

ITEM ANALYSIS AND VALIDATION OF MCQs IN PAEDIATRICS FOR FINAL MBBS EXAMINATIONS

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ABSTRACT

Objectives: The study was designed to validate the MCQs used in Graduate examinations in Paediatrics using item analysis. **Material and Methods:** MCQs and their answers responded by 100 students in each batch appearing for their final MBBS examinations in paediatrics were analysed for 3 consecutive years from 2012 to 2014. Item analysis of each question were undertaken for difficulty index, discriminative index and discrimination effectiveness. **Result:** Wide variation in difficulty and discriminative indices were noted, often outside prescribed range, making many of these unsuitable for inclusion in the question bank. **Conclusion:** The teaching faculty, question setters and moderators need to be sensitized about its implication

Key words: MCQ (Multiple Choice Question), DOPS (Directly Observed Procedural Skills) Question validation, Item analysis, Difficulty index, Discrimination index, Distracter ineffectiveness, Question bank.

INTRODUCTION:

Examinations using Multiple Choice of Questions are known to have proven advantages in several respects, provided those are carefully framed in a scientific manner. These include choosing right stem, appropriate directions, time allotted, difficulty and discrimination index, choosing a proper stem, type of options, each of their functional distractions, uniformity in distribution and an undeniably correct answer key¹. After evaluation, MCQs need to be evaluated in a scientific manner for their validity in order to check knowledge areas covered in pre-validation and other important indices like difficulty index (Difficulty level), discrimination index (Whether the chosen key was too easy or otherwise) and the distracter ineffectiveness (Whether or not the distracters used were effective). Such routine exercise is called "Item analysis" and must be undertaken after each examination in order to constantly improve question designing, develop a set of marker MCQs for question bank, offer feed back to students as well as teachers and above all, detect technical flaws if any in framing the questions². However, such type of test has certain limitations as an assessment tool for evaluating applied knowledge³. Students adopted a deeper approach to learning for DOPS and a superficial approach to MCQs⁴.

Objectives:

1. Carry out post-validation item analysis of MCQs in Paediatrics for final M.B.B.S. annual examination held under a particular University for each year from 2012 to 2014.
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1. Depending on their level, recommend suitable questions to be included in University question bank, separately for under-graduate and competitive (PGCET) examinations.
2. Detecting technical flaw if any and suggesting appropriate remedial measures while sensitizing question setters on the issue.

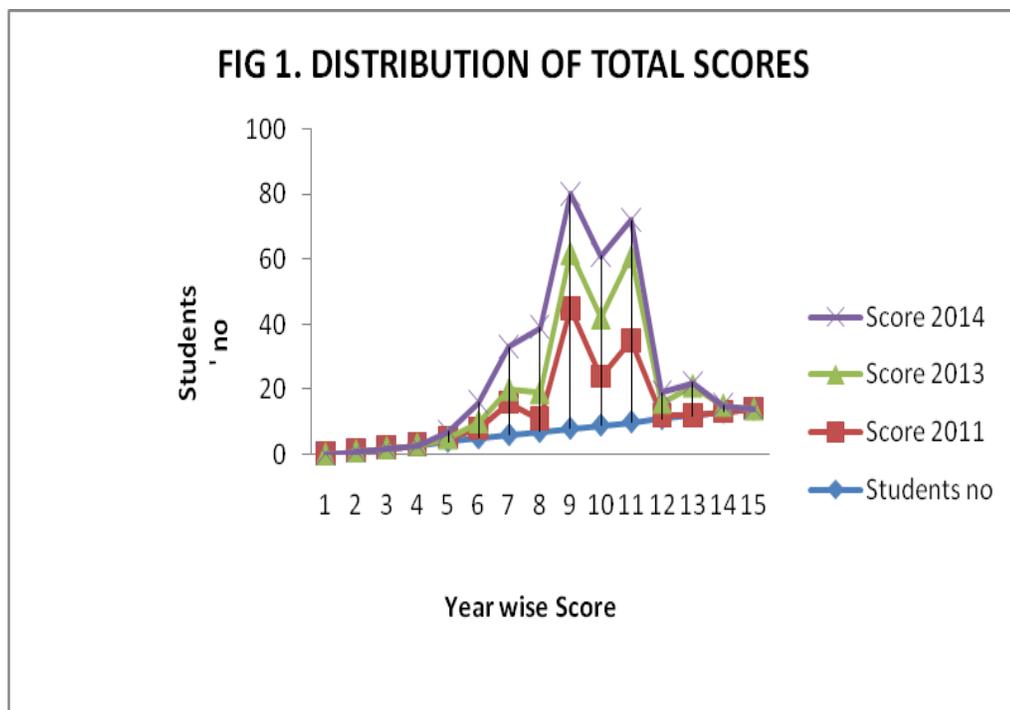
MATERIAL AND METHODS:

