

ASSESSMENT OF EGYPTIAN EMERGENCY MEDICAL TECHNICIANS' LEVEL OF EDUCATION AND TRAINING IN MANAGING MASS CASUALTIES AND DISASTER EVENTS

By

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Abstract

Introduction: Egypt has been and continues to be at risk of a multitude of natural and man-made disasters and mass casualty incidents (MCIs). In spite of the essential and integral role of the emergency medical services in MCIs management, there is abundant literature indicating that healthcare providers lack adequate education and training in responding to MCIs. **Aim of work:** The objectives of the study were to assess the current level of education, training, experience, preparedness and satisfaction with knowledge and training of the Egyptian emergency medical technicians (EMTs) in responding to MCIs. **Materials and Methods:** A cross-sectional and questionnaire-based survey that recruited 177 EMTs working within the Egyptian Ambulance Authority. Planning, education and training scores were calculated in order to determine a possible correlation with self-confidence and preparedness in responding to MCIs. **Results:** The results of the study demonstrated that about one-third of the surveyed EMTs found that they had a high MCIs planning level and about two-thirds had a high MCIs training level. However, about 70% of EMTs had no training regarding terrorism response and about half of them had never participated in MCIs exercises. Both the MCIs training level and the participation in MCIs exercises were correlated with the perception of the EMTs' confidence and preparedness for their role during MCIs response. The surveyed EMTs ranked the administrative obstacles as the most frequent

barriers to MCIs medical education or training. **Conclusion:** The educational strategy should include mechanism that substitute for practice and experience and should ensure that the identified training needs and the required competencies are met.

Keywords: Mass casualty incidents, Training, Education, Preparedness, Emergency medical technicians.

Shift work.

Introduction

Over the past decades, disasters are increasing in frequency and severity all over the world (UNISDR, 2014; CRED, 2015). Throughout history, Egypt has been subjected to natural disasters (earthquakes, floods and landslides), mass-casualty incidents (MCIs) (mainly fires, explosions, transportation accidents and stampedes at mass gatherings), civil unrest and terrorist attacks (The Cabinet Information and Decision Support Center, 2008).

A mass-casualty incident (MCI) is defined by the health community as an event in which the health needs exceed, at least temporarily, the response capacity in the affected area, mainly due to a large number of victims and/or severity of the injuries or illnesses. This imbalance can be due to a quantitative and/or a qualitative shortage of resources (manpower and materials), but also to organizational or operational shortcomings (Lennquist,

2012; Debacker et al., 2016). We can no longer rely on our goodwill and good intentions to manage MCIs situations, since the ultimate goal of its medical management is to minimize as much as possible the loss of life and the suffering of the affected population. A different medical approach is needed to achieve these objectives because of the immediate effects of the MCIs on the community and especially on the health care system, the number and variety of injured or ill victims, an initial phase of disorder, the temporary lack of resources and limited output of medical teams directly after the MCI, the necessity to operate in multidisciplinary and complementary teams, and the multiplicity of tasks (Hubloue and Debacker, 2010).

Multiple professional disciplines with a wider range of roles, responsibilities and experiences are involved in all phases of MCIs health management. Many recurring difficulties or problems

that plague the emergency response in MCIs arise from insufficient education and training of the involved personnel, poor understanding of the medical management plans, procedures and interventions, as well as the low levels of skills and experience (Lennquist, 2005; Bradt and Drummond, 2007; Spranger et al., 2007; Hubloue and Debacker, 2010). The management of the health effects of MCIs is one of the most difficult tasks that for health professionals. It requires a special knowledge, a professional skill in order to provide medical care of high quality in a primitive or hostile environment and an ability to organize a multi-disciplinary MCIs medical response system (Hubloue and Debacker, 2010).

In addition to deliver day-to-day life-saving care, the emergency medical system (EMS) is one of the key components in MCIs preparedness and response (Markenson et al., 2011). However, recent reports have indicated major deficiencies in the preparedness of EMS professionals in responding to MCIs (Catlett et al., 2011; Fernandez et al., 2011; Hung et al., 2012; Algaali et al., 2015; Al-Shaqsi et al., 2015).

Aim of work

The objectives of the study were to assess the current level of education, training, experience, preparedness and satisfaction with knowledge and training of the Egyptian emergency medical technicians (EMTs) in responding to MCIs.

