

Assessment of Postgraduate Health Professions Students' knowledge on Ebola and the Need for Education in Global Health

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ABSTRACT

Background: Ebola virus disease is a serious acute illness that is often fatal if untreated. Multiple outbreaks have occurred in Africa from 1976 to 2014. The recent outbreak of Ebola in West Africa was declared by the WHO as a public health emergency of international concern.

Objective: The aim of this study was to assess knowledge level on Ebola among postgraduate health professions students at a university in Sudan and to make the case for the need for global health education.

Materials and Methods: A cross-sectional study was conducted among 123 postgraduate health professions students. Data was collected using a questionnaire constructed from information available on the websites of the World Health Organization and Centers for Disease Control and Prevention.

Results: Participants' response rate was 98.4%. 95.9% had heard of Ebola virus disease before the study. Of these, all had correctly identified the causative agent as a virus and more than 81% were aware that fever, internal and external bleeding were signs and symptoms of Ebola virus disease. More than 81% of study participants were aware that the methods of prevention included case management, using gloves and protective clothing and patient isolation. While, 68.6% correctly stated that there was no vaccine for Ebola virus disease.

Conclusion: There is gap in knowledge on Ebola virus disease which can be filled by incorporating education on global health with an emphasis on emerging and re-emerging infectious diseases in the curricula of both programs.

Keywords: Knowledge, Ebola, Global health, Sudan, students.

Ebola virus disease (EVD) is an acute, serious and often fatal disease¹⁻³. EVD outbreaks were first reported in South Sudan and the Democratic Republic of Congo in 1976¹. Since 1976, three EVD outbreaks had occurred in South Sudan with case-fatality rates (CFR) ranging from 41% to 65%⁴. Since the discovery of EVD, over 20 confirmed outbreaks have occurred⁵. The previous outbreaks in Eastern and Central Africa had occurred in isolated communities near tropical

rainforests which helped to prevent the epidemic from spreading further. The recent outbreak in West Africa has been the largest and most complex outbreak to contain because it has occurred in both urban and rural areas with reported cases and deaths exceeding all previous outbreaks combined¹. Cumulative data released by the WHO in January 2016 reveal that the recent outbreak in West Africa resulted in 15,215 confirmed cases and 11,300 deaths with CFR of 74.3%⁶. Factors which are believed to have contributed to the spread and complexity of the management of the outbreak in Guinea, Sierra Leone and Liberia have been cited as poverty, very weak health systems, lack of human and infrastructural

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resources, and harmful traditional medicinal and cultural practices^{1,2,7,8}.

EVD is a medical and public health crisis and a social problem which has resulted in multiple human tragedies: orphaned children and abandoned rural villages, economic and social disruption, daily hardship in quarantine zones, riots and uncollected bodies⁷. On August 8th 2015, the WHO Director-General declared that the West Africa EVD outbreak as a Public Health Emergency of International Concern under the International Health Regulations^{1,9}. The World Bank estimates the economic losses for sub-Saharan Africa as a result of EVD could amount to as high as 6.2 billion dollars¹⁰. Hence, the ripple effects can be debilitating.

In June 2011, South Sudan seceded from Sudan. Given the history of previous EVD outbreaks, South Sudan could be a portal of entry for the disease to Sudan. The occurrence of EVD in Nigeria was attributed to an index case which had flown to Lagos on a commercial flight from Liberia¹¹. A major contributing factor to the spread of emerging diseases is frequent air travel¹². The emergence of a new public health threat in one part of the world becomes a concern throughout the world¹³. It is reported that the Ministry of Health in Sudan has prompted a strategy for preventing EVD outbreaks, including instituting a notification system, increasing general awareness of the disease and training healthcare workers in how to handle suspected cases³. The possibility of an outbreak recurrence remains given the history and circumstances in South Sudan and the risk of transmission to Sudan will become a great public health concern.

