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Original Research Article

Assessing knowledge of Ebola virus among health sciences students and healthcare professionals: a cross-sectional study in Ajman, UAE

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ABSTRACT

Background: This study aimed to evaluate the knowledge of Ebola virus infection among students enrolled in health sciences programmes (Medicine, Dentistry and Allied Health Professions) and healthcare professionals in a private hospital in Ajman, UAE.
Methods: It was a population based study where no samples collected and sampling technique involved. This cross-sectional study included 719 participants, among which 463 were health sciences students and 256 healthcare professionals. A self-administered questionnaire was given to all participants. A score of 50% or more in the questionnaire was considered a good score, representing a good level of knowledge and practice. Non-parametric statistical tests such as Mann-Whitney U test, Kruskal-Wallis test, and Chi-squared test were applied along with logistic regression model using SPSS version 21.
Results: 100% of healthcare professionals (256) and 90.1% of students across all programs (417) were identified as having a good level of knowledge about Ebola virus infection. This observed difference in knowledge between type of participant was found to be statistically significant ($p \leq 0.001$). Compared to students, healthcare professionals were 8.9 times more likely to have higher levels of knowledge (score ≥75% in the questionnaire; COR: 8.9, CI: 5.5-14.3, $p \leq 0.001$). Higher knowledge identified among students of MBBS program (96.8%), clinical years of study, age ≥20 years old (92.4%), and students from South East Asia.
Conclusions: Various factors were found to contribute significantly to participants having good levels of knowledge, including type of participant (healthcare profession vs student), students' program of study and participants' region of origin.

Keywords: Ebola virus infection, Health care professionals, Knowledge, Medical students

INTRODUCTION

Ebola virus disease is a major public health issue and highly fatal viral illness, with reported case fatality rates of 90%.[1-3] Ebola virus disease in humans is known to be caused by four viruses of the genus Ebola virus: Ebola virus (Zaire Ebola virus; first described in 1976 in Zaire, a central African state now known as Democratic Republic of the Congo) Sudan virus (Sudan Ebola virus; first discovered in Sudan in 1976), Taï Forest virus (Taï Forest Ebola virus, previously Côte d'Ivoire Ebola virus; first described in Côte d'Ivoire) and Bundibugyo virus

(Bundibugyo Ebola virus; first discovered in Uganda). There is also the Reston virus (Reston Ebola virus), which has not been seen to infect humans, but has affected other species such as monkeys.[4] Several Ebola outbreaks have been recorded in history, the first outbreaks occurring in Zaire and Sudan in 1976. The largest outbreak to date has been the West African Ebola epidemic of 2014, which mainly affected Sierra Leone, Liberia and Guinea. In these countries there were 28,610 people infected, of which 11,308 people died, a 39% case mortality.[5]

Virus transmission between humans occurs via direct contact with the bodily fluids of infected individuals – most commonly blood, sweat or vomit, but also through urine, breast milk, saliva and semen. Some Ebola cases have shown that the virus could stay viable in the semen for approximately 70 days. The virus can be directly transmitted by physical contact with the lacerated skin of an infected patient.[6] Indirect transmission through previously contaminated fomites is also possible. Droplet infection can also occur within close proximity to an infected person (approximately a distance of less than a meter), if the droplets from their cough or sneeze are saturated with the virus.[7] One reason for its massive dispersion during the West African epidemic was due to the ritual of washing Ebola virus victims at funerals.

Healthcare workers are exposed to a high risk of contracting Ebola virus when appropriate personal protective equipment is not available. This risk is especially high when they are managing patients that are not recognized as having Ebola virus disease, which can lead to them being unknowingly exposed to infective aerosols generated during medical procedures.[6]

The most common symptoms of Ebola virus infection are fever, headache, sore throat, vomiting, conjunctivitis, myalgia, joint pain, abdominal pain and diarrhea.[1-3,8,9]

It is clear that Ebola virus has the potential to have major public health implications and can cause significant morbidity and mortality. Healthcare professionals and health sciences student experience occupational risk when caring for patient with Ebola virus disease. Hence, it is vital they practice appropriate infection control and take appropriate precautions with personal protective equipment to minimise that risk. Given the gravity of Ebola virus as a disease entity, it is important for healthcare professionals and health sciences students to have a good working knowledge of Ebola virus disease However, as is evidenced in the literature, this is unfortunately not always the case. One study conducted among students and staff in a Malaysia university reported a low median knowledge score of Ebola virus infection.[10] However, there have been studies that have shown good levels of knowledge. A study from the USA reported that more than 85% of the students were aware that the infection is transmitted through a patient's body fluids.[11] Furthermore, a study from Nigeria reported that 67% of healthcare workers had a good knowledge of Ebola virus infection[12]

The current study was conducted to assess the knowledge levels among health sciences students and healthcare professionals regarding Ebola virus disease in Ajman, UAE.

