

Assessment of Ebola disease outbreak emergency response among Healthcare Providers in Mena Emergency Hospital during Hajj Season 1435

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Abstract

Background: During Ebola virus disease (EVD) outbreak, 1435 there have been concerns pilgrims may spread the contagious diseases Ebola. Ministry of Health have been instituted all precautions to prevent the spread of Ebola during the hajj.

Objectives: To document healthcare emergency response towards the potential of facing Ebola virus outbreak during Hajj season 1435.

Methods: This work was a cross-sectional study, carried out among healthcare providers (HCPs) in Mena Emergency Hospital. All HCPs were invited to participate and voluntary respond to a self-administrated, structured, anonymous questionnaire during the period 1-5 /12/1435. The questionnaire included questions and statements covering: bio-demographic data of the participants, perception of the outbreak, knowledge, attitude, risk acceptance.

Results: Overall, 157 completed questionnaires was received, of them 85 physicians and 72 nurses, representing 54.1% and 45.9% of the sample respectively.

An overall, 90.7% of the respondents reported receiving infection control instructions/guidelines about Ebola virus infection/outbreak; 85.9% received/read MOH circulars updating them with the outbreak and providing guidelines for dealing with confirmed or suspected cases of EVD; 83.1% received Ebola alert SMS from the MOH Command and Control Center; 66.9% attended CME programs for Ebola virus infection/outbreak; and 52.9% visited MOH internet site concerned with EVD. The vast majority of the participants (89.8%) attained >50% scores on the knowledge scale, of them 41.4% attained >75% score, while 48.4% attained 50-75% scores.

The adjusted multivariate logistic regression analysis, revealed that: being a physician, original work of the participant is hospital setting and reading MOH circulars regard EVD guidelines were independently associated with good knowledge.

Attending CME training concerned with Ebola virus infection/outbreak, seeking information from MOH internet site about Ebola virus infection/outbreak, being a nurse, and married marital status, were factors independently predicted the risk acceptance among the participants.

Meanwhile, having good knowledge about Ebola virus infection/outbreak, concern that may get sick with Ebola virus and being married as marital status, were factors that independently associated with the reported self-efficacy about dealing with Ebola virus infection/outbreak.

Conclusion: Emergency response of healthcare providers to Ebola virus infection/outbreak 1435 in Mena Emergency hospital was adequate. Staff with good exposure to the official sources of knowledge (CME programs, Ministry of Health (MOH) circulars & guidelines, MOH internet site, exhibited better knowledge, risk acceptance and self-efficacy. Despite, most of the participants attended training programs for preparedness; still, about one third of the participants felt insufficient knowledge and skills, which imply the need to review these programs in terms of coverage and content to satisfy their training needs.

1. Introduction

Ebola virus disease (EVD), previously known as Ebola hemorrhagic fever is a deadly disease caused by infection with one of the Ebola virus species. Ebola virus causes severe viral hemorrhagic fever with a high fatality rate [1]. The 2014 outbreak of EVD in West Africa, caused by Ebola virus, was the largest and most complex Ebola outbreak in history. There were more cases and deaths in this outbreak than all others combined [2]. Ebola virus is highly contagious, can be transmitted by direct contact with blood, body fluids, or skin of EVD patients or persons who have died of EVD; the virus has an incubation period of 2-21 days (average 3-13days); symptoms range from, firstly, fever and fatigue before descending into headaches, vomiting, violent diarrhea, then multiple organ failure and massive internal bleeding [1-3]. EVD outbreaks have a case fatality rate of 50-90%, yet no specific drug or vaccine is available for people and/or animals hosts [2].

Health care providers (HCPs) are at a greater risk of contracting EVD and may promote its transmission by occupational exposures [3]. Transmission in health care settings has been associated frequently with EVD outbreaks in Africa. If cases of the disease do appear,

prompt actions including strict infection control measures should be applied to avoid the spread of the disease within health-care facilities. Patients must be isolated from contact with any unprotected people and hospital workers must wear protective clothing, such as masks, gloves, gowns and goggles [3].