The recent outbreak in West Africa has shown that EVD has the potential threat to spread and affect a wider geographical region. Such a threat highlights the importance of having healthcare workers (HCWs) being aware of the disease to aid

in controlling the outbreak. During outbreaks, HCWs are the first to be mobilized to contain the outbreak. Higher incidences of EVD among HCWs were reported in Sierra Leone, Liberia and Guinea compared to non-HCWs and in Guinea alone the incidence of EVD among HCWs was 42.2 times higher than among non-HCWs¹⁴. As of August 2014, 240 HCWs developed EVD and 120 died¹⁵. Standard precautions should always be applied by HCWs when caring for patients, regardless of their presumed diagnosis. These precautions include basic hand hygiene, respiratory hygiene, personal protective equipment, safe injection practices and safe burial practices¹. Unsuspecting HCWs not using appropriate protective equipment and when infection control precautions are not strictly practiced may acquire transmission from patients within healthcare settings. But, HCWs can also play an active and positive role in promoting awareness on the disease and control and dispelling panic, fear and negative attitudes during epidemics. The aim of this study was to assess the knowledge level on EVD among postgraduate health professions students in public and tropical health and in family medicine at a university in Sudan. We hope our findings will provide guiding information that might lead to incorporating education on global health and emerging infectious diseases in Sudanese universities.

MATERIALS AND METHODS:

It was a cross-sectional study conducted during February 2015 at the University of Medical Sciences and Technology (UMST). The UMST is a private university with fourteen postgraduate masters programs. The study population consisted of postgraduate health professions students who were available at the time of the survey and enrolled in the

master of family medicine and master of public and tropical health. All students in the master of family medicine were medical doctors, while the students enrolled at the master of public and tropical health were from medical, dental and non-medical backgrounds such as veterinarians and administrators. Because the source population size was small all 125 registered students were considered eligible to participate in the survey.

Data was collected using a structured close-ended questionnaire. These questions were constructed based on information on EVD published on the websites of the World Health Organization (WHO) and Centers for Disease Control (CDC)^{16,17}. Questionnaires were distributed during the end of sessions when it would be convenient to find the maximum number of students available. Data analysis was conducted using SPSS. Descriptive analysis was performed and Chi square tests for comparison of proportions were conducted to determine if

there were significant differences in responses between the two groups (family medicine and public health). The alpha level of significance was set at <0.05.

RESULTS:

Of the 125 eligible students, 123 students were present at the time of the survey and submitted complete questionnaires giving a response rate of 98.4%. There were 56 (45.5%) males and 67 (54.5%) females in the final sample. Most students were enrolled in the public and tropical health program (59.3%) and the remaining students were enrolled in the family medicine program.

Of the total 123 students who participated 118/95.9% had heard of EVD. Of the 118 students who were aware of EVD, all had correctly named the causative agent as a virus and 68 (57.6%) correctly identified the region of the recent EVD outbreak as West Africa (Table 1). Sixty-seven (56.8%) correctly identified the mode of transmission was through contact with

Table 1: Knowledge on region of recent outbreak and transmission of EVD among postgraduate students (n = 118)

	Public & Tropical Health Program	Family Medicine Program	Total	P value
Recent outbreak of EVD occurred in West Africa	44 (61.1%)	24 (52.2%)	68 (57.6%)	0.338
Transmission of EVD is through contact with the blood, secretions, organs or other bodily fluids of ill humans and infected animals	44 (61.1%)	23 (50%)	67 (56.8%)	0.235

blood, secretions, organs or other body fluids of infected animals and ill humans.

The incubation period of 2 – 21 days was correctly stated by 75 (63.6%) respondents (Table 2). The commonly reported signs and symptoms of EVD were fever (97/82.8%), internal and external bleeding (96/81.4%), fatigue (86/72.9%) and sore throat (73/61.9%). Sixty-nine (58.5%)

correctly mentioned the CFR ranges from 25% to 90%.