METHODS

Cross-sectional design was used to conduct the study. All students and healthcare professionals of the institution was invited to participate in this study. All the participants in this study were volunteers. Since it is a population based study, no samples were selected for the research and hence no sample size calculation and sampling technique was done in the present study. Participants were fully informed about the purpose of this research and signed consent was obtained from all of them prior to starting the research. The research was conducted in a Medical University in Ajman, UAE. All the participants that were health sciences students who attending this medical university and all the participants who were healthcare professionals were working in its teaching hospital in Ajman, UAE. The study was conducted during spring semester of year 2015 (from February - July 2015). Inclusion criteria states the students and health professionals who were interested to participate were included in the study and those who were not interested to join or give consent were excluded from the study. This research has been approved by the Institutional Review Board of University.

This study used a self-administered questionnaire to assess participants' knowledge of Ebola virus disease. It was done during participants' free time. The questionnaire collated socio-demographic characteristics of participants and assessed their knowledge of various aspects of Ebola virus disease, including general knowledge, mode of transmission, symptoms, risk factors, complications, treatment and management and prevention.

Each correct answer was given a score of 1 and each incorrect answer was given a score of 0. The minimum score in the questionnaire was 0 and the maximum score was 70. A participant scoring 50% and above (≥35 out of 70) was considered as having a good score demonstrating a good level of knowledge about Ebola virus, whereas a participant scoring below 50% (<35 out of 70) was considered as having a poor score showing a poor level of knowledge.

Data was stored on Microsoft Excel and statistical analysis was carried out using IBM SPSS Statistics 21 version. Descriptive statistics and inferential techniques were performed. The results were expressed in frequency, percentages, average, degree of impact (OR), and confidence intervals for OR. Statistical tests such as Mann-Whitney U test and Kruskal-Wallis test were

applied to find whether the difference in the knowledge score is statistically significant across the independent factors.

Association between dependent and independent variables have been tested by Pearson's Chi-squared test. Further Logistic regression model has formulated to observe major determinant of good knowledge score from the identified predictors. Subsequently, significance of degree of association has identified and results are presented with odds ratio and p value.

RESULTS

There was a total of 719 participants in this study, 463 (64%) were health sciences students and 256 (36%) were healthcare professionals. Out of the 463 students, 187 (40%) were from the MBBS programme, 92 (20%) were from the Pharm D programme, 77 (17%) were from the doctor of dental medicine, 67 (15%) were from the bachelor of physiotherapy and allied health sciences programmes and 40 (9%) were from the bachelor of biomedical sciences programme. Of the 256 healthcare professionals, 189 (74%) were nurses, 49 (19%) were doctors and 18 (7%) were lab technicians. Based on the scoring system described previously, minimum, maximum and median scores were noted for all participant subgroups. Analysis was carried to test for significance of differences in knowledge across various subgroups, these are shown in Table 1 and 2.

There were significant differences in the median knowledge score obtained when comparison was made between participants' age, nationality, type of participant (student vs healthcare professional), students' year of study and students' programme of study. The significance of the difference in the median scores was tested by Mann-Whitney U and Kruskal-Wallis non-parametric tests (based on nature of the variable) and found to be statistically significant with p value ≤0.001.

A comparison of score against age groups inclusive of all participants showed that as age increased so too did level of knowledge. The older the age group, the larger the percentage of participants that obtained a good score in the questionnaire.

Table 1: Average knowledge score of Ebola virus infection among participants' demographic/academic/professional characteristics (n=719)

Potential factors of Good knowledge score		Median score	Minimum score	Maximum score	P value
Gender (n=719)	Male	47	24	59	NS
	Female	48	22	60	
Nationality (n=719)	EMR	42	22	60	≤0.001
	South East Asia	50	22	59	
	Others	47	28	57	
Age in years (n=719)	<20	42	22	57	≤0.001
	20-25	45	22	59	
	26-30	51	41	59	
	>30	50	40	59	
Type of participant (n=719)	HCP	51	41	60	≤0.001
	Students	43	22	59	
Programme of study (n=463)	MBBS	46	30	59	≤0.001
	DMD	44	22	54	
	PHARM D	42	24	54	
	Other health science programs (BPT, BHS, BBMS)	41	22	56	
Year of study (n=463)	Pre-clinical stage	42	22	57	≤0.001
	Clinical stage	47	26	59	
Specialty of HCP (n=256)	Doctors	52	43	60	NS
	Lab technicians	50	46	57	
	Nurses	50	41	59	
Duration of service of HCP (n=256)	≤10 years	51	41	60	NS
	>10 years	50	42	59	

