

Development and Validation of a Questionnaire to Measure Iranian Nurses' Knowledge, Attitude and Practice Regarding Disaster Preparedness

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ABSTRACT

Introduction: Despite the key role of Iranian nurses throughout disaster management, there is no instrument available to examine nurses' current disaster preparation levels.

Aim: The aim of this study was to develop and analyse the reliability and validity of a questionnaire on the nurses' knowledge, attitude and practice of disaster preparedness.

Materials and Methods: The scale was developed based on a comprehensive literature review and applied to 112 nurses in three public educational center affiliated to Ilam University of Medical Sciences, Ilam, Iran. Reliability was obtained using the test-retest method. Cronbach's alpha was used to verify

internal consistency. Exploratory factor analysis was used to assess the validity of the questionnaire.

Results: Explanatory factor analysis using varimax rotation revealed seven main factors associated with the nurses' knowledge, attitude and practice regarding disaster preparedness. The questionnaire overall internal consistency using Cronbach's alpha was 0.785, showing acceptable internal consistency. The intraclass correlation coefficient using Test-retest method was 0.82. Total variance was 67.57%.

Conclusion: The instrument has satisfactory reliability and validity indices and can be used to measure nurses' knowledge, attitude and practice regarding disaster preparedness.

Keywords: Disaster management, Emergency preparedness, Factor analysis, Iran, Scale development

INTRODUCTION

Disasters are complex physical, social, economic and political event that take place each day somewhere in the world and have intense impact on individuals, families and communities [1-4]. Factors such as rapid population growth since 20th century and climate change have led more people to predispose to disasters [5,6]. The incidence of natural disasters worldwide has steadily increased, especially since the 1970's; there was 80% increase in the growth of natural disasters from 1980 to 2009 [7]. Between 1994 and 2013, Emergency Events Database recorded 6,873 natural disasters worldwide, which claimed 1.35 million lives or almost 68,000 lives on average each year. In addition, 218 million people were affected by natural disasters on average per annum during this 20-year period [8]. In 2014, the number of reported worldwide disasters was slightly lower than the annual average reported from 2004 to 2013. However, about 8000 people were killed by natural disasters in 2014 [9].

Asia is one of the most disaster affected area in both the number of deaths and the number of disasters [5,10]. It has been estimated that more than 97% of natural disasters related deaths occur in developing countries which are disaster-prone places [5]. In 2015, Asia bore the brunt of major disasters reported globally of which Nepal devastating earthquake and flood in Chennai, India being the worst affected by disasters of 2015 [9]. Besides those natural disasters, there are man-made or technological disasters such as terrorisms, road accidents and fires which also typically occur more often in developing countries [2]. Iran is one of the most vulnerable countries to natural disaster [1,10,11]. Iran is also ranked as one of the top 10 countries in the world and fourth in Asia which is most frequently hit by natural disasters [2]. Due to geographical diversity almost all kind of natural disasters occur in Iran [2]. In 1999 a drought in Iran affected 37 million people

[1]. In terms of disaster mortality, the Bam earthquake in 2003 resulted in the highest casualty rate (26 thousand deaths) and the most profound social impact in the recorded post-1900 history of devastating urban earthquakes in Iran [1]. So, helping vulnerable countries better prepare for and manage disaster should be taken in such areas. One of the best ways to prepare for disasters in these areas is to educate and train nurses regarding disaster preparedness and response. Nurses are the largest division of the health system and are often the first healthcare staff on site after disasters [4]. Studies showed that the timely attendance of nurses to the affected zone may decrease nearly 20% of casualties and the death [2-4,11]. However, nurses are often inadequately prepared for disaster management [12]. Usher and Mayner study most of the volunteered nurses for a disaster event reported no previous preparedness for disaster response [3]. Studies showed that except for some developed countries disaster-nursing education is rarely provided at nursing schools and most of nurses are not prepared for mass casualty situations management which may postpone effective humanitarian responses [4,13]. There is also lack of evidence regarding how nurses perceive disaster education and preparation content [7]. It is undeniable that nurses should have appropriate knowledge and skills regarding disaster management but before discussion regarding nursing curriculum, it is necessary to examine nurses' current preparation levels [10,12]. Although there are few tools to measure nurses' disaster preparedness in English [14-16], there was no instrument available for use with Iranian nurses.

Considering these facts, this study aimed to develop a self-administered questionnaire on the knowledge, attitude and practice of nurses regarding disaster preparedness and assess its validity and reliability.

So, we undertook a factor analysis on baseline responses of the questionnaire.