With regards to treatment, 85 (72%) correctly reported that there is no proven treatment, but supportive care and rehydration with oral and intravenous fluids and management of symptoms improves survival (Table 3). The commonly reported methods of prevention

Table 2: Knowledge on signs and symptoms, incubation period and CFR of EVD among postgraduate students (n = 118)

	Public & Tropical Health Program	Family Medicine Program	Total	P value†
Incubation period of EVD ranges from 2 – 21 days	51 (70.8%)	24 (52.2%)	75 (63.6%)	0.040
Symptoms and signs				
Fever	59 (81.9%)	38 (82.6%)	97 (82.2%)	0.927
Fatigue	55 (76.4%)	31 (67.4%)	86 (72.9%)	0.284
Diarrhea	38 (52.8%)	25 (54.3%)	63 (53.4%)	0.868
Vomiting	34 (47.2%)	21 (45.7%)	55 (46.6%)	0.868
Rash	37 (51.4%)	22 (47.8%)	59 (50%)	0.706
Impaired liver and kidney function	27 (37.5%)	10 (21.7%)	37 (31.4%)	0.072
Internal and external bleeding	60 (83.3%)	36 (78.3%)	96 (81.4%)	0.490
Muscle pain	40 (55.6%)	19 (41.3%)	59 (50%)	0.131
Headache	40 (55.6%)	20 (43.5%)	60 (50.8%)	0.201
Sore throat	47 (65.3%)	26 (56.5%)	73 (61.9%)	0.340
Case-fatality rate of EVD ranges from 25% - 90%	41 (56.9%)	28 (60.9%)	69 (58.5%)	0.673

Table 3: Awareness on methods of prevention of EVD among postgraduate students (n=118)

	Public & Tropical Health Program	Family Medicine Program	Total	P value†
EVD has no proven treatment but is managed through supportive care and rehydration with oral or intravenous fluids and management of symptoms	57 (79.2%)	28 (60.9%)	85 (72%)	0.031
Case management	60 (83.3%)	37 (80.4%)	97 (82.2%)	0.688
Contact tracing and monitoring health of contacts	46 (63.9%)	29 (63%)	75 (63.6%)	0.926
Good laboratory service	40 (55.6%)	25 (54.3%)	65 (55.1%)	0.898
Prompt and safe burial of the dead	49 (68.1%)	31 (67.4%)	80 (67.8%)	0.940
Social mobilization	52 (72.2%)	31 (67.4%)	83 (70.3%)	0.575
Community engagement	48 (66.7%)	32 (69.6%)	80 (67.8%)	0.742
Using gloves and protective clothing	63 (87.5%)	34 (73.9%)	97 (82.2%)	0.600
Cooking meat thoroughly before consumption	36 (50%)	21 (45.7%)	57 (48.3%)	0.648
Regular hand washing	56 (77.8%)	29 (63%)	85 (72%)	0.082
Patient isolation	61 (84.7%)	35 (76.1%)	96 (81.4%)	0.240

from EVD were using gloves and protective clothing (97/82.2%); patient isolation (96/81.4%); regular hand washing (85/72%); social mobilization (83/70.3%); community engagement (80/67.8%); prompt and safe burial of the dead (80/67.8%) and contact tracing (75/63.6%).

Eighty-one (68.6%) students correctly acknowledged that there is no vaccine for EVD (Table 4).

Sixty-seven (56.8%) respondents were aware that patients who survive develop immunity against EVD. Nearly all (97/82.2%) students were concerned that there will be an outbreak of EVD in Sudan and almost all respondents (112/94.9%) believed that their postgraduate program curricula should be updated to include emerging infectious diseases.