Materials and Methods

Study design: A cross-sectional descriptive study was conducted.

Place and duration of study: Data was obtained from EMTs working in the Egyptian Ambulance Authority (EAA) through an online survey .The study was done during the period from July 2015 to June 2016.

Study sample: One hundred seventy seven Egyptian EMTs participated in the online survey. The main inclusion criteria were that any participant should be working as EMT and registered in the EAA.

Study methods: The survey was based on a self-structured questionnaire partially based on published literature (Fernandez et al., 2011; Huang et al., 2011; Su et al., 2013). The questionnaire was drawn up in the English language

and subsequently translated to Arabic language and pilot tested with respect to relevance, clarity and understanding. The final questionnaire was uploaded in the online Survey Monkey® software after minor adjustments. The questionnaire consisted of 33 close-ended and 4 open-ended questions. The latter type of question was used when the researchers were not certain whether all possible alternatives could be included in a close-ended question.

The questionnaire was composed of 3 sections:

- The first section included demographic data such as EMTs' age, educational level, work experience as EMT and current position of employment.
- The second section contained information on (1) MCIs exposure and experience in dealing with MCIs; (2) MCIs preparedness; and (3) confidence level in responding to MCIs.
- The third section inquired on (1) EMTs' level of MCIs education and training; (2) EMTs' satisfaction with respect to their current knowledge

and training in managing MCIs; (3) EMTs' opinion regarding the best methods for education or training in the management of MCIs; and (4) possible barriers EMTs' faced to obtain adequate education or training.

Consent

The Egyptian Ambulance Authority at Cairo governorate approved the study and the EMTs participated willingly by filling out the self-administered questionnaire after being informed that their participation is voluntary and their refusal to participate would have no negative consequences. All data were kept anonymous and confidential throughout the study.

Ethical approval

The study was approved by Ethical Committee of Faculty of Medicine, Minia University, Minia, Egypt.

Data management

A number of questions were combined to generate 2 scores: the disaster-planning score and the disaster-training score. The disaster-planning score was calculated by computing the results of Q14, Q16 and Q17. The total

score ranged from 3 to 7 points and was classified into a poor planning score (3 points), a moderate planning score (4-5 points) and a high planning score (6-7 points). The disaster-training score was calculated by computing the results from questions Q18, Q19, Q20 and Q21. The total score ranged from 4 to 8 points and was classified into: a poor training score (4 points), a moderate training score (5-6 points), and a high training score (7-8 points).

All statistical analyses were conducted using IBM® SPSS®, version 19. Descriptive statistics were reported to describe demographic characteristics of the study population.

A Pearson's correlation test was used to determine associations between the planning and training score and the perceived level of preparedness and confidence in responding to disasters. A p-value of <0.05 was used to demonstrate statistical significance.

Results

Table 1: Distribution of the survey participants by age, level of education, number of working years and types of MCIs that the survey participants responded to.

Participants' characteristics	Categories	Frequency No:177	Percent %
Age groups/years	20-29	54	30.5
	30-39	84	47.5
	40-49	19	10.7
	50-59	19	10.7
	>60	1	0.6
Level of education	Secondary	61	34.5
	University	108	61.0
	Postgraduate	8	4.5
Duration of work/ years	<5	21	11.9
	5-9	92	52.0
	10-14	17	9.6
	15-19	23	13.0
	>20	24	13.6
Types of MCIs that the survey participants responded to.	Never participated	16	9.0
	Mass gathering	7	4.0
	Bombing	4	2.3
	Other explosions	4	2.3
	Bus crash	89	50.2
	Building collapse	25	14.1
	Chemical incident	11	6.2
	Fire	20	11.3
Others	1	0.6	

Table 1 showed that the majority of the participants (78%) were young adults (20-39 years), with a rather high level of education (65.5% bachelor degree or higher), with less than 10 years of experience in the EMS profession within the EAA (64%).

Moreover, it showed also that about 9% of EMTs had no previous experience in dealing with MCIs, while 91% responded to different MCIs which were in a very large part caused by transportation accidents, building collapse and fires.

Table 2: Participants' previous experience in MCIs management.

