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The Effect of Nurses' Disaster Management Training Program on their Knowledge and Attitudes

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Abstract: **Disasters have a potential of producing mass casualties thereby, straining the health care systems, which need to be prepared for an unusual increase in workload. Aim: to determine the effect of nurses' disaster management training program on their knowledge and attitudes, in critical care units at Alexandria Main University Hospital. Methods: a quasi-experimental, interventional research design was utilized. Setting: The study was conducted at Alexandria Main University Hospital; in all critical care units (N=4), namely: First, Second Third and Fourth Units. Subjects: All nurses were included (N = 66). Tools: The data was collected through self-administered questionnaire encompassing two tools: Tool (I): Disaster Management Knowledge Questionnaire. Tool (II): Disaster Management Attitudes Questionnaire. A demographic characteristics questionnaire was developed. Results: Statistically significant differences were found immediately after and after three months from attending the training program regarding total nurses' knowledge and its three domains of disaster management. Moreover, significant improvements were found for total nurses' attitudes regarding disaster management at immediately after and after three months from attending the training program. Conclusion: nurses' disaster management training program had highly statistically significant differences on their knowledge and attitudes, between before, immediately after and after three months from training program, in critical care units at Alexandria Main University Hospital. Recommendations: implementing training programs for all health care providers to extend their awareness about disaster management. Also, conducting nursing research in disaster in order to provide information to make evidenced-based decisions regarding disaster management practice and education.**

Keywords: **Nurses, disaster management, training program, knowledge, attitudes.**

1. INTRODUCTION

Hospitals are the greatest important part of the health care delivery system that provide services to the public in regular daily life and during emergency incidents imposed by disasters and crisis [(1)]. The nursing profession plays a dynamic role to get ready for and react to disasters. Nurses are often called upon to play the role of first responders when any disaster occurs. They are often the first health care personnel, who will be as first handlers, direct nursing care providers, on-site care coordinators, information and evidence providers or educators, and triage officers when disasters occur [(2, 3)].

A disaster is defined as: "a lethal disruption of the operational functioning of a community or a society producing widespread human, physical material, economic and environmental losses that exceed the capability of the affected community or society to cope and handle using its own resources" [(4,5)]. Furthermore, it is viewed as: "a sudden, catastrophic event that seriously disturbs the functioning of a society and causes superfluous victims that exceed the community's or society's ability to manage by means of its own resources. It is often triggered by nature or it can have

human origins" [6]. Moreover, it seen as: "a sudden astonishing event that brings countless harm, loss, devastation and injury to individuals and surrounding environment" [7].

The South African National Disaster Management Centre (SANDMC) (2014) [8] classified disaster into two main categories: natural and man-made disasters. Natural disasters are events produced by natural phenomenon as: earthquakes, storms, floods, and others. On the other hand, man-made disasters are catastrophic events caused by human action as: wars, industrial accidents, terrorist attacks, and others [8]. Disasters can take numerous diverse profiles and shapes and can be extended from an hourly disturbance to days or weeks of progressing obliteration and eradication. This extent is greatly depending on the preparedness and readiness of health care organizations to deal with disasters [2, 8].

Hospitals are considered among the first organizations to be affected after a natural or man-made disaster [9]. Since there are heavy demands placed on nursing care at the time of a disaster, hospitals need to be prepared to handle such an unfamiliar nursing workload. Disaster management is a never-ending cycle of planning, organizing, training, equipping, evaluating, and taking corrective actions to ensure effective coordination during disaster response [10]. In other words, it is an ongoing process intended to assure and guarantee hospital resilience and functioning during disasters with reducing total morbidity and mortality [11,12]. Disaster management is crucial to provide adequate health care and address the challenges of disasters. The hospital disaster management has therefore taken an increased importance at local, municipal and national levels [13]. It is characterized by the organization and management of assets and commitments for managing all angles of disasters in specific readiness to reduce the consequences of disaster and accomplish a quick and successful recovery [14]. This necessitates a well-documented and verified disaster management plan in every hospital; as well as, frequent nurses' training to increase their knowledge and improve their attitudes about management of mass casualties of disasters [15,16].