DISCUSSION:

Knowledge of EVD

All respondents in the survey knew EVD is caused by a virus. Similar studies that reported that 50%, 80% and 93.2% of their respondents correctly knew the disease was caused by a virus^{5,18,19}. More than half the respondents were aware of EVD epidemic in West Africa. In comparison, a Nigerian study revealed almost 85% were aware of the recent EVD occurring in West Africa¹⁹. The incubation period for

EVD is 2 to 21 days^{1,5,19}. Our study found that 63.6% have correctly identified the incubation period. This is comparable to the 61.8% reported in similar study¹⁹. Only 56.8% of the respondents correctly acknowledged the routes of EVD transmission. The virus is transmitted from wild animals to people and spreads in the human population through human-to-human transmission¹. But the natural reservoir of the Ebola viruses remains unknown¹⁹. Transmission of EVD is by physical contact with body fluids, secretions, breast milk, tissues or semen from infected persons that are alive or immediately following death especially during funeral rites⁵. Our survey has shown that 58.5% correctly indicated the CFR of EVD. The average CFR of EVD is 50%, but CFR have ranges from 25% to 90%^{1,5,19}. The marked variation in CFR is attributed to the different viral species with Zaire Ebola virus being the most lethal with a CFR of up to 90%⁵. Overall, greater proportions of public and tropical health students answered correctly the questions on knowledge of EVD. On two questions there were significant differences between students of both programs. This would be expected of public and tropical health students because their program includes a module on virology and because they are expected to be better aware of public

Table 4: Vaccine, curriculum and concern from EVD outbreak in Sudan among postgraduate students (n = 118)

	Public & Family Tropical Health Program	Medicine Program	Total	P value†
There is no vaccine for EVD	49 (68.1%)	32 (69.6%)	81 (68.6%)	0.863
Patients who survive develop immunity against EVD	38 (52.8%)	29 (63%)	67 (56.8%)	0.272
Curriculum should be updated to integrate education on emerging infections	68 (94.4%)	44 (95.7%)	112 (94.9%)	0.771
Concerned that there will be an outbreak of EVD in Sudan	61 (84.7%)	36 (78.3%)	97 (82.2%)	0.371

health emergencies. Family medicine students are clinicians trained in delivering primary health care and their curriculum possibly does not include the topic of EVD. This would suggest that the family medicine program should have a module on public health incorporated in its curriculum.

Humans are not infectious until they develop symptoms and they remain infectious as long as their blood contains the virus¹. With regards to fever, 82.2% of the respondents correctly indicated fever as a presenting symptom. Related studies conducted on healthcare workers indicate knowledge of fever as a presenting symptom was reported by 78.2% and 95.1%^{2,19}. Other symptoms of diarrhea, vomiting and muscle pain were reported by 53.4%, 46.6% and 50% of the respondents respectively. In contrast a study reported the same symptoms with higher proportions of 93.6%, 94.1% and 82.2% respectively². More respondents knew that internal and external bleeding was a common symptom (81.4%). Similarly a higher proportion (94.1%) was reported in separate study². Although students in both programs had nearly comparable proportions with regards to correct responses on signs and symptoms, knowledge of the symptoms and signs was still not adequate.

Seventy-two percent of the respondents correctly knew that there is no proven treatment for EVD, but supportive care through rehydration with oral or intravenous fluids and treatment of specific symptoms, would improve survival. Of the respondents, 68.6% were aware that there was no vaccine for EVD. Surprisingly, this is greater than the proportion of 27% reported among healthcare workers in a tertiary setting in Nigeria¹⁹. Currently a range of potential treatments including blood products, immune therapies and drug therapies are

being evaluated. There are no licensed vaccines available yet, but two potential vaccines are undergoing human safety testing¹. However, interim analysis of a trial on a recombinant VSV-vectored vaccine has suggested that it might be highly efficacious and safe in preventing EVD and is most likely effective at the population level when delivered during a disease outbreak²⁰.