Being a highly contagious disease Ebola HF can spread to other parts of the world because of continuous movement of people in different parts of the world so it becomes necessary for the HCPs to be, aware of this fatal disease. Saudi Arabia, being a place for the largest mass gathering in the world during Hajj, with Muslims coming from every place in the globe have a specific concern regard outbreaks of infectious diseases.

2. Research aims:

The objectives of this work were to assess emergency response of HCPs towards the potential dealing with Ebola virus infections during Hajj season 1435H (2014G), their risk perception, level of concern, acceptance of risk and basic knowledge about the disease and outbreak.

3. Research Methodology:

3.1 Study design and Setting

This work was a descriptive cross-sectional study, conducted in Mena Emergency Hospital, during 1-5/12/1435H (26-30 September 2016). The hospital is well equipped, of 214 beds capacity, operating seasonally during Hajj. The hospital run by more than 450 personnel; of them ~100 physicians, ~200 nurses and ~50 other HCWs directly involved in patient care. Hospital staff are recruited from all health regions of the country for this temporary period of the year. The hospital experience severe congestion with patients during operation, receiving large number of emergencies and outpatients with full bed-capacity patient's admissions.

3.2 Participants and Sampling

Physicians and nurses of the hospital staff were the sampling frame of the study. The eligible participants were those who are directly involved in patient care. To receive an adequate number of responses, all eligible physicians and nurses available at the time of the survey were invited to participate, with two hundred questionnaires distributed.

3.3 Survey instrument and administration

An anonymous structured questionnaire was constructed based on the literature review and previous research findings [1-3]. The questionnaire included 40 items in four parts: First part,

included nine questions/statements to describe demographic, professional and work practice characteristics of the respondents; the second part included eight questions/statements to explore awareness regard Ebola virus infection/outbreak, concern about possibility to face Ebola virus infection cases. The third part included questions to assess preparedness: the participant, being oriented with guidelines regard Ebola virus infection/outbreak, attended CME training programs, being instructed with infection control standard procedures, receiving SMS from MOH, visiting MOH internet site for Ebola virus infection/outbreak orientation. The forth part of the questionnaire included 15 questions to assess participant's knowledge about the disease and sources of his/her knowledge. Reliability Statistics for the knowledge items of the questionnaire was high (Cronbach's Alpha= 0.792).

Healthcare workers were invited to participate in the study at the time of their arrival to embark on their mission in the hospital and before commencing the hospital orientation programs. Participation was voluntary. The agreed subjects self-completed the questionnaire with a briefing for the study objectives by a trained coordinator who did not have medical or administrative responsibilities in the hospital during the study.

3.4 Pilot study

The questionnaire was pre-tested and piloted with a convenience sample of 10 HCPs (5 physicians and 5 nurses) with similar demographic characteristics to the study population to ensure clarity and ease of administration. Based on respondents' recommendations, some changes were done to improve the final questionnaire.

3.5 Ethics

Participation was voluntary for the agreed staff. Filling and returning back the questionnaire was considered a consent for participation. A written approval from the hospital authority was taken to conduct the study. The study was a tool to explore preparedness of the staff and to assess the instructive needs to be addressed in the orientation sessions before commencing the hospital operation.

3.6 Statistical analysis

Statistical analysis was carried out using EpiInfo 7 program and SPSS Version 23. We generated descriptive statistics for all survey items. A bivariate analysis with Chi-square test was done to explore associations between respondent's characteristics with different levels of knowledge about Ebola virus infection/outbreak.

Knowledge scale was created, composed of 37 knowledge items, which revealed high reliability (Cronbach's Alpha= 0.792). Knowledge scale was dichotomized into binary dependent outcome variable to classify respondent into two groups; “knowledgeable” respondents, who attained 75% knowledge score and “less knowledgeable” with scores < 75% on the knowledge scale.

A multivariate logistic regression models with backward selection and cutoff point of <0.2 were developed to capture predictors independently associated with three outcome variables, namely: knowledge, risk acceptance and self-efficacy. Odds ratios (ORs) and their 95% confidence intervals (CIs) were reported as measures of association between predictors and outcome of interest. All statistical tests were two-tailed and p-values of 0.05 or less were considered statistically significant.