The nurses' knowledge about disaster management can be evaluated through three major domains: ***(1) core concepts*** [17,18]; including: ***disaster***; ***disaster management*** that is the organization and management of diverse types of resources and responsibilities for dealing with all aspects and parts of disasters [18]. ***Crisis*** is unexpected and uncontrollable event that disturb or impede the normal operation of an organization or community. ***Crisis management*** is the process by which any organization deals with a troublesome and unexpected event that threatens or damage the organization and/or its stakeholders [17]. ***Emergency*** is a serious situation or occurrence that happens unexpectedly and demands immediate action. It is a condition of urgent need for action or assistance [17,18]. ***Hazard*** is any phenomenon, substance or situation, that has the potential to cause disruption or mutilation to individuals, their property, their services and their surrounding environment [18]. ***Vulnerability*** is any factor or constraint of an economic, social, physical or geographic nature, that decrease the ability to prepare for and cope with the impact of hazards. Finally, ***risk*** which is the probability that negative consequences may arise when hazards interact with vulnerable areas, individuals, property and environment (Risk R = Hazard (H) x Vulnerability (V)) [17,18].

Furthermore, ***(2) disaster management phases:*** mitigation, preparedness, response and recovery [19-23]. ***Disaster mitigation*** is a type of long-term, pre-disaster planning that involves continuous structural and non-structural efforts to eliminate forthcoming consequences of disasters [19]. Mitigation plans and activities are considered the cornerstone of disaster management and are ongoing process, with recurrent reassessment to ensure proper disaster preparedness. Some examples may include: promoting disaster insurance; redesigning the structure of organizations; raising or moving buildings from disaster zones; and following safety standards of building materials and apparatuses [19,20].

In respect to ***disaster preparedness***, it is the practical state of readiness to respond to any disaster and include plans or preparations made in advance of any disaster that help individuals and communities in getting ready to either respond or to recover [19, 21]. It aims to achieve a satisfactory level of readiness to respond to any emergency situation. These measures can be described as logistical readiness to deal with disasters and can be enhanced by having response mechanisms and procedures, developing long- and short-term strategies, media and public awareness, the stocking of standby food and water; the gathering and screening of willing community volunteers or citizens education and evacuation plan, holding disaster rehearsals and drills, installing smoke detectors, development of hospital disaster plans, and building early warning systems [20].

Concerning ***disaster response***, it is an immediate reaction or relief, or any actions taken immediately following an emergency, including efforts to save lives and to prevent further property damage [20, 21]. Ideally, disaster response involves putting already established disaster preparedness plans into action. It is what the public classically thinks of when imagining a disaster, such as: flashing lights, implementation of evacuation plan, search and rescue and providing shelters for the victims. Health care and psychosocial intervention responses start in this phase, with the focus to satisfying the basic needs of the victims until sustainable community has been achieved. It may continue even when recovery phase can already start [21-23].

As regard to ***disaster recovery***, it is the process of repair and restoration, as it involves restoring, bringing back, rebuilding, and reshaping the impacted zone [20, 21]. It starts after damages have been assessed and adequate response efforts are achieved and still on-going. It encompasses actions intended to return the affected community to its pre-disaster state or better. As disaster is brought under control, the affected population can undertake a growing number of activities aimed at restoring their lives and the infrastructure that supports them. Recovery activities continue until all systems return to normal or better. These measures, both short and long-term, intended to return vital life-support systems to the minimum operating standards, such as: temporary housing, public awareness, health and safety education, continued health care monitoring, reconstruction of vital services, counseling programs and donations and grants [20-22].

Lastly, (3) ***nurses' awareness and training about disaster management***, any health care organization can teach nurses a culture of disaster management and preparedness by developing educational curricula, conducting disaster drills, advancing instructions and raising mindfulness of organization disaster management plans [24, 25].

2. SIGNIFICANCE OF THE STUDY

Disasters are a universal issue with impulsive impact especially for the affected communities [26]. According to the World Health organization (WHO) (2016) [27], global natural disasters caused economic losses of 210 billion dollars; with approximately 8.250 human fatalities [27]. Moreover, in 2017, 335 natural disasters worldwide affected over 95.6 million people, resulting in killing 9.697 people and costing a total of 335 million dollars [28]. Egypt has been susceptible to a multiplicity of natural and man-made disasters. Also, urban disasters and severe accidents are also frequent and quite often, resulting in massive disaster situations [29]. Since 1980 till 2015, Egypt was exposed to 23 natural disastrous events that affected 262.864 persons, killing 1.927 persons and costing the nation 1.342.000 dollars [26].

Historically, Egypt witnessed several types of disastrous events that hit the country till nowadays [30]. Examples of such events include, but not limited to: the earthquake that occurred in 1992, which caused damage to more than 5000 buildings and killed 560 individuals; the massive local attack of locusts' swarms on the southern and western borders of Egypt with Sudan and Libya in 2004; the massive landslide, in Cairo, in 2008; the Alexandria train collision on August 2017, near Khurshid station, in the suburbs of the eastern edge of Alexandria; lastly, the Ramses railway station disaster that occurred on February 2019. These events killed thousands of Egyptian people and cost the nation millions of dollars [31]. Recent studies indicated that Egypt will be exposed to risks posed by climate change and is prone to natural shocks such as heat waves, cold waves, flash floods, earthquakes and anticipated sea level rise in the northern region [32, 33]. As nurses constitute the largest and major group of health care providers, their readiness to respond to disaster and to participate in management and recovery activities are significant in making a community more resilient against disaster [34].

