# FLAWS IN MCQS DESIGNED BY NURSE EDUCATORS AT A NURSING SCHOOL IN PESHAWAR, PAKISTAN

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## ABSTRACT

**AIM:** The overarching aim of this study was to assess the flaws in Multiple Choice Questions (MCQs) designed by nurse educators working at a nursing school in Peshawar, Pakistan.

**METHOD:** A case study approach was used to analyze 70 MCQs designed by 7 nurse educators at one nursing school of Peshawar, Pakistan.

**RESULTS:** Out of all 70 items analyzed, mean DF1 was 63.5+ 20%. Total 49(70%) items had "good to excellent" (DIF I between 31 - 60%) and 43 (61.4%) had "good to excellent" DI (> 0.25). Mean DI was 0.197+ 0.27. Poor DI (< 0.20) were noted in 26 items while undesirable negative DI were noted in 6 items showing poor preparation of students and also flaws in constructing these MCQs. Mean DE was 66.2% (139) considered as ideal/ acceptable while 71(33.8%) non-functional distractors (NFD) were noted. 22 (10.5%) of MCQs have a single NFD, 17(8.10%) have two NFDs while 5(2.38%) of the MCQs have three NFDs.

**CONCLUSION:** The aim of the Study was to emphasize on the construction of quality MCQs which truly assess the knowledge of the students and can differentiate the students of different abilities in correct manner.

**KEYWORDS:** Difficulty index DF1, discrimination index DI, distractor efficiency DE, multiple choice question or item, non-functional distractor (NFD)

## INTRODUCTION

The development of human resources (HRD) of health related manpower including medical and nursing schools play an important role in the economic and social prosperity of a nation. Assessment and examination of the medical and nursing undergraduate students in an efficient and effective way gives insight about progress in their learning and competencies. Most of the medical colleges and nursing schools use multiple choice questions (MCQs) or "items" for the assessment of their students. One of the public sector health sciences University is also using MCQs as an assessment tool in all its affiliated institutes and collages for the assessment of undergraduate students including nursing students. The quality of MCQs play an important role to give a good insight about the students' knowledge, so it should be free from all sort of flaws and weaknesses. For identifying the quality of a standard MCQs "Item analysis" are the techniques use to examines student responses to each and every individual test items (MCQs) for assessing the quality of these MCQs and to improve or revise items and the test. Assessing cognitive, affective, as well as psychomotor domain are the characteristic of a good and standard MCQ and therefore it is preferred over other methods of assessment because of its (1) objectivity in assessment, (2) comparability in different settings, (3) wide coverage of subject, and (4) minimization of assessor's bias. The evaluation of understanding and analyzing power of students besides assessing knowledge is also the characteristic of a good MCQ. Item analysis through calculation of difficulty index (DIF I) also denoted by FV (facility value) or P-value, discrimination index (DI), and distractor efficiency (DE) enables educators in identifying a good MCQ[1,2]. It also help the institute in developing a test bank of standard MCQs. As MCQs are given priority on other tools of assessment nowadays, so keeping in view the widespread use of MCQs in the students assessment and examinations, present study has been undertaken with an objective to evaluate

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MCQs or items and develop a pool of valid items by assessing with DIF I, DI, and DE and also to revise/store or discard items based on obtained results ([1]). An ideal item (MCQ) will be the one which has desirable difficulty index (DIF I between 30 and 70%), good discrimination index (DI ≥ 0.25) and maximum DE (100%) with no nonfunctional distractors [1,2].

## METHODS

A case study approach was used to achieve the aim of this study. Before starting the study a formal approval was taken from the head of the respective School of nursing. Informed voluntary consent was sought from participants. Then a purposive sample of 70 MCQs constructed 10 each by all the seven nursing teachers (1st 10 MCQs of each teacher) in different subjects for the semester exams were selected for item analysis. Out of total 70 MCQs 40 were taken from semester VI attempted by 40 students and the rest of 30 were selected from semester III attempted by 48 students of BScN. All the MCQs were single stem with 4 options including one being correct and the remaining three incorrect options/distractors. These all 70 MCQs and their 210 distractors were assessed for item analysis through calculating their difficulty index DFI/ P value, discrimination index DI and distractors analysis. The students were divided in 30% higher group H and 30 % lower group L for analyzing DFI and DI, while the rest 40% were in middle group and they were considered only for analyzing distractors[1].

The following formulas were used for calculating DFI and DI.

DIF I or p value = [(H + L)/N] × 100 and

DI = 2 × [(H − L)/N]

Where 'H' is the number of correct responses in high ranked group 'L' is the number of correct responses in low ranked groups and 'N' is the total number of students in both groups[1-3].