4. Results and discussion:

4.1 RESULTS

In total, 200 questionnaires were distributed and 157 were returned complete, with response rate of 78.5%. The respondents of HCPs were made of 88 (56.1%) males and 69 (43.9%) females of which physicians constituted 85 (54.1%) and nurses 72 (45.9%). Detailed characteristics of the respondents are summarized in Table 1.

Table 2, give details about risk perception and concern regard Ebola virus infection among Healthcare Providers (HCPs) their beliefs in self-efficacy and institutional preparedness in dealing with the potential EVD threat during Hajj season 1435H (2014). About ninety percent (89.9%) thought that Ebola virus outbreak is a major global threat and 89.7% agreed that HCPs who care for Ebola patients are at higher risk of getting infection with the virus. Most of the participants (83.2%) were accepting the risk of might getting infection, because it is a part of their job.

Participants expressed their concern that an outbreak might occur during Hajj; 33.1% were extremely concerned/highly concerned, 25.3% somewhat concerned, while 41.6% were slightly or not concerned at all. Among participants, 36.4% was extremely concerned/highly concerned of might get thick with Ebola being a patient's caregiver, and 27.3% were extremely concerned/highly concerned of transferring the infection to their families. Overall, 33.1% of the participants perceived a high risk for acquiring Ebola.

A good knowledge scores was attained by the participants, with median (mean \pm SD) score of 26 (25.42 \pm 5.42) on a scale of 37 points (Table 3). In total, 89.8% the participants attained

50% or higher on the knowledge score; of them 41.4% attained $\geq 75\%$ score and 48.4% attained 50-74% of the score (Table 5, Figure 1). Most participants (89.8%) knew that Ebola is transmitted by contact with body fluids of infected persons and 88.5% of them know that the virus can enter the body through broken skin or unprotected mucus membranes. However, lower percentage of the participants (24.2%) realize that the incubation period is as short as two days and as long as 21 days (39.5%). Only 62.4% exactly identified the operational case definition of patient under investigation. More than ninety percent (94.3%), recognized that fever 38.6°C and 80.3% of them recognized that unexplained hemorrhage (bleeding or bruising) are cardinal symptoms/signs of the Ebola infected patients (Table 3). However, only 46.5%, 62.4%, 42.7%, 54.1% recognized that leucopenia, thrombocytopenia, elevated serum AST & ALT and coagulation abnormality are important findings in laboratory investigation for a case of Ebola virus infection respectively (Table 3). Most of the participants (79.0%) reported that there is a specific laboratory test for Ebola virus detection, (83.4%) there is no specific treatment, and 84.7% that there is no preventive vaccine available (Table 3).

Sources of participant's knowledge mostly reported were MOH internet site (52.2%), CME training programs (44.6%), general internet sites (33.8%), colleagues (31.2%), WHO and CDC internet sites (30.6%), media TV/newspapers (24.2%) and official MOH circulars including guidelines (22.3%) (Table 4).

The adjusted multivariate logistic regression analysis controlling for confounders and other independent variables, revealed that: being a physician (OR, 4.55; 95% CI 1.58-13.05; $P=0.005$), original work of the participant is a hospital setting (OR, 4.25; 95% CI, 1.45-15.79; $P=0.031$), and reading MOH circulars regard DVD guidelines (OR, 10.25, 95% CI 1.45-15.79; $P=0.021$) were independently associated with good knowledge. Being a nurse (OR, 10.22; 95% CI, 1.79-58.37; $p=0.009$), being married as marital status (OR, 7.28; 95% CI 1.30-40.81; $P=0.021$), attending CME training concerned with Ebola virus infection/outbreak (OR, 3.61; 95% CI, 1.18-10.97; $P=0.023$) and seeking information from MOH internet site about Ebola virus infection/outbreak (Odds Ratio, 4.19; 95% CI, 1.34-13.10; $P=0.014$) were factors that independently predicted risk acceptance among the participants. Meanwhile, being married as marital status (OR, 2.52; 95% CI, 1.05-6.05; $P=0.039$), concern that may get sick with Ebola virus (OR, 1.91; 95% CI, 1.24-2.93; $P=0.007$) and having good knowledge about Ebola virus infection/outbreak (OR, 1.12; 95% CI, 1.03-1.22; $P=0.007$),

were factors that independently associated with reported self-efficacy about dealing with Ebola virus infection/outbreak (Table 6).

