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EFFICACY OF MULTIPLE CHOICE QUESTIONS AS A TOOL FOR FORMATIVE ASSESSMENT

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ABSTRACT

Formative assessment is an intrinsic part of the ongoing teaching-learning process. Aim of the present study was to compare multiple choice questions with the conventional method of evaluation i.e. long answer questions and short answer questions as a tool for formative assessment. The study was conducted in the Department of Anatomy, as a part-end assessment. Two hundred and thirty eight students of First-year MBBS took the test by both the above methods. Analysis of the study was done by Quantitative analysis and Qualitative analysis. Post-validation was done by Item analysis, by calculating the difficulty index of each item. The average percentage of marks obtained by multiple choice questions method was 60.2% and by conventional method was 64.6%. The failure rate was higher in multiple choice questions method (23.1%) as compared to the other method (11.3%). Item analysis showed that 70 % of the questions were in the acceptable range, 4 % were too difficult and 26% were too easy which needed modification. This study inferred that for multiple choice questions to be a meaningful and effective tool of evaluation, the tests should be frequent, covering small portions and with immediate feedback to the students. To make any assessment fair and valid, the written tests should be strategically mixed with all types of questions.

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INTRODUCTION

A successful teaching programme is one, which allows the students to gain maximum meaningful knowledge in the short span of time available. The recent revision of the preclinical course to one year curriculum has led to an increasing trend to move from subjectivity to objectivity. Assessment of medical undergraduate students gives an insight about their learning and competencies. Formative assessment (FA) is a part of the developmental or ongoing teaching-learning process. The immediate feedback given in FA, informs learners of their present state of learning and provides opportunity to modify learning during the learning process (Jain *et al.*, 2012). Scientific studies confirmed that it is the evaluation system rather than the educational objectives or curriculum or instructional techniques that have the most profound impact on what the students ultimately learn (Miller, 1973). The most important characteristics of the evaluation process and the evaluation tool are relevance, validity, reliability, objectivity and feasibility (Ananthkrishnan, 2000).

Multiple choice questions (MCQ) being versatile, are the most widely used components of objective examinations and are used for formative and summative assessment as well as for various entrance examinations where ranking of students is of paramount importance. A comparative study of conventional method of evaluation by Long answer questions (LAQ), Short answer questions (SAQ) with MCQs, for assessing cognitive domain of undergraduate medical students was undertaken.

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy, as a part-end assessment. Two hundred and thirty eight students of First-year MBBS took the test by conventional method (LAQ and SAQ) and by MCQ method. Fifty MCQs were set, all of one pattern i.e. Type A with 'one best response'. There was no negative marking. Pre-validation of the test paper was done by scrutinization by the Head of Department. The time allotted was one hour. Evaluation was done out of fifty marks and a 50 % score was considered as the passing marks by both methods. The study was analysed by Quantitative analysis, Qualitative analysis and by Item analysis. Quantitative analysis was done, by comparing the marks scored by both methods, their average, the failure rate and finding the number of students

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who scored higher by each method. Qualitative analysis was done, by preparing a feedback questionnaire with close end and open ended questions, the responses of which were analysed by grading them on a Five-point Likert's scale. Post-validation of the question paper was done by Item analysis. The marks of the students were arranged in order of merit and divided into thirds. Upper one-third students were considered as high achievers and lower-third were considered as low achievers. Difficulty index or Facility value of each MCQ was analysed, using the formula

$$p = \frac{H+L}{N} \times 100$$

where:

H= number of students with correct answer in high achievers group

L= number of students with correct answer in low achievers group

N= total number of students in the two groups including non-responders

The Difficulty index (p value) between 30%- 70 % was considered as acceptable whereas an index less than 30% (difficult questions) and more than 70% (too easy questions) were not considered as acceptable and needed modification.

RESULTS

I Quantitative analysis

Position for Table/Graph 1

The number of students who failed by MCQ method were 55(23.1%) and by conventional method were 27(11.3%). It was observed that 79(33.1%) students scored better by MCQ method, 149(62.7%) scored better by the other method and 10(4.2%) students scored the same marks by both methods.