MATERIALS AND METHODS

Scale development

The scale was developed based on a comprehensive literature review [1,6,10-13,16-23]. At first we identified studies regarding nurses' knowledge, attitude and practice of nurses regarding disaster preparedness [3,4,6,11-13,21]. Then, the questionnaire items and content was developed on collaboration with health specialist including an emergency nurse, an emergency physician, two nurse instructors and a disaster manager. The initial version of questionnaire was sent to three professionals in the areas of nursing, disaster management and statistics and also an educational instructor who was expert in the design and validation of such tools. So, they could appraise the importance and relevance of items and content, the fluency of language and the measurement scales. They were also asked to provide additional suggestions to incorporate in the next version of questionnaire. Then, a pilot study was carried out with 20 hospital nurses who did not participate in the final study. When nurses filled the questionnaire, we conducted a focus group and interviewed them to check the comprehension and clarity of the questionnaire. They were asked to report any ambiguity regarding understanding the items and identify the questions that were most difficult to understand. They were also asked to suggest changes for ambiguous items. Doubtful items reported by participants and their suggestions were recorded by researchers for possible reconsideration. The resulting questionnaire composed of two parts. The first part was to collect the demographic characteristics of nurses' including age, gender, years in experience, ward, education level and working hour per week. The second part consisted of 6 questions on knowledge, 11 questions on attitude and 6 questions on practice of nurses regarding disaster preparedness. The items were formulated so that participants could then evaluate their level of agreement with each item according to a three-point Likert scale ranging from 1 to 3. The total score of questionnaire ranged from 11 to 33 for attitude and 6 to 18 for each of knowledge and practice domains. Finally, once adjustments based on the nurses' comments were made, a cross-sectional study was conducted in three public educational center affiliated to Ilam University of Medical Sciences, Ilam, Iran. All of employed nurses in selected hospitals were invited to participate in the study. Finally, 112 nurses accepted to be enrolled in the study.

Validity and reliability of a questionnaire

The construct validity using exploratory factor analysis and Cronbach's alpha are two statistical methods that we used for measuring construct validity and internal consistency of the questionnaire [24]. Factor analysis tests, the hypothesized structure of the content domain. The two factor-analytic methods used for evaluating structural validity were Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). EFA is a statistical method used to identify the underlying relationships between measured variables and discover the latent variables (constructs or factors) that underlie the scale. On the other hand, CFA allows the researcher to test whether the hypothesized relationship between observed variables and their underlying latent constructs exists and also test alternative factor models to determine which provides the best fit [17]. To assess the questionnaire reliability (stability) a test-retest study was done with a convenience sample of 10 nurses on two occasions, with a two weeks interval.

Before the data collection, the study proposal was approved by the regional ethics committee of Ilam University of Medical Sciences. Next, researchers were referring to the three public hospitals from April to June 2015. After giving basic information, the study subjects were asked to participate in a session for data collection. All subjects who participated in the study gave informed consent.

DATA ANALYSIS

Continuous variables were reported as the mean value \pm Standard Deviation (SD). Cronbach's alpha coefficient was used as an estimate of the internal consistency of the questionnaire. Bartlett's test of sphericity was used to determine the degree of interrelations between variables for use in factor analysis. Kaiser-Meyer-Olkin Test (KMO) was used to determine sample adequacy. The KMO statistic ranged between 0 and 1. KMO value close to 1 indicates the sample efficiency and justifiability for factor analysis. Chi-square test, Comparative fit index (CFI) and root mean square error of approximation (RMSEA) were used as fit indices. CFI measures equal to or greater than 0.9 and RMSEA less than 0.05 displays the most acceptable fit index [25].

RESULTS

The study participants comprised of 112 nurses (50% male) with the mean age (SD) of 32.5 (± 6.08) for male and 34.8 (± 7.5) for female. Most of participants had a bachelor degree (85%) in nursing and 33% had 5–10 years of clinical experience. The values of KMO and Bartlett's Test showed in [Table/Fig-1]. As shown in that table the KMO measure of sample adequacy was 0.761 and Bartlett's test of sphericity was $\chi^2 = 346.03$ ($p < 0.0001$). The mean of participants score in each of knowledge, attitude and practice are domains are showed in [Table/Fig-2]. Also, the correlation of questionnaire domains depicted in [Table/Fig-3]. As shown in [Table/Fig-3] each of domains was statistically correlated with other domains. Explanatory factor analysis using varimax rotation revealed seven main factors associated with the nurses knowledge, attitude and practice regarding disaster preparedness which included: 1- familiarity with disaster management [12-17]; 2- training using disaster simulation [5,10,11]; 3-educating others regarding disaster management [3,7,9]; 4- having plan for unpredicted disasters [6,8]; 5- taking part in disaster maneuvers [18,20,22]; 6- possible threats to disaster management [4], and 7-preparedness during disasters [2]. The first factor accounted for 17.7% of the total variance and the second factor accounted for an additional 10%, while the other factors contributed less to that variance [Table/Fig-4]. For this CFA model, the chi-square value was 1939 ($p < 0.05$). RMSEA value was 0.058 which signify good fit index. The CFI value was 0.92 which meet the criteria (0.9 or higher) and indicate acceptable model fit.