4.2 DISCUSSION

On 8 August, it was formally designated by WHO that Ebola virus infection outbreak is a public health emergency of international concern [4] This declaration coincided with Muslims' largest gathering in Hajj season 2014, with Muslims coming from all countries of the world. This raised the concern that pilgrims may spread the diseases, so that Saudi Arabia played down fears, having banned pilgrims from the affected African countries with the outbreak, namely, Sierra Leone, Guinea and Liberia. Ministry of Health (MOH) have been instituted all precautions to prevent entry and spread of EVD during the hajj [5].

As serving mass gathering, healthcare facilities during Hajj, receive high load of patients that make work environment vulnerable for transmission of infections, unless infection control measures are strictly applied and HCPs are properly prepared. Prevention and dealing with conceivable undetected cases of Ebola virus infection among pilgrim coming from unbanned counties was a real concern for healthcare facilities.

This work was a cross-sectional survey among HCPs in Mena Emergency Hospital, a seasonally operating institution, providing care to pilgrims during their stay in the holy place Mena. The objectives of the study were to assess the emergency response of HCPs in facing a potential EVD cases, as well as exploring their risk perception, concern and risk acceptance.

The study underlined a good emergency response and adequate preparedness among the participants. An overall, 90.7% of the respondents reported receiving infection control instructions/guidelines about Ebola virus infection/outbreak; 85.9% received/read MOH circulars updating them with the outbreak and providing guidelines for dealing with confirmed or suspected cases of EVD; 83.1% received Ebola alert SMS from the MOH Command and Control Center; 66.9% attended CME programs for Ebola virus infection/outbreak; and 52.9% visited MOH internet site concerned with EVD. The vast majority of the participants (89.8%) attained >50% scores on the knowledge scale, of them 41.4% attained >75% score, while 48.4% attained 50-75% scores. This situation denote the effort spent in preparation of HCPs to ensure competence in providing better care for pilgrims within safe Hajj healthcare facilities. However, still one third (33.1%) of HCPs were not covered by CME training for EVD, the most formal way to ensure proper staff preparation, capacity building and

reassurance. This gap was fixed through the confirmatory staff training carried out during hospital preparation period before commencing hospital operation.

Engagement of various preparedness activities such as revision of protocols, training of HCPs proved effective in other studies. Healthcare associated cases of EVD due to contact to the cross-bordered cases to US and Spain have demonstrated the importance of training of HCPs in personal protective equipment regimens [6-7]. Having been trained on EVD showed positive association with acceptable knowledge in Italian hospitals [8].

Attending CME training programs in this study proved also effective for staff assurance. Staff who attended CME programs for EVD/outbreak, have near four times (OR, 3.61; 95% CI, 1.18-10.97; P=0.023) probability for accepting the risk for dealing with EVD cases than CME non-attending staff.

Outstandingly effective, the study demonstrated an important role of reviewing MOH circulars with guidelines in enhancing HCPs knowledge about the disease and outbreak. Staff who were acquainted themselves with MOH circulars devoted to enhance staff awareness and providing guidelines regarding EVD/outbreak were independently have ten times probability of achieving good knowledge scores (OR, 10.25; 95% CI 1.42-74.31) than their counterparts.

Physicians were independently more knowledgeable than nurses were (OR, 4.55; 95% CI, 1.58-13.05; p=0.005). This is, not only may be logically explained by the different education level; but also could be attributed to the better opportunity of the physicians to receive more training than nurses could.