		Frequency No=177	Percent %
Previous experience in MCIs management	No, I did not	16	9.0
	> 2years ago	64	36.2
	Within last 2 years	39	22.0
	Within last year	33	18.6
	Within last 6 months	25	14.2
Number of participations in MCIs management	Never	16	9.0
	Once	7	4.0
	Twice	20	11.4
	3 times	7	4.0
	4-5	35	19.6
	6-9	38	21.5
	>10	54	30.5
Participation in MCIs exercises	Did not participate	97	54.8
	Table top	3	1.7
	Internet drill	5	2.8
	Computer Simulation	6	3.4
	Live drill	3	1.7
	Full scale	63	35.6
Attended training on terroristic incidents' management	No, I did not	127	71.8
	> 2 years ago	13	7.4
	Within last 2 years	11	6.2
	Within last year	13	7.3
	Within last 6 months	13	7.3

Table 2 showed that only one third of the EMTs were involved in response to at least an MCI during the last year. However, about 72% of the EMTs were involved in management of 4 or more MCIs that affected 10 to 50 casualties per incident.

About fifty-five percent of the surveyed EMTs had never participated in any type of disaster exercise. Full-scale exercises were the most cited format for those EMTs who participated in a disaster exercise. Additionally, nearly 72% of the surveyed EMTs did not attend any training course on terrorism-related MCIs management.

Table 3: Distribution of the participants according to the categorized planning, training and education score, preparedness and satisfaction with one's current knowledge and training.

	Categories	Frequency No=177	Percent %
• Planning score	Poor planning level	30	16.9
	Moderate planning level	88	49.7
	High planning level	58	32.7
	Missing	1	0.7
• Training and education score	Poor education/training	21	11.9
	Moderate education/training	35	19.8
	Good education/training	119	66.9
	Missing	2	1.4
• Feeling of being prepared for role	Not prepared	16	9.0
	Moderately prepared	46	26
	Prepared	115	65
• Satisfaction with one's knowledge	Dissatisfied	54	30.5
	Neutral	34	19.2
	Satisfied	89	50.3
• Satisfaction with one's training	Dissatisfied	39	22.0
	Neutral	107	33.9
	Satisfied	31	44.1

Table 3 showed that 17% of the EMTs estimated that they had a poor level regarding the planning preparedness, about 50% a moderate level and about 33% a high level.

An education and training score was also and it was evident that about 67% of EMTs had a high education and training score, about 20% a moderate score and 12% a poor score.

Similarly, 65% of the EMTs reported that they are prepared for their role in MCI and disaster medical management, while 26% were moderately prepared and only 9% felt that they were poorly prepared for their role.

About half of the surveyed EMTs were satisfied with their current knowledge about disaster medical management and about 30% were dissatisfied.

Moreover, nearly 44% of the surveyed participants were satisfied with their current training in disaster medical management, while 22% were dissatisfied.

Although approximately three quarters of the surveyed EMTs were aware of the existence of an EMS plan for MCIs management, about 62% were cognizant of their role in the medical management of an MCI and 43% consulted the EMS plan for MCIs management at the start of their job as EMT, but only one quarter of the EMTs rechecked their action card within the last 2 years (Data not tabulated).

Table 4: planning, training and education score, preparedness and satisfaction with one's current knowledge and training.

	Training and education score	Planning score	Feeling prepared for role	Confidence score	Rating your skills	Satisfied with Knowledge	Satisfied with Training
Training and education score							
Planning score	0.317*						
Feeling of being prepared for role	0.506**	0.521**					
Confidence score	0.573**	0.431*	0.184				
Rating your skills	0.579**	0.211	0.612**	0.790**			
Satisfaction with one's knowledge	0.305*	0.463*	0.498*	0.689**	0.317*		
Satisfaction with one's training	0.414*	0.201	0.602**	0.818**	0.580**	0.546**	

*: Statistically significant $p < 0.01$

** : Highly statistically significant $p < 0.001$

Table 4 showed that there were significant correlation coefficient between training and education score and the EMTs confidence and satisfaction with their knowledge and training as well as with their feeling of being prepared for their role in management of MCIs.

Table 5: Participants' opinion regarding the preferred methods and barriers for education and training in disaster medical management.