## RESULTS

The data collected were analyzed through MS Excel 2013 for calculating simple proportions and means of DFI, DI and NFDs. The result shows some flaws in the MCQs studied. Out of total 70 MCQs 49 (70%) were having desirable DFI (from 30-75%), 19 (27.1%) of the MCQs were easy with DFI >70% while 2 (2.9 %) of the MCQs were difficult MCQs with DFI < 30%. The mean DFI was 63.53 + 20.01 the overall result of DFI is presented in Table 1 while the percentages of DFI are show in chart A. and Table 1.

The mean discrimination index DI was 0.197 + 0.27. Out of total 70 MCQs 43 (61.4%) were having acceptable DI > 0.2, whereas 18 (25.7%) MCQs were noted with poor DI 0.2> 0. The number of MCQs with undesirable DI <0 or having –ve DI were noted in 2(2.9%) MCQs. Table 2 shows the DI analysis with percentages in chart B.

Out of total 210 distractors Analyzed the functional distractors (those selected by >5% students) were noted to be 139 (66.19%). Mean the remaining 71(33.81%) of the distractors were nonfunctional distractors NFDs. 26 (37.14%) of the MCQs had no NFDs. 22 (31.43%) of the MCQs had one NFD each, while 17(24.29%) of the MCQs had two NFDs and the remaining 5 (7.14%) MCQs had three NFDs. The overall analysis of distractors is shown in Table3 with percentages in chart C. Only 14 (20%) of the MCQs were noted with desirable DFI, DI and DE. Were as the remaining 56(80%) had flaws either only in DFI, DI or DE or had flaws in any two of these components and even some had flaws in all of these three component.

## DISCUSSION

Quality nursing care is one of the utmost characteristic of the nursing profession and it depends upon the
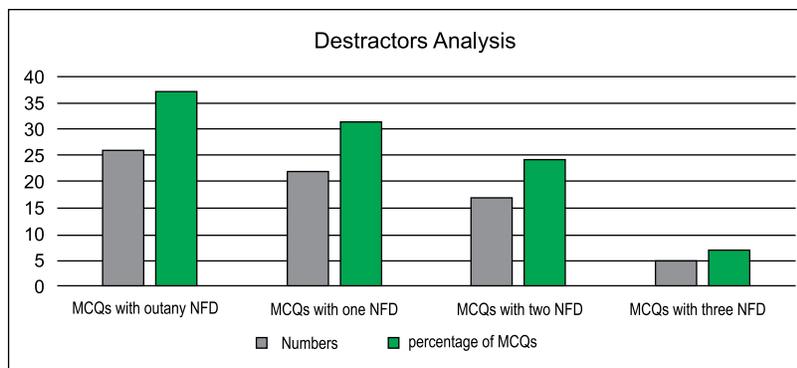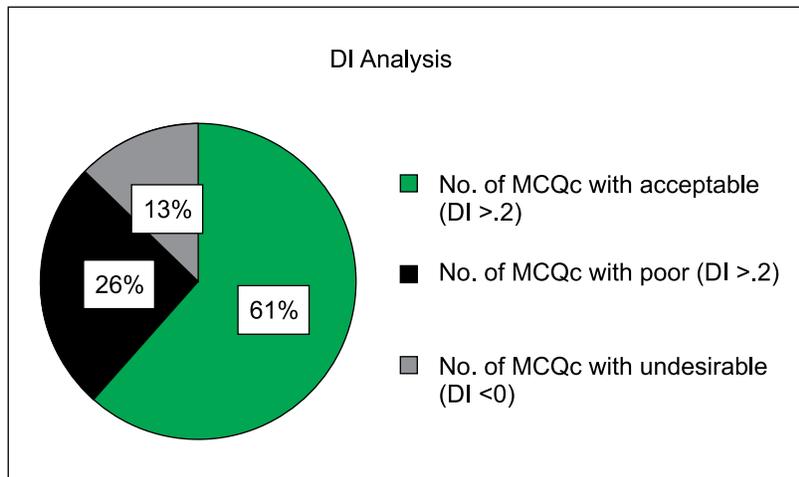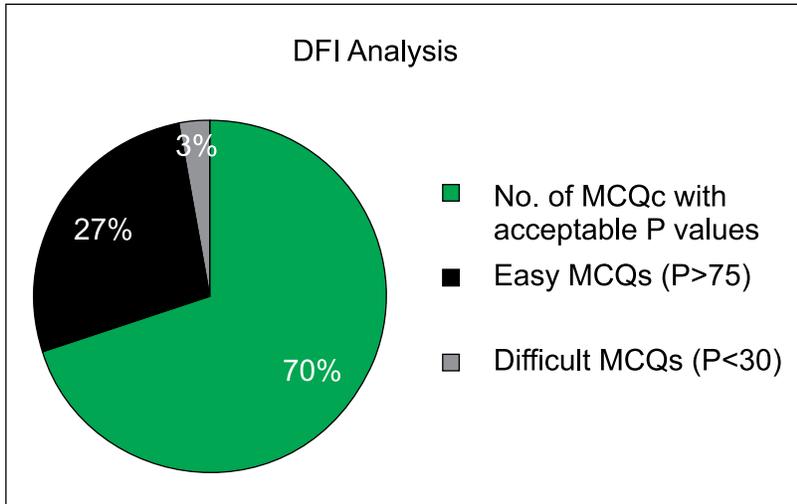
| Table 1. | | |
|---|---|---|
| Mean DFI | 63.53 | |
| SD DFI | 20.01 | |
| MCQs with acceptable DFI | 49 | 70.0% |
| Easy MCQs (P>75) | 19 | 27.1% |
| Difficult MCQs ( P<30) | 2 | 2.9% |