AIM OF THE STUDY

The aim of this study was to determine the effect of nurses' disaster management training program on their knowledge and attitudes, in critical care units at Alexandria Main University Hospital.

RESEARCH HYPOTHESIS

H1: Nurses' knowledge is significantly and positively improved after attending disaster management training program, in critical care units at Alexandria Main University Hospital.

H2: Nurses' attitudes are significantly and positively improved after attending disaster management training program, in critical care units at Alexandria Main University Hospital.

3. MATERIAL AND METHODS

3.1. Research design: a quasi-experimental, interventional research design was utilized.

3.2. Setting: The study was conducted in all critical care units, at Alexandria Main University Hospital (N=4), namely: First, Second, Third and Fourth Units. It is the main university hospital, affiliated to Alexandria University and is equipped with 1,825 beds. The capacity of critical care units includes 100 beds in the previously mentioned four units. Alexandria Main University Hospital is the largest teaching hospital at Alexandria city. It provides wide range of services to all populations from Alexandria and nearest governorates, such as: emergency services, medical, surgical and critical care services, radiology, pharmacy, laboratory, physiotherapy, outpatients and para-medical services, as: dietary, maintenance, …etc. Moreover, it provides teaching and clinical training services for medical and nursing students and setting for wide range of scientific researches.

3.3. Sample:

All nurses, who were working in the previously mentioned settings with at least six months of working experience and who are available at the time of data collection, were included. (N = 66)

3.4. Tools of the study:

The data was collected through self-administered questionnaire encompassing two tools:

Tool (I): Disaster Management Knowledge Questionnaire, that was developed by researchers after thorough review of related literature [2-6, 19-25]. It was used to measure nurses' knowledge about disaster management. It has 40 items, grouped into three domains, namely: core concepts (10-item); disaster management phases (20-item); and nurses' awareness and training about disaster management (10-item). All questions were organized in accordance with training program content with total score 80 degrees. ***Scoring System:*** The score "two" was given for correct answer; "one" was given for incomplete answer and "zero" for incorrect answer. The total nurses' knowledge was considered good if Knowledge ≥ 75%, fair 50-<75%, and poor knowledge ≤ 50%.

Tool (II): **Disaster Management Attitudes Questionnaire.** It was developed by researchers after thorough review of related literature [1,4,7,10, 19-25]. to measure nurses' attitudes about disaster management. It contains 30 items. ***Scoring System:*** Responses were measured on 5-point Likert rating scale ranging from (1) strongly disagree to (5) strongly agree. Reversed score items were applied for negative statements. The scores of the items were summed-up and the total divided by the number of the items, giving a percent score. Nurses' attitude was considered positive if the percent score was ≥ 50% and negative if < 50%.

In addition, ***Demographic Characteristics Questionnaire*** was developed and included: age, educational qualification, current working unit, years of nursing and unit experiences.

Methods:

- An authorized approval was obtained from the Director of Alexandria Main University Hospital and the head of departments in which the study was conducted. Researchers introduced the research purposes to nursing administrators for better cooperation, and to motivate nurses to actively participate in the study.

- Tools (I and II) were translated into Arabic and revised by panel of seven experts: five bilingual academic professors and two assistant professors from nursing administration, to test its content and face validity, to give their recommendations regarding the tools' contents and the clarity of items. Their comments were taken into consideration for ensuring accuracy and minimizing potential threats to the validity of the study.

- Test-retest reliability was executed for the two tools, with two weeks interval to investigate the stability of the tools overtime, it was found to be reliable (r = 0.88 and 0.78), respectively. Also, the study tools were examined for reliability by measuring the internal consistency of items using Cronbach's Alpha Coefficient test. The two tools proved to be reliable (α = 0.87) for tool one and (α =0.79) for tool two, at a statistical significance level where p ≤ 0.05.

- **Pilot study:** it was carried out, to test the clarity, feasibility and applicability of the study tools, on (10%) of the study subjects (N= 7), who were excluded from the study subjects. Accordingly, some modifications were done.

Subsequently, the study was conducted through three consecutive stages: planning, implementation and evaluation.