		Agree No (%)	Neutral No (%)	Disagree No (%)
Preferred methods for education and training	Self-education	131 (74.0)	31 (17.5)	15 (8.5)
	Face to face	77 (80.2)	23 (13.0)	12 (6.8)
	Internet	97 (84.8)	62 (35.0)	17 (10.2)
	Disaster drill	140 (79.1)	24 (13.6)	13 (7.3)
	Computer simulation	98 (55.3)	50 (28.2)	29 (16.4)
	Table-top	84 (47.5)	65 (36.7)	28 (15.9)
	Workshops	154 (87.0)	18 (10.2)	5 (2.9)
	Combined methods	151 (85.3)	16 (9.0)	10 (5.6)
Barriers for training	Lack of interest	23 (13.0)	19 (10.7)	135 (76.3)
	Lack of time	27 (15.2)	31 (17.5)	119 (67.3)
	Lack of resources	59 (33.4)	37 (20.9)	48 (45.7)
	Frequent change of workplace	29 (16.4)	37 (20.9)	111 (62.7)
	Cost	47 (26.5)	34 (19.2)	96 (54.3)
	Administrative	113 (63.9)	28 (15.8)	36 (20.3)

Table 5 showed that the educational and training methods of the surveyed EMTs preferred for their education and training in managing mass casualties were in descending order: workshops (87%), blending learning (85.3%), face-to-face classes (80.2%), disaster drills (79.1%) and self-education (74%). Computer simulation (55.3%), web-based learning (54.8%) and table-top exercises (47.5%) were selected to a lesser extent on its ability to improve education and training in disaster medical management.

Approximately half of the participants attended lectures or training courses in the last 2 years. Moreover, respectively 67% and 44% of the surveyed EMTs searched information on internet or in publications or books.

Administrative obstacles as barrier to disaster medical education or training were ranked highest by the survey respondents (63.9%), followed by lack of resources (33.4%), cost of training (26.5%), frequent change of workplace (16.4%), lack of time (15.2%), and lack of interest (13.0%).

Even though, the training and exercise in MCIs medical management provided by the EMS system was rated as good to very good by 64% and as poor to very poor by 20% of the surveyed EMTs (Data not tabulated).

Discussion

Our study showed that a great majority (91%) of the EMTs reported that they were prepared for their role during MCIs management (Table 2). This is consistent with the international literature (Fisher et al., 2008; Al-Shaqsi et al., 2015). Also our work showed about 90 % of the surveyed EMTs had experience in being deployed in MCIs with an exposure to more than 4 MCIs in 72 % of the respondents (Table 2). This is comparable to the study of Fischer et al. (2008), but also lowers levels of MCIs experience of EMS health providers have been reported by Al-Shaqsi et al. in 2015.

The results of our work indicated that more than 50% of the EMTs had never participated in MCIs exercises (Table 2). The participation in MCIs exercises is lower in this study compared with an 80% participation in previous

reports (Fischer et al., 2008; Al-Shaqsi et al., 2015).

Although, Egypt is one of the countries that have frequent terroristic incidents, the surveyed EMTs reported that about 72% had never attended any training or exercises on management of terroristic incidents (Table 2). Similar findings were detected in previous studies that demonstrated the presence of marked gaps of the EMTs regarding having an adequate training in terrorism response (Miller et al., 2006; Reilly et al., 2007; Kollek et al., 2009; Holgersson et al., 2016).

Moreover, those who have training within the last year were only about 14.6% (Table 2). This very low percent of EMTs recent training on terroristic incidents management is one of the shortcomings of the EMS system, since knowledge and skills of health providers who are not exposed to MCIs on a regular basis will decline within 6-12 months after initial training (Wik et al., 2002; Miller et al., 2006; Shiyovich et al., 2015).

Regarding the planning score, our results indicated that 17% of the EMTs

estimated that they had a poor level regarding the planning-preparedness, 50% a moderate level and about one third (32.7%) of them had a high level (Table 3).. These findings were comparable to previous reports from different studies (Fernandez et al., 2011; Al-Shaqsi et al., 2015).

An education and training score indicated that 67% of the surveyed EMTs had a high level of education and training, 20% a moderate level and 12% a poor level (Table 3). These findings support previous reports that indicated gaps in education and training regarding MCIs medical management in EMS professionals (Fischer et al., 2008; Catlett et al., 2011).

The current study found that the MCIs preparedness training was moderately correlated with the EMTs' perception to be prepared for their role during MCIs response ($r = 0.51$, $p < 0.001$) (Table 4). This is consistent with previous reports (Fernandez et al., 2011; Al-Shaqsi et al., 2015).