Despite that, the participants expressed higher perception (89.7%) about EVD/outbreak with agreement that HCPs caring for Ebola patients are at highest risk of getting infection, yet, less concern expressed by them. Participants in the study, expressed less concern (33.1% were extremely/highly concerned) that there will be a large EVD outbreak will occur during Hajj and 36.4% were extremely/highly concerned that they may get sick with EVD during their duty in Hajj. This could be attributed in part by their convenience with the decision taken by authorities in Saudi Arabia of banning pilgrims from the affected African countries with the outbreak and may also reflect their satisfaction with the institutional measures directed for prevention and control of the disease. Their prior preparation by training, better communication and providing sufficient resources needed for standard infection prevention & control may be also considered.

The role of exposure to relevant sources of knowledge for risk acceptance was obvious in our study. Participants who participated in CME training programs (OR, 3.61; 95% CI, 1.18-10.97; P=0.023) and those who were seeking information from the official MOH site regard EVD/outbreak (OR, 4.19; 95% CI, 1.34-13.10; P=0.014), both were independently associated with risk acceptance.

The present study highlighted that self-efficacy of the participants was independently affected by participants' knowledge, which comes in agreement finding of other researchers [9]. Higher concern that participants' may getting infection with EVD being a HCP was independently associated with also with self-efficacy. This may be explained by actively seeking behavior of the highly concerned person to get more knowledge about the disease, get training to have better skills in infection prevention/control to protect self and others.

Some limitations may encounter our study to generalize results and conclusions. First of all, although Mena Emergency Hospital nearly have similar Healthcare manpower compared to other hospitals in the holy places in Makkah, the study results may not be fully representative of medical professionals and hospitals serving pilgrims during Hajj season. Secondly, the sample size was smaller than to bring a narrower confidence intervals for estimates or to capture other, may be important independent factors associated with the outcome variables of interest. Furthermore, the response rate among nurses (~ 40%) was lower than physicians (~ 80%) which may not proportionally representing the nursing staff. Thirdly, other HCPs other than physicians and nurses who might be in direct contact with patients or biological samples were not included, so generalizing results to all HCPs should be taken with caution. Despite these several limitations, the study succeeded to give insights about the emergency response among HCPs about EVD/outbreak and their knowledge gaps, which were subsequently taken into consideration while providing the orientation training courses in the preparation period, before commencing the hospital operation.

5. Summary:

Emergency response of healthcare providers to Ebola virus infection/outbreak (2014) in Mena Emergency hospital was adequate. The hospital is an example for other hospitals serving Hajj pilgrims. Staff with good exposure to official sources of knowledge (CME programs, Ministry of Health (MOH) circulars & guidelines, MOH internet site, possessed better knowledge, risk acceptance and self-efficacy. Despite, most of the participants attended training programs for preparedness; still, about one third of them felt insufficiency

in knowledge and skills, which highlights the need to review these programs in terms of coverage and content to satisfy their training needs.

6. Recommendations:

In spite of the emergency response of healthcare providers to Ebola virus infection/outbreak (2014) in Mena Emergency hospital was adequate as an example for other hospitals serving Hajj pilgrims and most of the participants attended training programs for preparedness; still, about one third of them felt insufficiency in knowledge and skills, which highlights the need to review these programs in terms of coverage and content to satisfy their training needs.

7. References:

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8. Figures & Tables:

Table (1): Characteristics of the studied healthcare Providers (HCPs) in Mena Emergency Hospital during Hajj season 2014, Saudi Arabia. (n=157)

Characteristics	Number	(%)
Gender		
• Male	88	56.1
• Female	69	43.9
Age in years *		
• <30	47	31.1
• 30-39	50	33.1
• 40+	54	35.8
Median (Mean ± Standard Deviation)	35 (36.66±9.94)	
Nationality		
• Saudi	58	36.9
• Non Saudi	99	63.1
Marital Status*		
• Married	113	72.4
• Single/Others	43	27.6
Job category		
• Physician	85	54.1
• Nurse	72	45.9
Education attainment (last degree)*		
• Less than Bachelor	45	28.8
• Bachelor	65	41.7
• Diploma/Master	35	22.4
• MD/PhD/Fellowship	11	7.1
Original Workplace*		
• Hospital Setting	122	79.7
• PHC center/ Others	31	20.3
Duration of Experience in years*		
• <5	44	29.9
• 5-10	51	34.7
• >10	52	35.4
Health Profiles		
• Have any chronic Disease	29	18.5
Exposure to institutional and self-resources of updated knowledge and practices		
• Read MOH circulars and guidelines as regard Ebola.	133	85.9
• Visited MOH internet Site for Ebola awareness.	82	52.9
• Attended any CME program for Ebola.	105	66.9
• Received Ebola alert SMS messages from MOH.	128	83.1
• Read/instructed Ebola infection control guideline.	137	90.7

*Total number in some categories may be less than 157, due to missed responses.