• ***Planning and preliminary stage:*** The researchers explained the aim of the study to nurses. The initial assessment was planned to assess nurses' needs, knowledge and attitudes about disaster management, by filling the questionnaire sheets at their working units and returned it back to the researchers, who were present to answer any questions and prevent knowledge contamination (tool I and II).

Afterwards, the disaster management training program was organized, as follow: the objectives and content were established; designing handout was based on the analysis of data obtained from nurses at the initial assessment and based on the review of related literature; theoretical and practical contents were developed; instructional media was used, such as: role play, brainstorming groupwork, case study and video. The handout was reviewed by the previously mentioned panel experts. Consequently, some changes were done; then, the last handout form was established. Place and time for the sessions were approved by head nurses and nurses according to their work schedule and off days to prevent disturbing their work times and patient care.

• ***Implementation stage:***

Nurses were divided into 6 groups, each group involved 10-11 nurses. Each session took approximately two hours (total 18 sessions). Each group was given three consecutive sessions (total time 6 hours/group) to cover the content.

First session, it was aimed to establish relationship with nurses, then introduce general and specific objectives of disaster management, core concepts of disaster management by differentiating between: disaster, disaster management, crisis, crisis management, emergency, hazard, vulnerability and risk with clarifying examples on each concept. ***Second session*** focused mainly on disaster management phases, namely: disaster mitigation/prevention; disaster preparedness; disaster response; and disaster recovery. Moreover, activities to be practiced in each phase; the importance and methods of nurses' training and awareness about disaster management. ***Third session*** was mainly centered on the practical part of disaster management. Content of the training program was delivered using relevant and interactive teaching strategies according to the information presented including (interactive lecture, brainstorming, small group discussion, role play, groupwork and case studies). Instructional media, as video presentation was used; handout and visual materials through laptop. The Handout was circulated to nurses prior to the sessions to enhance their awareness. Sessions were provided to nurses in the lecture hall at their working unit, during morning shift and sometimes during evening shift. Following every session, structured feedback was performed by nurses and the researchers on how to increase their understandings.

• ***Evaluation stage:***

Data was collected, using study tools (tool I and II) to determine the effect of disaster management training on nurses' knowledge and attitudes, at immediately after and after three months from training program implementation; compared to pre-implementation. These were delivered among nurses at their working units. The two tools took approximately from 25 to 40 minutes/participants. The data collection took 7 months started from the beginning of November 2018 till the end of May 2019.

Ethical considerations: the aim of the study was explained to subjects and oral informed consent was obtained from them for their participation in the study. Confidentiality, privacy and anonymity of subjects were maintained; as well as their right to withdraw at any time, from the research, were assured without any consequences.

Statistical analysis*:* Data were collected, tabulated, and analyzed statistically using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22. The following statistics were applied. ***1. Descriptive statistics:*** in the form of frequencies, percentages, mean and standard deviation. ***2. Analytical statistics:*** The **McNemar test** is used on paired nominal data to analyze the significance between the three stages; and **Correlation coefficients** are used to measure the strength of the relationship between two variables. All statistical analysis was done using two tailed tests and alpha error of 0.05. Regarding P value, it was considered that: non-significant (NS) if $P > 0.05$, Significant (S) if $P < 0.05$ and Highly Significant (HS) if $P<0.01$.

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4. RESULTS

Table 1 illustrates that mean age of the studied nurses was 36.98±13.43; the highest percentage of them (40.9 %) had from 30-<40 years old. Above one third of them (37.9%) hold Bachelor of Nursing Sciences. Less than one third (30.3%) of them were working in the First Unit; compared to 15.2 % of them, who were working in the Fourth Unit. Additionally, more than one half (56.1%) of them had from 5-<10 years of nursing experience; contrasting to, 40.9 % of them with the same years of current working unit experience. Nearly three quarters of them (74.2%) mentioned that they did not attend previous training program on disaster management.

Table (2) indicates that high statistically significant differences were found between pre, immediately after and after three months from attending the training program regarding nurses' knowledge domains, namely: core concepts; disaster management phases and nurses' training and awareness about disaster management (P<0.001). Regarding core concepts of disaster management domain, approximately three quarters (74.2 %) of the studied nurses reported poor knowledge at pre-implementation; compared to 77.3% and 71.2% of them, who reported good knowledge (at immediately after and after three months from attending the training program), consecutively. As for disaster management phases, 78.9% of nurses had poor knowledge before attending the training program; while the majority (80.3%) and (74.2 %) of them had good knowledge, immediately after and after three months from attending the training program, respectively. Concerning training and awareness about disaster management, the majority (80.3%) of the studied nurses mentioned that they have poor knowledge, before attending the training program; contrarily, the majority (84.8%) and more than three quarters (77.3%) of them acquired good knowledge immediately after and after three months from attending the training program, respectively.