Kaiser-Meyer-Olkin measure of sampling adequacy	0.761
Bartlett's Test of Sphericity	
Approx. Chi-Square	346.037
df	190
significance	<0.0001

[Table/Fig-1]: The values for KMO and Bartlett's test.

Questionnaire domains	Mean(SD)	Range
Knowledge	9.5(± 3.78)	6-18
Attitude	27.35(± 2.39)	21-33
Practice	3.88 (± 1.16)	3-7
Total	40.73 (± 7.33)	30-58

[Table/Fig-2]: The mean of participants score in each of knowledge, attitude and practice domains.

Questionnaire domains	Knowledge	Attitude	Practice	Total
Knowledge	1			
Attitude	0.725	1		
Practice		0.815	1	
Total			0.794	1

[Table/Fig-3]: Pearson's correlation between questionnaire domains.

Reliability

Internal consistency and test-retest were used as estimators of reliability of questionnaire. Cronbach's alpha was computed for

Factor	Items	Eigenvalue	Variance (%)	Cumulative percentage
1. Familiarity with disaster management	12,13,14,15,16,17	3.543	17.715	17.715
2. Training using disaster simulation	5, 10,11	2.095	10.476	28.192
3. Educating others regarding disaster management	3,7,9	1.782	8.910	37.102
4. Having plan for unpredicted disasters	6,8	1.705	8.523	45.625
5. Taking part in disaster maneuvers	18,20,22	1.466	7.331	52.955
6. Possible threats to disaster management	4	1.464	7.318	60.273
7. Preparedness during disasters	2	1.460	7.302	67.576

[Table/Fig-4]: Results of the factor analysis.

Domains	Cronbach's alpha
Knowledge	0.652
Attitude	0.610
Practice	0.585
Total	0.785

[Table/Fig-5]: Internal consistency for each of questionnaire domains.

each domain and total scale to measure internal consistency. As a whole, the questionnaire internal consistency using Cronbach's alpha was 0.785, showing acceptable internal consistency. Cronbach's alpha coefficient for each of questionnaire domains are showed in [Table/Fig-5]. Test-retest scores were strongly and significantly associated with a correlation of 0.82.

DISCUSSION

The first step in the preparedness of nurses regarding disaster management was to identify what nurses really know and believe about disaster management. The development and validation of a scale that measure nurses knowledge, attitude and practice regarding disaster preparedness is essential in the attempt to design and implement effective disaster preparedness education curricula and continuing education programs. So, such programs could be helpful in preparing nurses to respond effectively in these difficult situations. According to extensive review of literature this is one of first studies which developed a valid questionnaire that specifically measure nurses knowledge, attitude and practice regarding disaster management. The use of confirmatory factor analysis meets a high standard for validation of a new scale. This validation study revealed that the questionnaire had good internal consistency and reproducibility. The exploratory factorial analysis showed seven factors, in which the items weighed down on a given factor had some shared conceptual meaning and on the other side, the items in different factors measured different concepts. Also, high correlation between items in each of factors showed their congruence.

Regarding internal consistency, the lowest value which would be indicative of a test as having good internal consistency is 0.7 or greater. In our study Cronbach's alpha measure reached the recommended level for clinical use and the test-retest statistic examination revealed good stability of the responses to the items of questionnaire over time. Exploratory factor analysis also identified seven factors accounting for 67.57 % of the variance. It has been recommended that item extraction should continue until the researcher reaches at least 60% variance [24,26]. So, the variance explained by these factors in our study can be considered appropriate. Al Khalailah et al., also conducted a study to determine psychometric properties of Arabic version of Disaster Preparedness Evaluation Tool. They found three factors explained

64% of the variance which include knowledge, skills and post disaster management [16].

LIMITATION

Despite the strength of this study, it also has some limitations. First, a convenience sample of nurses in three public educational center in west of Iran do not represent variation of all the country population. In relation to future research, the scale should be used with larger samples across other hospitals of Iranian provinces. Second, the ambiguity regarding the role of Iranian nurses in disaster management and their lack of competency for providing care in disaster situation might influence their responses to questionnaire items.

CONCLUSION

In conclusion, our newly developed scale to measure nurses' knowledge, attitude and practice regarding disaster preparedness has adequate validity and reliability for use in surveys in Iran. Having baseline information regarding nurses preparedness status could help health policy makers to provide nurses training courses and put these training in academic curriculums.

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