Table 2: Risk perception and Concern regard Ebola virus infection and Beliefs in self and institutional efficacy in dealing with a potential Ebola virus Disease (EVD) infection among Healthcare providers (HCPs) in Mena Emergency Hospital, Saudi Arabia during Hajj season 1435H (2014).

Risk Perception about Ebola Outbreak		
Do you think that EVD Outbreak is a major global threat?	Number	%
-Agree	133	89.9
-Uncertain	8	5.4
-Disagree	7	4.7
Do you agree that HCPs who care for Ebola patients are at highest risk of getting infection?		
-Agree	139	89.7
-Uncertain	13	8.4
-Disagree	3	1.9
Do you accept the Risk of might getting the infection, because it is a part of your job?		
-Yes	104	83.2
-No	21	16.8
Concern about Ebola Outbreak:		
Are you concerned that there will be a large outbreak the recent Hajj Season 1435H?		
-Not at all concerned	30	(19.5)
-Slightly concerned	34	(22.1)
-Somewhat concerned	39	(25.3)
-Highly concerned	27	(17.5)
-Extremely concerned	24	(15.6)
Are you concerned that you may get sick with Ebola being a Health Care worker?		
-Not at all concerned	29	18.8
-Slightly concerned	32	20.8
-Somewhat concerned	37	24.0
- Highly concerned	30	19.5
-Extremely concerned	26	16.9
Are you concerned that someone in his/her family may get sick with Ebola?		
-Not at all concerned	61	39.6
-Slightly concerned	35	22.7
-Somewhat concerned	16	10.4
- Highly concerned	26	16.9
-Extremely concerned	16	10.4
Belief in self and institutional efficacy in dealing with possible situation suggest Ebola cases.		
- Do you feel that your knowledge/skills are sufficient to deal with any suspect case of EVD?	90	64.3
-Do you think that the institutional preparedness is sufficient for dealing with any possible situation suggest EVD cases?	133	75.3

*Total number in some categories may be less than 157, due to missed responses.

Table 3: Frequency of correct answers regard Ebola virus infection 2014 outbreak, among health care Providers (HCPs) in Mena Emergency Hospital during Hajj season 1435H (2014), Saudi Arabia.

Item of knowledge	Number	(%)
*Knowledge about the Outbreak and Agent Characteristics		
• Geographic distribution: Mostly affected countries.	147	93.6
• One of the hemorrhagic fevers.	148	94.3
• An infectious disease.	143	91.1
• Mortality: Severe and often fatal.	125	79.6
• Causative agent is virus.	149	94.9
Knowledge of Transmission		
• **Easy transmission.	101	64.3
• *Period of infectivity is related to the duration of symptoms.	116	73.9
*Most confirmed human transmission occur through		
• Infected body fluids	141	89.8
• Infected objects	92	80.7
• Infected animals	98	72.6
• Airborne	38	34.5
• The virus can enter the body through broken skin or unprotected mucus membranes e.g. eyes, nose or mouth	139	88.5
Knowledge of Incubation Period		
• As short as: From 2 days	38	24.2
• As long as: To 21 days	62	39.5
#Knowledge of Clinical Picture of Cardinal Symptoms and Signs, Diagnosis and Case definition		
• Fever 38.6°C.	148	94.3
• Severe headache.	126	80.3
• Muscle pain.	121	77.1
• Weakness.	121	77.1
• Diarrhea.	127	80.9
• Vomiting.	105	66.9
• Abdominal (stomach) pain.	110	70.1
• Unexplained hemorrhage (bleeding or bruising).	126	80.3
• Cough.	76	48.4
• Expectoration.	115	73.2
• Leucopenia.	73	46.5
• Thrombocytopenia	98	62.4
• Elevated serum AST and ALT.	67	42.7
• Coagulation abnormalities.	85	54.1
• There is a specific Laboratory Test/s.	124	79.0
**Knowledge of the Case Definition of Person Under Investigation?		
• Case Definition of Person under Investigation is based on both Clinical Picture and epidemiological Risk Factors.	98	62.4
*Knowledge of treatment and prevention		
• There is a specific effective Medication.	131	83.4