Fig. (1) shows that total nurses' knowledge percent scores were good, immediately after and after three months from attending disaster management training program (91% and 88 %), respectively; compared to 83 % of them with poor knowledge prior to program implementation.

It is concluded from Fig. (2) that the majority of the studied nurses have positive attitudes toward disaster management, at immediately after and after three months from attending the training program (93% and 87 %), consecutively; compared to 89 % of them, who had negative attitudes toward disaster management before the program.

Table (3) clarifies that there were no statistically significant differences between nurses' total knowledge mean scores and demographic characteristics, namely: age; educational level; working unit; years of both experiences nursing and current working unit (P > 0.05). On the other hand, there were high statistically significant differences between nurses' total attitudes mean scores and all demographic characteristics (P<0.001); except working unit which was significant difference (P<0.05).

As evident in Table (4), strong high positive significant correlations were found between total nurses' knowledge and total attitudes towards disaster management (r = 3.142, p <0.001).

Table (1): Demographic characteristics of the studied nurses. (N=66)

Demographic characteristics	Nurses (N = 66)	
	No.	%
Age		
< 30	9	13.6
30-<40	27	40.9
40-<50	19	28.9
50-60	11	16.6
Age (mean ± SD)	36.98±13.43	
Educational level		
Diploma of Secondary Nursing School	23	34.8
Diploma of Technical Institute of Nursing	18	27.3

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Demographic characteristics	Nurses (N = 66)	
	No.	%
Bachelor of Nursing Sciences	25	37.9
Current Working Unit		
First Unit	20	30.3
Second Unit	19	28.8
Third Unit	17	25.7
Fourth Unit	10	15.2
Years of experience in Nursing		
1-<5 years	16	24.2
5-<10	37	56.1
≥10 years	13	19.7
Years of experience in current working unit		
1-<5 years	23	34.8
5-<10	27	40.9
≥10 years	16	24.3
Attendance of previous training program on disaster management		
Yes	17	25.8
No	49	74.2

Table (2): Percent scores distribution of the studied nurses regarding disaster management knowledge, at pre, immediately after and after three months from attending disaster management training program. (N=66)

Disaster Management Knowledge Domains		Disaster management training program (N=66)						McN p
		Pre		Immediately after		After 3 months		
		No.	%	No.	%	No.	%	
Core concepts (10 items)	Good	7	10.6	51	77.3	47	71.2	<0.001**
	Fair	10	15.2	12	18.2	14	21.2	
	Poor	49	74.2	3	4.5	5	7.6	
Disaster management phases (20 items)	Good	3	4.5	53	80.3	49	74.2	<0.001**
	Fair	11	16.6	12	18.2	15	22.7	
	Poor	52	78.9	1	1.5	2	3.1	
Nurses' training and awareness about disaster management (10 items)	Good	3	4.5	56	84.8	51	77.3	<0.001**
	Fair	8	12.2	10	15.2	14	21.2	
	Poor	55	83.3	0	0.0	1	1.5	

McN: McNemar test; **highly significant at P<0.01

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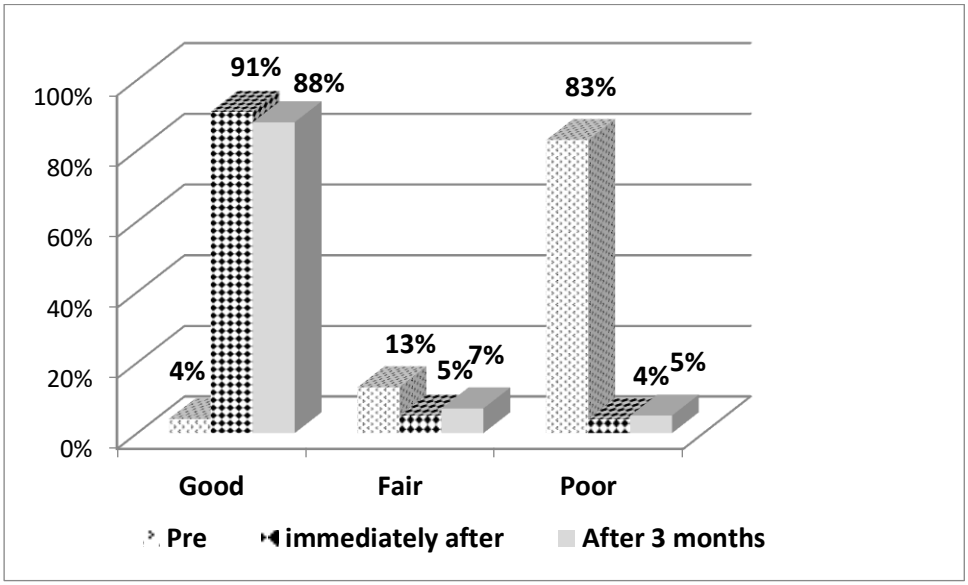