Inclusion criteria: Old question papers in Paediatrics for final M.B.B.S. annual examination held under the anonymous University for January 2012, 2013 and 2014 were collected (Annexure A, B, C) along with their model answer keys. 100 students each appearing their annual examination in the above 3 consecutive years were included. **Exclusion criteria:** Students and their respective scores in the middle 1/3rd of the merit list were excluded.

Procedure: Scores secured by all students were obtained with due permission from the competent authority and tabulated in order of merit in descending order for each year.

A frequency table was prepared in respect of each item and number of students of MGM Medical College, Kamothe in separate groups of high (In upper 1/3rd of merit) and low achievers (In lower 1/3rd of merit), responding to particular options (A,B,C,D, N/S) vis-à-vis their response to the correct key. (Annexure D, E, F).

The mean and SD were calculated, plotting scores obtained by all students year-wise (Fig: 1).



Item Analysis: MCQs for each year were evaluated separately for following indices:

1. **Difficulty index** (Percentage of total number students opting for the correct key) i.e.

$p = 100 (H + L) / T$ (H=High achievers i.e. higher 1/3rd, L=Low achievers i.e. higher 1/3rd, T=Total number of higher 1/3rd and lower 1/3rd achiever students)

2. **Discrimination index:** i.e. $d = 2 (H-L)/T$

3. **Distracter ineffectiveness:** If less than 5% of students have not attempted a particular distraction option. All the above data are summarized in table 1.

RESULTS:

p: Question as very difficult when <30%, acceptable between 30 –70%, too easy if > 70%. **d:** Discard if < 0.15, revise if 0.15-0.20, acceptable when 0.20-0.25, good when 0.25-0.35, excellent if >0.35. An options is **ineffective of distraction** if less than 5% students did not attempt the it.

Table-1: Consolidated indices in item analysis of final MBBS Paediatric MCQs

Year	No. of Students	No. of MCQs	Percentage								Distraction ineffective question & its option
			Too Easy	Acc	Very diff	Exc	Good	Acc	Rev	Dis	
Jan 2012	96	28	46	29	25	4	0	4	21	71	4(B), 5(B), 7(A), 8(D), 9(D), 10(D), 11(A),12(A), 17(A), 24 (A), 25(D), 28 (D) = 12
Jan 2013	96	28	18	61	21	15	21	18	21	25	5(D),7(B,C, D), 9(A,D), 12(A),15(CD), 18(A), 24 (B) 25(A,B,C), 26(D)=9
Jan 2014	96	28	18	43	39	11	0	29	0	61	1(D), 5(A), 8(D), 9(A,D), 10 (A), 15(B), 24 (B,C,D) 26(C) = 8

JANUARY 2012:

Difficulty index-Too easy 13 (46%), acceptable 8 (29%), very difficult 7 (25%). **Discrimination index** – Excellent 1 (4%), Good 0, acceptable 1 (4%), revise 6 (21%), discard 20 (71%). **Distraction ineffectiveness** – Distractive options of following Questions were found to ineffective: 4(B), 5(B), 7(A), 8(D), 9(D), 11 (A), 12 (A), 17(A), 24 (A), 25(D), 28(D)

JANUARY 2013:

Difficulty index-Too easy 5 (18), acceptable 17 (61), difficult 6 (21%). **Discrimination index** – Excellent 4 (15%), Good 6 (21%), acceptable 5 (18%), revise 6 (21%), discard 7 (25%). **Distraction ineffectiveness** – Following Questions having distractive options were found to be ineffective: 5 (D), 7 (B, C, D), 9 (A, D), 12 (A), 15 (C, D), 19 (A), 24 (B), 25 (A, B, C), 26 (D).

JANUARY 2014: **Difficulty index**-Too easy 11 (39%), acceptable 12 (43%) and very difficult 5 (18%).