| Table 2. | | |
|---|---|---|
| Mean DI | 0.197 | |
| SD DFI | 0.27 | |
| MCQs with acceptable (DI >.2) | 43 | 61.4% |
| MCQs with poor (DI .2>0) | 18 | 25.7% |
| MCQs with undesirable (DI <0) | 9 | 12.9% |

| Table 3. | | |
|---|---|---|
| Total no. of distractors | 210 | %age |
| Nonfunctional distractors | 71 | 33.81 |
| Functional distractors | 139 | 66.19 |
| No. and %age of MCQs without any NFD | 26 | 37.14 |
| No. and %age of MCQs with one NFD | 22 | 31.43 |
| No. and %age of MCQs with two NFDs | 17 | 24.29 |
| No. and %age of MCQs with three NFDs | 5 | 7.14 |

## DFI Analysis



- No. of MCQc with acceptable P values
- Easy MCQs (P>75)
- Difficult MCQs (P<30)

3%
27%
70%

## DI Analysis



- No. of MCQc with acceptable (DI >.2)
- No. of MCQc with poor (DI >.2)
- No. of MCQc with undesirable (DI <0)

13%
26%
61%

## Destractors Analysis



MCQs with outany NFD    MCQs with one NFD    MCQs with two NFD    MCQs with three NFD

■ Numbers    ■ percentage of MCQs

instruction in writing MCQs, these MCQ or items often have item-writing flaws. An ideal item (MCQ) is the one having desirable difficulty index (DIF I between 30 and 70%), has good discrimination index (DI $\geq$ 0.20) and maximum DE (100%) with all of the three distractors are functional [2].

The study result indicates that there are certain flaw in the quality of MCQs so there is intense need to classify these MCQs in to different categories on the basis of different flaws it had. MCQs having desirable DFI, DI and no NFDs are standard MCQs will be considered to be stored in MCQs bank. Item difficulty is due to the fundamental characteristics of a MCQ which results in the frequencies of correct responses of students to the MCQ[1]. The Items analyzed in the study had flaws in all the three components including DFI, DI and DE. The mean DFI was 63.53$\pm$ 20.01 which is in acceptable range but still 2.9% of the MCQs have DFI < 30 (difficult) and 27.1% of the MCQs having DFI> 70 (easy). A study conducted by Gajjar, S (2014) had the mean DFI of 39.14% [2]. Those with DFI <30 need to be revised in a bit easy language while those with DFI > 70 need to be made little bit complex before considering for test bank. The mean DI in the study was 0.197$\pm$0.27 Those Items with poor DI (DI <2>0) is also needed to be revised. Distractor efficiency DE of the MCQs were also analyzed, all the 210 distractors were checked for its efficiency. A distractor selected by less than 5% students as a correct option were considered as nonfunctional distractor NFD. More NFDs in an item increase DFI and decrease DI while none or less NFDs decrease DFI and increase DI make an item a standard one. 33.81% of the distractors in the study were NFDs, efforts to be made to replace NFDs with ideal/plausible distractors.

### Limitations in the study

The primary limitation of the study was the diversity of student's

production of knowledgeable, skilled and efficient nurses through nursing schools. Quality education provides basis for the development of any profession including nursing profession, Assessment of the students in a standard way is one of the basic component of quality education. Bothe the formative and summative assessment has great effect on the learning process and is an important variable in directing the learners in a finicky way [1] among the variety of established tools for assessment Multiple-choice questions (MCQs) are frequently used to assess the students in medical and nursing disciplines [1]. However, few educators have formal

background, some of them had schooling from well reputed schools of the city so they are good in results while some are from backward areas with poor communication skills, this may affect the DFI of the study.

## CONCLUSION

Study items analyzed had flaws in all the three components, those with DFI <30 or > 70 need to be revised before considering for test bank. Those Items with poor DI (DI <2>0) is also needed to be revised whereas those with negative DI and having NFDs should be discarded. NFDs in Items need to be revised and to prepare ideal items, level of preparedness of students must be kept in mind and more efforts to be made to replace NFDs with ideal/plausible distractors. On the basis of project result it is further recommended that all new faculty should be offered sessions on how to develop standard MCQs and also about importance of quality review and item analysis. These sessions will help the new teachers to construct MCQs in a standard way and will also help the institute in constructing test bank of standard MCQs.

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