Good Knowledge≥ 75%; fair 50-<75%; poor ≤ 50%

Fig. (1): Distribution of total nurses' knowledge percent scores regarding disaster management, at pre, immediately after and after three months from attending the training program (N=66).

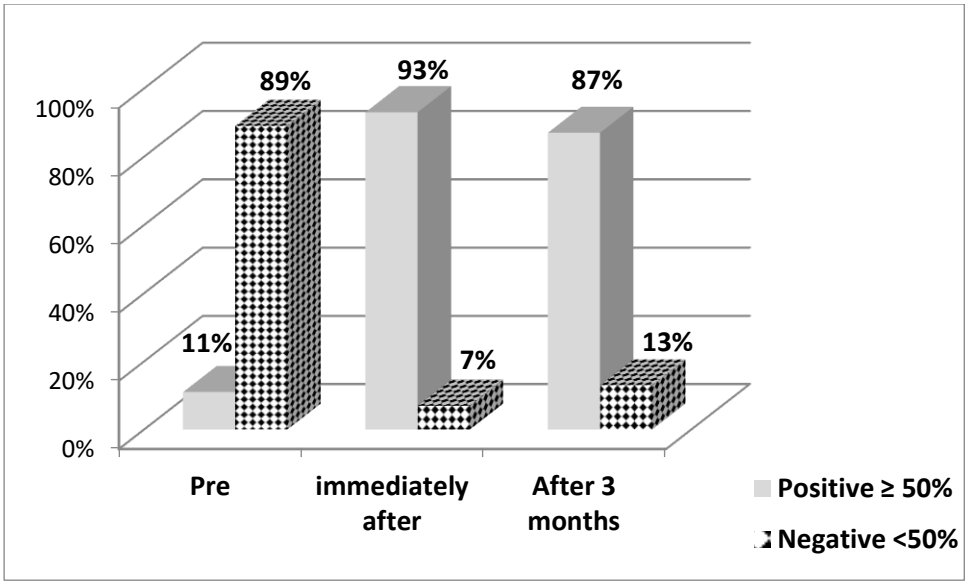

Fig. (2): Distribution of total nurses' attitudes regarding disaster management, at pre, immediately after and after three months from attending the training program (N=66).

Table (3): Relationship between the studied nurses' demographic characteristics and their total disaster knowledge and attitudes mean scores following disaster management training program (N=66).

Demographic characteristics	Total Disaster Management			
	Knowledge		Attitudes	
	Mean	SD	Mean	SD
Age				
< 30	18.321	1.301	11.643	1.924
30-<40	21.325	2.985	15.362	1.215
40-<50	21.927	2.113	15.846	1.121
50-60	19.397	1.021	14.524	1.390

Demographic characteristics	Total Disaster Management			
	Knowledge		Attitudes	
	Mean	SD	Mean	SD
P value	3.320		.002**	
Educational level				
Diploma of Secondary Nursing School	17.654	1.209	13.325	1.320
Diploma of Technical Institute of Nursing	14.985	1.360	13.941	1.846
Bachelor of Nursing Sciences	16.325	1.953	16.259	2.374
P value	4.541		.000**	
Current Working unit				
First	25.369	2.305	21.652	1.095
Second	23.179	2.369	18.361	1.387
Third	26.391	2.159	20.357	1.621
Fourth	23.619	2.347	19.301	1.258
P value	4.951		.018*	
Years of experience in nursing				
1-<5 years	24.139	3.214	19.368	1.205
5-<10	24.397	3.910	21.647	2.351
≥10 years	23.981	2.367	19.294	1.254
P value	5.347		.001**	
Years of experience in the current working unit				
1-<5 years	23.620	1.893	18.361	2.154
5-<10	25.634	2.624	20.214	1.320
≥10 years	23.479	1.937	19.698	1.891
P value	5.982		.000**	

*Significant at level P< 0.05**;** **highly significant at P<0.001

Table (4): Correlation matrix between the studied nurses' total knowledge, its domains and total attitudes toward disaster management (N = 66).