• There is a preventive vaccination.	133	84.7
***Knowledge of Infection Prevention/Control measures against Ebola virus infection		
• Wear protective clothing, including masks, gloves, gowns, and eye protection.	130	96.3
• Ensure sterilization measures.	117	88.0
• Isolate patients with Ebola from other patients.	120	93.8
• Avoid direct contact with the bodies of people who have died from Ebola virus infection.	110	90.9
• Ebola pathogen can be eliminated with heat (heating for 30 to 60 minutes at 60 °C or boiling for 5 minutes).	50	48.6
• Lipid solvents as alcohol-based products, detergents, hypochlorites can be used as disinfectants.	68	63.5
Knowledge Score with maximum score of 37 points:		
• Mean ± SD	25.42±5.42	
• Median	26	
• Range	4-37	

*Yes/No.

**Selection from multiple choices.

***Selection any of the choices: highly effective or effective.

#Check Boxes.

Table 4: Source* of Knowledge of the Participants regarding Ebola infection.

Source of knowledge	Number	(%)
• Colleagues	49	31.2
• Medical Journals	22	14.0
• WHO/CDC Internet sites	48	30.6
• General Internet Sites	53	33.8
• Ministry of Health Site	82	52.2
• Official Circulars and guidelines	35	22.3
• CME Program/Lecture(s)	70	44.6
• Media TV/Newspapers	38	24.2
• Other Sources	9	5.7

*Multiple responses

Table 5: Association between respondents' characteristics and knowledge Levels of Ebola Virus Disease (EVD)/Outbreak.

Characteristics	Percentage Score Attained			Significance	
	<50	50-74	≥75	X ²	P value
Total Score of knowledge	16 (10.2)	76 (48.4)	65 (41.4)		
Gender				11.54	0.003
• Male	4 (4.5)	39 (44.3)	45 (51.1)		
• Female	12 (17.4)	37 (53.6)	20 (29.0)		
Age in years				10.99	0.027

• <30	7 (14.9)	30 (63.8)	10 (21.3)		
• 30-39	4 (8.0)	23 (46.0)	23 (46.0)		
• 40+	4 (26.7)	22 (40.7)	28 (51.9)		
Nationality				19.19	<0.001
• Saudi	11 (19.0)	35 (60.3)	12 (20.7)		
• Non Saudi	5 (5.1)	41 (41.4)	53 (53.5)		
Marital Status				7.96	0.019
• Married	11 (9.7)	48 (42.5)	54 (47.8)		
• Single/others	5 (11.6)	28 (65.1)	10 (23.3)		
Job category				19.16	<0.001
• Physician	4 (4.6)	33 (38.8)	48 (56.5)		
• Nurse	12 (16.7)	43 (59.7)	17 (23.6)		
Education last degree				33.19	<0.001
• Less than Bachelor	10 (22.2)	29 (64.4)	6 (13.3)		
• Bachelor	4 (6.2)	27 (41.5)	34 (52.3)		
• Diploma/Master	0 (0.0)	19 (54.3)	16 (45.7)		
• MD/PhD/Fellowship	1 (9.1)	1 (9.1)	9 (81.8)		
Original Workplace				3.13	0.209
• Hospital Setting	11 (9.0)	56 (45.9)	55 (45.1)		
• PHC center	5 (16.1)	17 (54.8)	9 (29.0)		
Experience in years				11.05	0.026
• <5	8 (18.2)	23 (52.3)	13 (29.5)		
• 5-10	2 (3.9)	27 (52.9)	22 (43.1)		
• >10	2 (3.8)	23 (44.2)	27 (51.9)		
Have Chronic Disease				1.71	0.425
• Yes	4 (13.8)	16 (55.2)	9 (31.0)		
• No	12 (9.4)	60 (46.9)	56 (43.8)		