Discrimination index – Excellent 3 (11%), acceptable 8 (29%), discard 17 (61%). **Distraction ineffectiveness** –

Following 8 questions having specified distractive options were found to be ineffective: 1(D), 5(A), 8(D), 9(A, D), 10 9A), 15 (B), 24 (B, C, D), 26(C).

DISCUSSION:

2012: Difficulty index (p) - Not an ideal MCQ paper on account of following short-comings. There are 'Too easy' questions to the tune of 46%, much higher than recommended limit of 10-20%. Questions in 'Acceptable' range are only 29% as against ideal 60 to 70%. However, combining with easy questions, both come to 65%. Difficult questions (25%) are slightly higher than recommended limit of 20%. On **discriminatory index (d)**, there are only 4 questions each to be considered as 'Excellent' and 'Acceptable'. Rest 92% either need revision (21%) or to be discarded (71%). 12 (20%) had at least one option having poor **distractive effectiveness**.

2013: Difficulty index (p) – A good MCQ paper having 18% 'Too easy' questions, 61% in 'Acceptable' range and 21% in the difficult questions (25%) are slightly higher than the recommended limit of 10 to 20%. As regards discriminatory index (d), 15% questions were considered excellent, 21% 'Good', best suited for inclusion in the question bank, particularly at competitive level. 18% were just in 'Acceptable' range. However, 46% questions need either revision (21%) or to be discarded (25%). 9 questions (20%) had at least one distractive ineffectiveness option in them, not qualifying for inclusion in question bank.

2014: Difficulty index (p) – 'Too easy' questions are of 39% and 'Acceptable' ones are 43% as against recommended range of 60 to 70%. In combination, both are in the range of 82%; making it a very liberal paper. Difficult questions (18%) are within the permissible limit of 10 to 20%. As regards discriminatory index (d), only 3(11%) are 'Excellent' and 12 (29%) are just 'Acceptable'. Rest 17 (61%) deserved discard; not qualifying to be included in the question bank. 8 questions (26%) had at least one distractive ineffectiveness option in them.

However questions having poor distractive effectiveness can be included in the question bank after altering the concerned invalid option with a better distractive one. Multiple spikes in the curve showing students' number wise distribution of total scores each year confirm lack of reasonable proportion between too easy, average and difficulty levels. Higher number of too easy questions, higher percentage of options having ineffective distractions and several items deserving rejections are few flaws detected under present study. At the same time, some were found to be of excellent, good and difficult category also. We did not deal to differentiate mere recall level questions from application oriented ones. In a study covering MCQs and SEQs in Biochemistry for the 1st batch MBBS students of a new medical college in Karachi, 76% questions were found to be of just recall type while 24% were at interpretation level. 30.43% of MCQs had implausible distracters. 27.4% of stems in MCQs were out of focus and 24.64% had unnecessary informations⁵. Analyzing medical journals as valuable resources for quality MCQs, less than 20% items were found in the areas of application, analysis, interpretation and problem solving with quality level variation between journals.

For high quality MCQs, it recommends journals to instruct to authors to strictly deliver on formal, predetermined and set quality criteria⁶. MCQs must target all levels of learning appropriate for the given content, cover over all items, stems and options. Flawed MCQs interfere with accurate, meaningful interpretation of test scores and negatively impact pass rate. Therefore, to develop reliable and valid tests, items are required to be flawless⁷.

CONCLUSION:

Item analysis of MCQ papers reveals existence of wide variation in difficulty level and their discriminative ability. There is a genuine need to review quality of contents. Due care to include questions as per recommended difficulty and discriminative indices are not being ensured, defeating the very purpose to use it as a valid tool to objectively test knowledge. MCQs may be validated each time before next examination for suitable rectification of weakness, besides enriching the question banks. While good and acceptable questions can be included for formative and summative assessments, difficult and excellent ones can be preserved for use in elimination oriented tests e.g. - P.G. entrance examinations and the like also. This is bound to improve evaluation quality, bringing in radical changes in examination system in terms of uniformity and objectivity. A structured faculty development program is the need of the hour, insisting on learning outcomes and measures of competency in objective terms at all levels, including feedback to students. The teaching faculty, question setters and moderators are required just to be trained and adequately sensitized about its importance and implication.

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