Total disaster management knowledge and its domains		Total disaster management attitudes
Core concepts (10 items)	**r**	1.489
	P	.091
Disaster management phases (20 items)	**r**	.635
	P	.002**
Nurses' training and awareness about disaster management (10 items)	**r**	.723
	P	.001**
Total disaster management knowledge	**r**	3.142
	P	.002**

*Significant at level P< 0.05**;** **highly significant at P<0.001

r = Pearson coefficient value: weak from 0.0 to 0.25- moderate from > 0.25 to 0.5- strong from > 0.5 to 1.00

5. DISCUSSION

Disasters are unpredictable events that may kill and disturb people; defeat properties and upset the environment [35]. Health care delivery system and health care organizations are only successful in disaster situations; when nurses have the fundamental disaster competencies to rapidly and effectively respond to disaster situations [36]. There is a rising consensus and agreement regarding the importance of equipping and arming all nurses with a knowledge-base, a minimum set of skills and changing to more positive attitudes to enable them to meet the challenges they face in dealing with the complexities of disasters [37]. It is envisioned that such training and education can equip nurses with disaster management competencies from around the world, while giving attention to local applications [38,39].

The results of this study clarified that nearly three quarters of nurses reported that they have poor knowledge regarding core concepts of disaster management before attending the training program. Lack of nurses' knowledge regarding disaster management could be attributed to unavailability of disaster management topic in their nursing curriculum. Also, absence of conducting in-service training about disaster management and unavailability of disaster management plan in hospital or if present, it is kept in drawers and nurses are not oriented with it. In the same line, Abd Elazeem et al. (2011) revealed that the majority of health team members had low awareness about all components of the disaster plan [38]. Moreover, Olivia et al. (2018) concluded that nurses in Hong Kong are not adequately prepared and are unaware about the hospital disaster preparedness plan, and all items. This lack of awareness could be related to the required knowledge leading to inability to manage disasters in hospitals [39]. Moreover, Yang et al. (2010) found that nurses were inadequate and ill-prepared for disasters [40]. Al Khalaileh et al. (2012) reported that registered nurses considered themselves weak to moderate in terms of their level of awareness for disaster management [41]. In addition, Chimenya (2011) found that high proportion of nurses at the hospital did not know about the disaster management plan and did not know what a hospital disaster plan should contain [42]. Furthermore, Loke and Fung (2014) indicated that nurses were not aware of their roles in preparing the community or the vulnerable population for disaster [43].

Pertaining to nurses' awareness about the importance of training and education courses about disaster management, the current study revealed that high percentage of nurses had unsatisfactory level of awareness prior to training and do not feel the importance of the necessity of training on drill and education courses. this result is in agreement with Ibrahim and El Hosany (2010), who reported that minority of the studied nurses were aware about the importance of training to control disaster [44]. Also, Al Khalaileh et al. (2012) suggested that additional training through courses and facility drills would be beneficial in increasing nurses' level of preparedness to disasters [41]. Abd Elazeem et al. (2011) also reported lack of hospital preparedness related to hospital drills and training [38].

Regarding nurses' disaster management knowledge, statistically significant differences were found between total disaster management knowledge and its three domains (core concepts; disaster management phases; and nurses' training and awareness about disaster management), at before, immediately after and after three months from attending the training program. From the researchers' point of view, this happened as a result of nurses' enthusiasm to gain more information about disasters and clarifying their roles in each disaster's phase and disaster's response. The nurses also, requested to develop poster that clarifies disaster management phases. These findings are supported by Campbell et al. (2017), who stressed that nursing roles and expectations must be defined in the disaster management plan and in job descriptions containing performance standards specific to disaster response [45]. Moreover, nurses focused on their interest to know all safety measures for hospital environment during all phases of disaster management and hospital's mitigation and preparedness. These are also supported by Mohamed and Zakaria (2013), who pointed out that needed and desired attention for hospital environment should be concentrated to prevent accidents, reducing injuries and errors and increasing organizational functions because the hospital environment is considered a dangerous place [46].

This result is also, in line with Samantha et al. (2009), who revealed that there was a significant difference between pre-test and post-test on knowledge constituting disaster nursing competencies among nurses [47]. Moreover, Zhang et al. (2011) found that about one third of the hospital nurses know disaster nursing knowledge before training; compared to above half of them at after training. Whereas, 41.5% of the hospital nurses know disaster nursing operation before training; contrarily to 58.9% of them after training. They also concluded that nurses were lacking disaster nursing perceptiveness before training; however, after training, the situation was improved greatly [48]. Similarly, Hokrani (2011) showed that there was a significant difference between the mean pre-test score and the mean post-test score on knowledge among nursing regarding disaster preparedness [49].