II Qualitative analysis

Position for Table/Graph 2

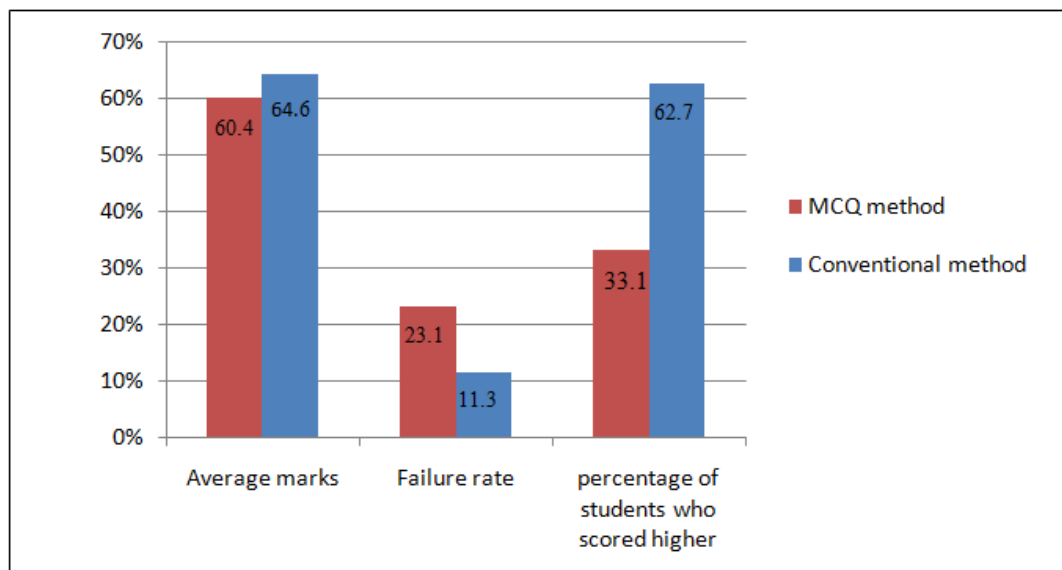
III Item Analysis

Position for Table/Graph 3

DISCUSSION

The MCQs are an extensively used and time tested method of assessment of knowledge in national and international examination. These are of different types as classified by Hubbard and Clemans (1971).

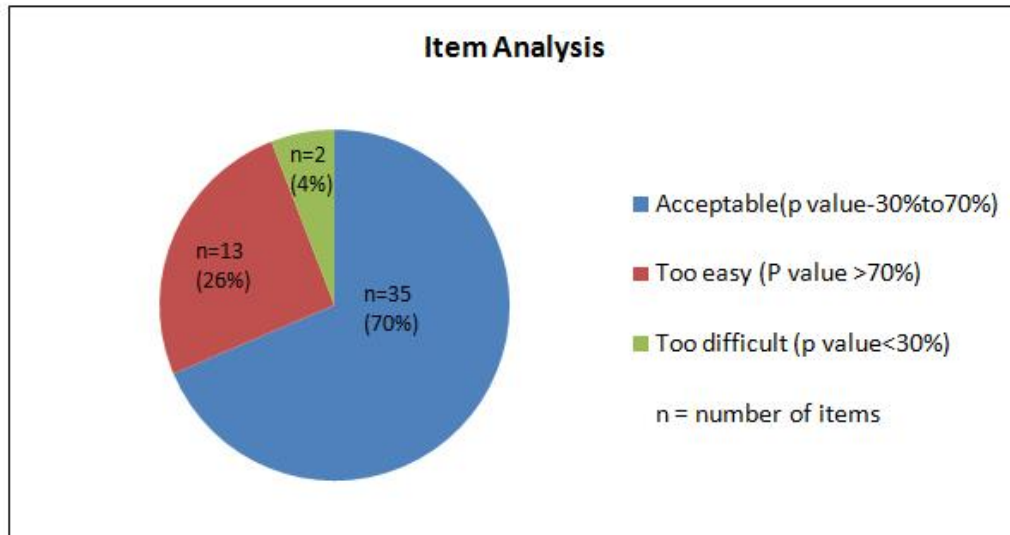
Table/ Graph 1. Comparison of Quantitative analysis by MCQs and Conventional method



Table/Graph 2. Feedback questionnaire with students' response in Five-point Likert's scale
 1- Strongly agree, 2-Agree, 3- Neutral, 4 - Disagree, 5- Strongly disagree. N= number of students
 MCQ - Multiple Choice Question, PG- post graduate