Table 2: Association between participants' socio-demographic characteristics and their total knowledge score of Ebola virus infection (n=719)

Socio-demographic Characteristics	Groups	Total knowledge score				P value
		Good (score ≥35)		Poor (score <35)		
		N	%	N	%	
Age group (in years)	<20	195	87.4	28	12.6	--
	20-25	221	92.5	18	7.5	
	26-30	120	100.0	--	--	
	> 30	128	100.0	--	--	
Age group in years (students)*	<20	195	87.4	28	12.6	0.08
	≥20	219	92.4	18	7.6	
Age group in years (HCP)	<30	93	100.0	--	--	--
	≥30	157	100.0	--	--	
Gender	Male	152	93.8	10	6.2	0.99
	Female	518	93.8	34	6.2	
Nationality	Eastern Mediterranean	232	85.6	39	14.4	≤0.001
	South East Asia	283	99.0	3	1.0	
	Others	152	97.4	4	2.6	
Type of participants	HCP	256	100.0	--	--	≤0.001
	Student	417	90.1	46	9.9	
Specialty of HCP	Doctor	49	100.0	--	--	--
	Nurse	189	100.0	--	--	
	Laboratory technician	18	100.0	--	--	
Duration of service of HCP	≤ 10	177	100.0	--	--	--
	> 10	63	100.0	--	--	

Further comparisons were made between questionnaire score and age groups among the student participants alone and the healthcare professional participants alone. 87.4% of the student participants aged <20 years old were found to have good knowledge, while 92.4% of student participants aged ≥20 had good knowledge. However, this difference was not statistically significant (p=0.08). All healthcare professional participants were found to have good knowledge irrespective of age group. Similarly, there were equal levels of knowledge among both genders, with 93.8% of male and female participants achieving a good score in the questionnaire.

When comparing participants by region of origin, 99% of participants from South East Asia achieved a good score, while 85.6% from the Eastern Mediterranean region and 97.4% from other regions achieved a good score. This difference showed that levels of knowledge of Ebola virus among participants from South East Asia were significantly better (p≤0.001) compared to participants from the other regions.

Significant differences in knowledge were also found between the different degree programmes students were in. Of the students from the MBBS, DMD and Pharm.D programmes, 96.8%, 90.2% and 88.0% respectively achieved a good score. In contrast, of the students in the other health sciences programmes (BPT, BBMS and BHS programmes) only 79.4% achieved a good score. The difference between the scores of students in the MBBS, DMD and Pharm.D programme and those in other health science programmes was significantly different (p≤0.001), highlighting that there needs to be an improvement in knowledge about Ebola virus among the other health science programmes.

Good scores were achieved by 85.6%, 87.4% and 95.2% of students in years 1, 2 and 3 respectively, the pre-clinical years. This gave an average of 89.1% of preclinical student achieving a good score. Comparatively, in the clinical years, 94.4%, in year 4, and 86.7%, in year 5, achieved a good score. So an average of 93.3% of students in clinical years achieved a good score. Although, on average students in clinical years demonstrated better knowledge than those in pre-clinical years, the difference was not statistically significant.

All healthcare professionals demonstrated good knowledge, compared to 90.1% of student participants. The difference observed between knowledge and type of participant was statistically significant (p≤0.001). All healthcare professionals demonstrated a good level of Ebola virus irrespective of age group, specialty and duration of service.

Using the Chi-squared test, three variables (nationality, programme of study, and type of participant) were found to be significantly associated with level of knowledge at the level of significance of 0.05. After adjusting for factors, these three variables are retained in multiple logistic regression model. Among healthcare professionals, 34% achieved a score of 75% and above (COR: 8.9, CI: 5.5-14.3, p≤0.001).

It was observed that participants from the South East Asia region had a 6.3 times (AOR) higher chance of demonstrating a good level of knowledge in the questionnaire compared to those from the Eastern Mediterranean. Similarly, participants from other regions (not South East Asia or Eastern Mediterranean) had a 5.5 times (AOR) higher chance of having good knowledge about Ebola virus compared to those from the Eastern Mediterranean with p value≤0.01 and 95% CI of 1.84 – 21.26 and 1.89 – 16.02. Students studying in the MBBS programme were 8.4 times (AOR 8.4; CI 3.21 – 21.8; p value ≤0.001) more likely of having good knowledge than students in other programmes. Though there were widened confidence intervals (indication of precision) for ORs, a significant impact is observed for the above-mentioned factors on participants' level of knowledge, details are given in Table 3.

Table 3: Predictors of good knowledge on Ebola virus infection.