This is also supported by Ahayalimudin et al. (2012), who revealed that nurses who attended disaster-related education or training are more likely to have adequate knowledge; compared to pre-test and before application of training booklet [50]. Furthermore, Collander et al. (2008) exhibited an increase and improvement in the awareness of health care nurses related to the principles of hospital disaster through participating in hospital disaster life support training course [51]. Additionally, O'Sullivan et al. (2008) recommended that the application of the training turned to be effective in increasing the level of nurses' awareness about hospital disasters management. Thus, more training and information were needed to enhance management for frontline nursing staff members, and important members of the response community [52].

Concerning nurses' attitudes towards disaster management training, the present study revealed that most nurses had negative attitudes towards disaster management training, pre-implementation; compared to the majority of them, who had positive attitudes at immediately after and after three months from disaster management training. This improvement in nurses' attitudes after training program implementation may be attributed to the increase in nurses' knowledge, associated with the modification in their understanding, application and overall perception of disaster management. This finding is congruent with Sinha et al. (2008), who has similarly reported that nurses have poor attitudes towards disaster preparedness and mitigation [53]. Moreover, Goyal et al. (2013) reported an improvement in nurses' attitudes after educational training program; as the percentages of nurses with positive attitudes were higher compared to pre-program [54]. Ahayalimudin et al. (2012) and Liu et al. (2011) also, indicated that majority of nurses had positive attitudes towards disaster management after attending disaster management training course [50, 55].

Moreover, the results of this study showed that there were no statistically significant differences between nurses' total knowledge scores and their demographic characteristics (age, educational level, working unit, years of experience in nursing and years of experience in the current working unit). This result is different from that of Osman (2016), who recognized that educational level was significantly associated with increased knowledge and practice scores of nurses' in disaster management [9]. On the other hand, there were statistically significant differences between nurses' total attitudes scores and all the demographic characteristics. These findings are opposite to another study, which detailed that none of the socio-demographic variables examined had an impact on nurses' attitudes towards disaster management [56].

In addition, the results of this study illustrated that there was a strong positive high significant correlation between nurses' total knowledge and their total attitudes toward disaster management. This result is in accordance with Sinha et al. (2008), who concluded that knowledge, attitudes and practices about disaster preparedness and mitigation were very poor, and was improved through exposing participants to orientation workshops, mock drills and similar practical exercises, which could develop an interest and more positive attitudes in disaster management [53]. These findings are also similar to that of Jiang et al. (2015), who illustrated noteworthy positive relationships between nurses' knowledge, attitudes and level of competence, when demonstrating disaster management strategies and indicated that such strategies were developed for nurses to improve their knowledge, attitudes and practices in disaster management [57]. In the same line, Lai et al. (2012) found that disaster nursing training and awareness protocols provide essential health care knowledge to increase disaster awareness, preparation, response, and rehabilitation with improving nurses' attitudes about disaster management [58]. On the other hand, Chimenya (2011) and Ahayalimudin et al. (2012) reported that despite the poor knowledge about the disaster management, the health care professionals had the right positive attitudes towards hospital emergency and disaster management [59, 50].

6. CONCLUSION

In conclusion, nurses' disaster management training program had highly statistically significant differences on their knowledge and attitudes, between before, immediately after and after three months from training program, in critical care units at Alexandria Main University Hospital.

7. RECOMMENDATIONS

Based on the study findings, the following recommendations were proposed:

Hospital administrators should:

1. Conduct periodic disaster management training programs for all nurses and health care professionals to extend their awareness around disaster management.

2. Develop disaster management plan in accordance with different multidisciplinary departments and make orientation days for all involved personnel.

3. Encourage application of nursing research in disaster and disaster management, in order to provide information to make evidenced-based decisions regarding practice and education.

4. Provide Nursing curriculum with disaster preparedness and management subject to prepare undergraduate and postgraduate nursing students to manage disaster.

Staff nurses should:

1. Evaluate their own limitations, knowledge and skills related to disaster management, in order to receive disaster preparedness education as continuous nursing education, in order to have a great pool of nurses during a disaster.

2. Periodically take part and participate in emergency response drills and disaster management training in order to be prepared for disasters.

3. Develop a personal disaster plan to arrange personal matters related to disaster management.

4. Be prepared to make ethically challenging decisions because, during a disaster, the routine method of nursing care changes.

Future Researches

- Replicate study with different health disciplines in disaster training programs for collaborative practices in the multidisciplinary disaster management situations.
- Replicate study in different settings for comparative design and facilitate generalization of the study findings.
- Identify the best teaching strategies for nursing students and nurses when faced disasters.

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