With regards to prevention and control, respondents' knowledge was adequate for case management, patient isolation, and regular hand-washing and social mobilization. Using gloves and protective clothing as measure of prevention and control was reported by 82.2%. A similar study reported a greater proportion of 96%². The WHO sees community engagement as crucial to successfully controlling outbreaks. Outbreak control relies on applying a package of interventions that includes case management, a good laboratory service, surveillance and contact tracing, safe burials and social mobilization. An effective way to reduce human transmission is by raising awareness of risk factors for Ebola infection and protective measures that individuals can take¹. Knowledge was inadequate with regards to prompt and safe burial of the dead, contact tracing and monitoring health of contacts, good laboratory service, community engagement and cooking meat thoroughly before consumption.

The need for incorporating global health in curricula

Global health can be broadly defined as those health issues that transcend national boundaries and governments and call for actions on the global forces that determine the health of people²¹. It is the global health of populations in a global context; while public health is usually viewed as having a focus on the health of the

population of a specific country or community.

Global health provides a means of knowing what happens to the health of people in other countries. EVD is an example of a re-emerging viral infectious disease which has demonstrated the potential to spread beyond local and national boundaries to become a regional and global health issue. This example highlights the importance of global health and educating healthcare providers in global health issues can improve the management and control of regional and global disease outbreaks. In our current circumstances, it is vital to expand understanding and knowledge on emerging infectious diseases to improve management of outbreaks and minimize the global threat. Teaching global health may lead to a greater appreciation for public health. Hence, global health training can benefit students of both programs.

African universities must be involved in global health issues, update their curricula and should consider entering in partnerships with Western universities to develop modules with a prime focus on emerging and re-emerging infectious diseases. This can be encouraged through the implementation of millennium development goal number eight that calls for developing a global partnership for development²². Knowledge and education should include epidemiological aspects; outbreak investigation and control; prevention and infection control; communication skills and technologies that aim to deliver correct information to reduce public panic, misconceptions and the adverse impact of harmful information. Additionally, updated curricula will aid in defining the role of HCWs in containing future outbreaks such as dispelling misconceptions to diminish fear, prevent stigma and discrimination and ultimately halt future outbreaks of EVD.

The limitation of this survey is the small sample size and the results cannot be generalized to reflect the level of knowledge among postgraduate health professions students at other universities. Because our data collection questionnaire was designed from information on EVD available on the websites of the WHO and CDC, we did not collect data and report on results that asked respondents on their attitudes, practices and misconceptions towards EVD. Hence, a comparison of our results with previously published KAP studies is limited to knowledge-based questions.

CONCLUSION:

Our study is the only survey to assess the level of knowledge of EVD among postgraduate health professions students and emphasize the need for global health education on emerging infectious diseases in Sudanese universities. This study shows that there are gaps in knowledge on EVD among postgraduate health professions students. The gaps in knowledge are observed almost equally between postgraduate healthcare family medicine students and public and tropical health students. These could be addressed by incorporating teaching global health concepts of emerging infectious diseases in the curricula of both programs, curricula of undergraduate medical and nursing students and as continuous professional development for medical doctors, lab technicians and clinical pharmacists.

ETHICAL CONSIDERATIONS:

The research proposal was granted ethical approval by the Dean of Faculty of Medicine and Dean of Graduate College. All participants were provided information about the survey and informed verbal consent was obtained from all students. All questionnaires were anonymous and no identifying information was collected.

COMPETING INTERESTS:

Both authors declare that they have no competing interests.

AVAILABILITY OF DATA UPON REQUEST:

The data of this study are available on request from the corresponding author.

AUTHOR CONTRIBUTIONS:

TO and AA conceptualized the study design. AA collected data and performed the data analysis and TO revised the data analysis. TO and AA equally contributed to the data interpretation. TO drafted the manuscript. TO and AA critically reviewed the manuscript and approved of the final draft for publication. In writing the cover letter to the Sudan JMS, TO and AA affirmed that the work is original, has not been considered for publication elsewhere, transfer copyrights to the journal and agree to accountability and for accuracy and integrity.

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