Additionally, there was significant correlation between the EMTs' education and training score and self-confidence in managing MCIs ($r=0.573$,

$p = 0.001$) (Table 4). Consistently, other studies, reported an association between training and comfort in responding to MCIs (Markenson et al., 2005; Clawson et al., 2007; Reilly et al., 2007).

However, Pearson correlation test showed a very weak correlation between EMTs' perception of being prepared for their role and their self-confidence in managing mass casualties during a disaster response ($r = 0.184$, $p < 0.05$) (Table 4), this coincide with the results reported by Al-Shaqsi et al. (2015).

Moreover, training and education score significantly correlated with EMTs rating one's preparedness and satisfaction with own knowledge and training skills in management of MCIs (Table 4). Such findings however, were consistent with previous studies (Williams et al., 2008; Scott et al., 2010), but different from others (Sinclair et al., 2012; Ingrassia et al., 2014; Skryabina et al., 2017).

Regarding the preferred educational methods for disaster medical management, the EMTs indicated that they prefer workshops (87%), blended-learning (85%), face-to-face classes (80%), disaster drills (79%) and

self-education (74%) as methods of education and training in MCIs medical management. Computer simulation (55%), web-based learning (55%) and table-top exercises (47%) were selected to a lesser extent on its ability to improve education and training in disaster medical management (Table 5). These results are similar with several studies that have shown that simulation-based training, hands-on and interactive exercise methods are important for EMTs in order to acquire the essential competencies in responding to MCIs (Seynaeve et al., 2004; Pfenninger et al., 2010; Schultz et al., 2012). The selected and preferred methods of training and education by our surveyed EMTs were similar to that were preferred by EMTs of other studies; such methods that have been shown to be effective in retaining the learned knowledge and skills and a practical and valid experiential method in improving response to real MCIs (Hsu et al., 2004; Baldwin et al., 2005; Lennquist and Lennquist-Montán, 2012; Sinclair et al., 2012; Khorram-Manesh, 2015).

EMTs ranked administrative issues (i.e. insufficient number of EMTs in

the governorates, low availability of training programs and problems in organizing training sessions) are the most important barrier to access to disaster training, followed by lack of resources, time constraints and inadequate funding to attend courses, and high turnover among EMTs (Table 5). This is consistent with previous published literature (Schultz et al., 2012).

There is some inconsistency between the level of current MCIs knowledge and training reported by the surveyed EMTs and the self-reported confidence in their MCIs response competencies. Although only 50% and 44% of the surveyed EMTs are satisfied with their current knowledge and training regarding MCIs medical management respectively, almost all EMTs reported that they felt prepared for their role during a disaster response and confident in managing MCIs (Table 5). Additionally, taking in consideration that nearly 72% of our EMTs had participated in more than 4 times in MCIs medical management (Table 2), one could argue that field experience, as reported by Bradt and Drummond

(2007), has a heavier impact on self-confidence in managing MCIs than education and training. Limitations

There were a few potential limitations in the study. All EMTs working within the EAA are males. The survey was Internet-based and so excluded EMTs without online access. The survey might have attracted EMTs who were already interested in the subject of disaster medical management and it is possible that the study population differ with respect to disaster preparedness training, perception of preparedness and self-confidence in managing mass casualties with EMTs who did not respond to the questionnaire. The use of a convenience sample of EMTs from EAA may limit the applicability of the study to EMTs from other countries.

Conclusion

EMS plays an essential and integral role in responding to MCIs. Disaster response management lacks international consensus on generally accepted standards for education and training and specific deployment qualifications of EMS providers that are required to respond to actual disasters.

The results of the study demonstrated that about one-third of the surveyed EMTs had a high disaster-preparedness planning level and about two-thirds had a high disaster-preparedness training level. However, about 72% of the EMTs had no training regarding terrorism response and about half of the EMTs had never participated in disaster exercises.

In order to remedy the identified gaps in disaster medical education, the training offered should include mechanisms that substitute for practice and experience such as simulation, hands-on and interactive exercises. The instructional approach should ensure that the identified training needs and the required competencies are met.

Finally, the educational formats should be easily accessible and affordable to EMTs.

Conflicts of interest

This work has no conflict of interests of any type.

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