

Study Sample

This descriptive-analytical cross-sectional study was performed in 2020 school-year. A total of 55 dental students who had taken theoretical "dental traumatology" course in that term were selected by census. Based on the course plan and educational content dental traumatology course was represented in form of lectures and slide shows.

Study Design

At the end of the routine teaching module on the topic of dental traumatology, the students were asked to prepare for MCQ and PMP exams. The assessment method was described for all students. Forty MCQs were presented. Each MCQ consisted of five answer options in a single-best-answer format. Cognitive skill level was rated by three independent reviewers using the modified Bloom's Taxonomy using consensus agreement as below:

Level I: Remember (identifying and retrieving information)

Level II: Understand (interpreting and sum-

marizing information)

Level III: Apply, analyze, evaluate, and create (implementing, organizing, and critiquing information)

Principles of PMP questions

PMP exam took place immediately after the MCQ. The PMP questions were compatible with routine MCQs which means PMP questions cover all the objectives in the MCQs test. The PMP exam was comprised of forty questions of five choice. In this exam, no test-retest was performed. In this study each PMP was designed and checked for accuracy and realism by an expert endodontist that had also Master of Science degree in medical education. To certify content validity, each PMP was revised by an expert panel consists of 5 endodontists. In the first stage, the educator designed a clinical case and provided information about a patient, who was referred to the endodontic department of Birjand dental school with a set of signs associated with trauma (based on the subjective report). Next, dental students, based on their knowledge the information given to them were required to answer questions. In the final stage, the students were required to answer questions about diagnosis and suggested appropriate treatments for patient.

Feedback

Feedback exists for each option in PMP questions; In other words, by choosing each option, whether right or wrong, the student gets an explanation. This process is called “feedback” and eventually results in an inability to get to the correct option.

Scoring PMP

The PMP tests are graded based on binary method in which the correct answer has one score and the wrong one has minus one. Then by using summative method, the total score (sum of the scores of questions) will be obtained. In this study, the dental students will lose one point for every extra selection. Finally the scoring of PMP and MCQ tests was calculated out of 100.

They answered 40 questions of PMP and MCQ exams within 60 and 40 minutes, respec-

tively.

Statistical Analysis

The total GPA of the students was taken from the faculty education. Data analysis was performed using independent two sample t-test and Pearson’s correlation test. Statistical analysis was performed in SPSS version 22.0 (SPSS Inc., Chicago, IL, USA), and $P < 0.05$ was considered statistically significant.

Results

Percentage of question per cognitive skill level I, II and III (defined by modified Bloom’s taxonomy) across MCQ test was 45%, 32.5% and 22.5% respectively. Fifty five third year dental students (%62 females and %37 males) enrolled and successfully completed the examinations. Finally the scoring of PMP and MCQ tests was calculated from 100. The reliability of both tests was measured by Cronbach’s alpha, which was 0.74 for PMP test and 0.70 for MCQ test.

No significant correlation was observed between the mean PMP and MCQ scores of female and male students (Table 1).

Table 1. Results of t-test of PMP and MCQ scores based on the gender of students

Test	Gender	Mean± Standard Deviation(SD)	T test P value
PMP	Female	42.45±11.86	-0.43 P=0.66
	Male	44.06±15.35	
MCQ	Female	74.85±13.46	-0.62 P=0.53
	Male	77.02±10.50	

The t-test showed statistically significant differences in the MCQ and PMP test scores of students. (Table 2)

Table 2. Mean score and SD in the MCQ and PMP exams.

Test	N.	Max	Min	Mean ± SD	t- test
PMP	55	68.29	9.76	43.07±13.18	P<0.001
MCQ	55	92.5	32.5	75.68±12.36	

The Pearson’s correlation test showed a significant correlation between the MCQ scores and total GPA but no significant correlation was observed between the PMP scores and total GPA (Table 3).

Table 3. Results of Pearson's correlation test of PMP and MCQ test scores and Students' total GPA.

Test	r	P value
PMP	0.093	0.49
MCQ	0.36	0.006

Discussion

Assessment should not only assess the students' knowledge but also should measure higher levels of thinking like problem solving. A reliable assessment will provide consistent results if applied to equivalents cohorts of students. MCQs benefit from a high reliability when there are sufficient numbers of questions and the set of questions is valid. MCQs are frequently used in evaluation of students of professional doctorate(2,4). Additionally; it is suitable for assessing large number of students. This method is great for assessing knowledge; however, barely can it evaluate the students' problem-solving skills effectively(9). A large part of the curriculum can be assessed by this test, besides it can be simply scored by use of specified computer software. Yet, designing an appropriate MCQ is difficult and requires special skill. Generally, MCQ causes the students study perfunctorily only to pass the exam(10). MCQ testing is a valuable resource for certifying students' capacity to remember core rules or to demonstrate recognition of fundamental relationships. Such testing assesses only a limited range of the overall cognitive taxonomy, however, and is not optimal to assess many of the competency domains considered critical for adequate professional performance. The MCQ format can be used to assess higher-level cognitive processes when case-based formats are used so that students must identify key data from a patient scenario and interpret these data in order to respond to questions written at the application level of modified Bloom's taxonomy. For example, questions based on case scenarios can be designed to select appropriate diagnostic tests to confirm assessments, and recognize the most suitable treatment approach from a list of options(11,12). In this study to assess higher-level cognitive processes in MCQ test,

one fifth of questions were case-based formats.

PMPs simulate reality and reproduce the decisions of a dental student for managing a patient. Also, the students were required to be involved actively in the problem(8,13). Various dimensions of clinical reasoning, such as notice of clinical cues, confirmation of clinical problems, determination and performance of actions, and evaluation and reflection, were incorporated in the PMP examine this study. In our study, students' scores in PMP test were lower than their scores in MCQ test, implying their low ability to respond PMP tests and unfamiliarity with PMP test. Due to the numerosity of student in dental schools, MCQ tests are mostly used since they are easier to correct and require less time. This has made the students to be hardly familiar with PMP tests and subsequently their clinical judgment ability is not satisfactory.

Conclusion

The students' scores in PMP test was lower than their scores in MCQ test. So to include the PMP tests in routine assessments of dental schools, appropriate educational programs should be designed.

Study limitations

Non-probability sampling in a single university and a single course might limit its generalization to different settings.

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Authors' contributions

Soheila Sionally: Conceptualization, Methodology, Writing - Review & Editing **Sedique Ebrahimipour:** Writing - Original Draft, Data Curation, Supervision

Conflict of interest

There are no conflicts of interest.

Ethical declarations

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Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

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