Questions	1 N (%)	2 N (%)	3 N (%)	4 N (%)	5 N (%)
1. Are MCQs easier to attempt	84 (35.2 %)	91(38.2%)	39(16.3%)	19(7.9%)	1(0.4%)
2. Adequacy of time given	169(71%)	57(23.9%)	7(2.9%)	3(1.2%)	1(0.4%)
3. Fair evaluation	75 (31.5%)	74(31%)	67(28%)	15(6.3%)	3(1.2%)
4. Thorough preparation	64 (26.8%)	72(30.2%)	55(23.1%)	34(14.2%)	12(5%)
5. Better assessment of depth of knowledge	115(48.3%)	85(35.7%)	25(10.5%)	11(4.6%)	1(0.4%)
6. More scoring	59 (24.7%)	73(30.6%)	69(28.9%)	31(13%)	5(2.1%)
7. Wider coverage of syllabus	65 (27.3%)	110(46.2%)	35(14.7%)	23(9.6%)	3(1.2%)
8. Improves understanding and discourages selective reading	101(42.4%)	96(40.3%)	29(12.1%)	6(2.5%)	5(2.1%)
9. Gives practice for pre PG exam	150(63%)	64(26.8%)	20(8.4%)	2(0.8%)	1(0.4%)
10. MCQ pattern to be included in part end exam/ weekly tests	87 (36.5%)	72(30.2%)	57(24%)	16(6.7%)	5(2.1%)

Table/Graph 3. Item analysis showing Difficulty Index (p value) of each item



1. Type A- the single or best response type
2. Type K- multiple completion type
3. Type E- relationship analysis type
4. Multiple true- false completion type
5. Matching type

Type A or single correct response type was considered in the present study. A distinct advantage of using MCQ is its ability to evaluate a number of students in a short span of time, grading tends to be quick, with broad coverage of syllabus and without subjective bias of evaluator (Patel and Mahajan, 2013). MCQs are useful assessment tools in measuring factual recall and if carefully constructed can test higher order of thinking skills which is very important for a medical graduate (Pande *et al.*, 2013; Norman, 1995 and Peitzman *et al.*, 1990). It helps in preparation for post graduate entrance examination, to be taken at the end of the course. However a negative point is that the method of MCQ scan lead to more of guessing and cueing effect by the student. In the present study, the average percentage of marks obtained by MCQ method was 60.2% and by conventional method was 64.6%. The failure rate was higher by MCQ method. It was observed that only 79(33.1%) students scored better by MCQ method, 149(62.7%) scored better by the other method and 10(4.2%) students scored the same marks by both methods. This may be attributable to more subjectivity during corrections in the LAQs and SAQs and the scoring pattern shows a halo/ anti-halo effect.

It also leaves some scope for guess work as the student is able to write a few lines or draw a diagram even if the precise knowledge and depth of understanding is lacking. In our study the students were exposed to the MCQ pattern of examination for the first time. The findings correspond with another comparative study which revealed maximum percentage of marks scored by oral method (90%), practical method (79%), essay type (76.4%) and by MCQ (70.5%). The failure rate was also highest by MCQ method (Adeniyi *et al.*, 2013). Bodhka compared the marks obtained by high achievers and low achievers in MCQ, SAQ and Modified Essay Question (MEQ) and found that maximum marks were scored in SAQ method by both the groups (Bodhka, 2012). Dakum *et al* showed similar results in their work (Dakum *et al.*, 2009).

On the contrary, a study conducted in Anatomy for four internal assessments and a terminal exam revealed a higher mean percentage by MCQ method than in theory and practical in all the tests (Mishra, 2013). The existing written examination pattern in the universities are subject to bias and are dependent on a number of extraneous variables such as students' handwriting, legibility, content, and way of presentation. Though the essay test has the advantages of being relatively easy to frame by the teacher and allows the students free and effective expression with ability to organize their ideas, but there is limited range of application and lack of objectivity. Previous studies evaluated the students response by feedback questionnaire revealed that 89% of students were of the opinion that MCQ preparation and examination helped them in learning the subject, self-studying, reasoning and enhancement of clinical skills (Gupta *et al.*, 2012). In the present study also a higher percentage of students appreciated and were in favour of MCQs being fairer, with better assessment of depth of knowledge and wider coverage of syllabus. However in response to the question whether MCQ pattern should be included for part-end exam/weekly tests only 36.5% students strongly agreed, 30.2% agreed, 24% were neutral, 6.7% disagreed and 2.1 % strongly disagreed. The probable explanation to this finding would be that, they are not in practice to this system as it is not a part of university exams in the state.

Conclusion

Formative assessment is of great help in detection of learning difficulties which can be corrected by counselling to modify learning methods or activities. This study inferred that for MCQs to be a meaningful and effective tool of evaluation, the tests should be frequent, covering small portions and with immediate feedback to the students. To make any assessment fair and valid, the written tests should be strategically mixed with MCQs, LAQs, and SAQs. It also gave teachers a good feedback on the efficacy of their teaching and preparation of the MCQ items. The future lies in online formative assessment which shall be witnessed by the medical students in the years to come (Velan *et al.*, 2008; Byron and Mc Donald, 2004 and Denton *et al.*, 2008).

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