Table 6: Adjusted Multivariate Logistic Regression analyses of Factors Associated with Good Knowledge, Risk Acceptance and Self-Efficacy among Healthcare Providers (HCPs) as regard dealing with Ebola Virus Disease (EVD)/Outbreak in Mena Emergency Hospital, during Hajj season 1435 H (2014) (n=157)

	Good Knowledge ^a		Risk Acceptance ^b		Self-efficacy ^c	
	aOR (95% CI)	p-Value	aOR (95% CI)	p-Value	aOR (95% CI)	p-Value*
Assignment.						
- Physician	4.55 (1.58-13.05)		1			
- Nurse		0.005	10.22 (1.79-58.37)	0.009		
Marital Status						
- Single			1		1	
- Married			7.28 (1.30-40.81)	0.021	2.52 (1.05-6.05)	0.039
Original Workplace.						
- PHC Setting	1					
- Hospital setting	4.25 (1.45-15.79)	0.031				
Did you read Ministry of Health Circulars and Guidelines as regard Ebola virus disease/outbreak?						
- No	1					
- Yes	10.25 (1.42-74.31)	0.021				
Did you attend any CME program for Ebola virus infection/outbreak?						
- No			1			
- Yes			3.61 (1.18-10.97)	0.023		
Did you visit Ministry of Health internet site for Ebola virus infection/outbreak awareness?						
- No			1			
- Yes			4.19 (1.34-13.10)	0.014		
Knowledge Score[†].						
- per 1-point increase					1.12 (1.03-1.22)	0.007
Are you concerned that you may get sick with Ebola virus being a healthcare worker?						
- No					1	
- Yes					1.91 (1.24-2.93)	0.003

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval.

^aFinal -2*Log-Likelihood: 116.90; Likelihood Ratio: 32.48; Model P-Value: 0.002;

^bFinal -2*Log-Likelihood: 89.83; Likelihood Ratio: 18.67; Model P-Value: 0.002;

^cFinal -2*Log-Likelihood: 150.55; Likelihood Ratio: 26.32; Model P-Value: <0.001;

*wald test.

[†] Maximum score with 37 points.

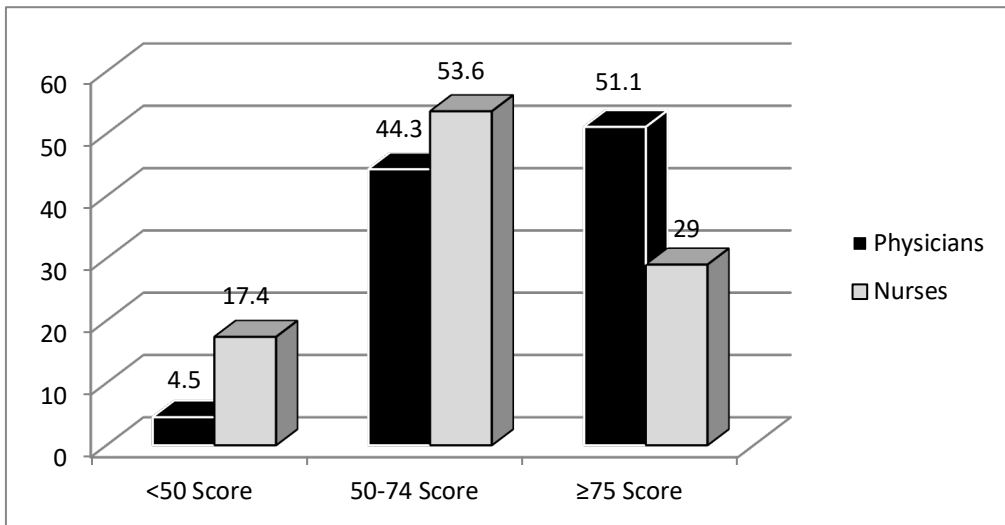


Figure 1: Percentage attainment on knowledge Score for Physicians and Nurses