Associated factors of good knowledge on Ebola	Crude		Adjusted	
	OR	**95% CI**	**OR**	**95% CI**
Nationality				
South East Asia	15.86 (≤0.001)	4.83 - 51.97	6.3 (≤0.01)	1.84 - 21.26
Other regions	6.39 (≤0.001)	2.24 - 18.24	5.5 (≤0.01)	1.89 - 16.02
EMR (Ref)	1	--	1	--
Programme				
MBBS	7.8	3.05 - 19.96	8.37 (≤0.001)	3.21 - 21.8
DMD	2.6	1.04 - 6.41	2.52 (NS)	0.99 - 6.45
Pharm. D	1.9	0.86 - 4.12	2.13 (NS)	0.94 - 4.83
Other health science programs (Ref)	1	--	1	--
Type of participant				
HCP	8.9 (≤0.001)	5.5 – 14.3	--	--
Student (Ref)	1	--	1	--

DISCUSSION

An important role given to healthcare professionals, and future healthcare professionals, is tackling emerging and re-emerging infectious diseases. Ebola virus disease has not had a significant presence in the MENA region, but with large numbers of international travelers in the region, it could very easily cross into its borders. Hence the important of assessing the knowledge of healthcare professionals and health sciences students regarding Ebola virus.

General knowledge of Ebola virus infection was shown to be significantly increasing among the participants following the outbreak in 2014 as they were more aware of the disease symptoms and transmission. Having such adequate and sustainable knowledge on these aspects of the virus is the key to promoting prevention of disease occurrence and propagation. Additionally, a study conducted among private dental practitioners in India, showed good knowledge (25th percentile value exceeded 55% of the highest knowledge score).[13] In the current study, participants in the older age group had better level of knowledge on Ebola virus as compared to those in the younger age group. This can be attributed to the fact that as people's age increases, especially those in medical fields, are keen to learn and acquire more knowledge about diseases, particularly infectious ones.

There was no association between the gender and level of knowledge in the current study, which was concordant with the findings of the study conducted among dental practitioners in India.[13] However, there have been contrary findings in the literature. Studies conducted by Kamate et al, and Leili et al, did identify an association between the gender and knowledge.[14,15] This was also found in a study conducted among the general population in Liberia regarding the knowledge, attitudes, and practices on Ebola virus disease. They found that male participants had better knowledge and there was a statistically significant association.[16] This may be attributed to the fact that Liberia has been affected by Ebola virus and men were more involved in burials and other activities that involved high risks of transmission.

In this study, all healthcare professionals achieved a score demonstrating a good level of knowledge in the questionnaire. This is contrast to a study carried out in a tertiary hospital in Ile-Ife, Nigeria where only 54.1% of doctors and only 42.6% of doctors demonstrated a good level of knowledge. The same was found of all other healthcare professionals in that study, like lab

technicians.[17] The study from Ile-Ife, Nigeria also found that only 44.7% of healthcare professionals with less that 10 years of service showed a good level of knowledge.

This difference in knowledge can explained by the fact that there were different cut off values for each research. In the current research the cut off value for a good level of knowledge was 50%, whereas in the other study the cut of value was higher at 65%. A study conducted in Nigeria by Iliyasu et al, on knowledge, attitude and practice of Ebola virus disease, found that only 46.6% of the participating healthcare professionals had good knowledge.[18] This can possibly be due to difference in the study population. In the current study, the study population included healthcare professionals (or those training to be healthcare professionals) only, while the other study included healthcare professionals as well as general population.

Limitation

The study was conducted in one medical institution in the UAE hence, generalization for the results may not be possible. The information provided is self-reported.

CONCLUSION

This research was conducted among health sciences students and healthcare professionals to assess their knowledge regarding Ebola virus. To conclude, among the 719 participants, all healthcare professionals and 90% of students had a good level of knowledge (score ≥50%). Students of the MBBS program were found to have more knowledge of Ebola virus infection compared to students in other programs, with 96.8% of MBBS students achieving a good score. Knowledge was also found to be higher among students in their clinical years of study, compared to those in pre-clinical years. Of students aged ≥20 years old, 92.4% (219) showed a good level of knowledge. As student age increased so did level of knowledge, however the differences were not statistically significant. Students from South East Asia were significantly more likely to have a good score on the questionnaire compared to students from other regions ($p \leq 0.001$), as 99% of students from South East Asia achieved a good score. Levels of knowledge were found to be equal among male and female participants. Association between total level of knowledge and potential factors showed that program of study (MBBS students as compared to students of other programs, $p \leq 0.001$), nationality (South East Asians as compared to others, $p \leq 0.001$), and type of participants (healthcare professionals as compared to students, $p \leq 0.001$) were found to be associated with good level of knowledge in all domains.

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