Are emergency medical personnel prepared to act under conditions of Ebola virus disease?

Łukasz SZARPAK	Dariusz TIMLER
Department of Cardiosurgery and Transplantology, Institute of Cardiology, Warsaw, Poland	Department of Emergency Medicine and Disaster Medicine, Medical University of Lodz, Poland
Łukasz CZYEWSK	**Krzysztof KUROWSKI**
Department of Nephrologic Nursing, Medical University of Warsaw, Warsaw, Poland	Departement of Thoracic Surgery, Hospital del Vinalopo, Elche (Alicante), Spain
Marcin MADZIAŁA	**Andrzej KUROWSKI**
Polish Society for Disaster Medicine, Warsaw, Poland	Department of Anesthesiology, Institute of Cardiology, Warsaw, Poland

ABSTRACT *Background.The most important aspect of fighting Ebola virus disease (EVD) is the reinforcing of emergency medical personnel's knowledge of diagnosis and rapid reaction to this pathogen. The aim of this study was to evaluate emergency medical personnel's knowledge of procedures regarding EVD victims.*

Methods. An anonymous survey was administrated via the internet in Poland, Spain, Turkey and the USA. 2855 emergency medical personnel who met the inclusion criteria participated in this study. A Wilcoxon descriptive statistics test was used.

Results. The total percentage of correct answers was 53.4 pt. vs. 36.6 pt. vs. 52.4 pt. vs. 60.3 points (Poland, Spain, Turkey and USA respectively). Correct answers in all research planes were more common amongst the emergency medical personnel from the USA.

Conclusions. We conclude that the knowledge held by emergency medical personnel of EVD is insufficient. Mandatory training to recognize and treat suspected EVD victims should be implemented.

INTRODUCTION

The Ebola virus disease (EVD) is a hemorrhagic fever caused by the Ebola virus of the filoviridae family [1,2]. EVD remains a significant emerging infection which challenges emergency and critical care practice [3,4,5]. Transmission occurs as a result of direct contact with the body fluids of infected individuals and is unlikely to occur during the incubation period [1,6,7,8,9].

The World Health Organization (WHO) has reported several outbreaks of Ebola since its discovery in 1976 [10,11]. There is an ongoing outbreak in Guinea, Liberia and Sierra Leone [1,2,6]. In March 2014, a new outbreak of EVD was identified in West Africa [8]. The latest WHO reports indicate that the risk of EVD infection no longer only exists in African countries. WHO reported a total of 8399 confirmed, probable and suspected cases of EVD in seven countries (Guienea, Liberia, Senegal, Nigeria, Sierra Leone, Spain and the United States of America [USA]) as of 8 October 2014. There have been 4033 deaths [11]. We currently know that a suspected case of the EVD has been found, for example, in the Czech Republic.

According to scientific literature there is a lack of scientific reports which raise the issue of substantial preparation of emergency medical personnel which can help in cases of EVD. Therefore the aim of this work was to evaluate the knowledge of physicians, nurses and paramedics from Poland, Spain, Turkey and the USA of etiology, diagnosis and management in cases of contact with EVD victims.

METHODS

2855 physicians, nurses and paramedics participated in this study. The inclusion criteria of the study were; volunteering as participant, working in either an emergency department or emergency medical service (EMS) and having at least 1 year of work experience. A survey translated into Polish, Spanish, Turkish and English was conducted by internet from July to September 2014 in Poland, Spain, Turkey and USA. The study was approved by the Executive Scientific Committee of the International Institute of Rescue Research and Education Prot. Number: 6.2014.11.21).

Interviewees were divided into four groups according to their country of work. The first section of the survey concerned the demographic profile of the subjects. The second section contained self-assessment questions about participants' knowledge of EVD. Participants evaluated their knowledge on a five-point Likert scale (1 = lack of knowledge; 5 = full knowledge). The third part included 10 questions in 5 parts to assess knowledge of EVD (3 questions about concept and nature of EVD, 2 questions about transmission of EVD, 2 questions about EVD detection and 3 questions about using personal protective equipment (PPE) and care of Ebola victims). Responses to the questions consisted of Correct, Incorrect, and Do not know options. Each correct answer was awarded a score of 1 and each incorrect and do not know answer were given score

of 0. Finally, knowledge was classified as low knowledge (0-33.3), medium (33.4-66.6) and high (66.7-100).

The analysis was done in MS Excel 2010 software and the results were analyzed with the R statistical package for Windows (version 3.0.0). Results were presented as mean ± standard deviation (±SD), frequencies and percentages. Statistically significant differences between groups were calculated using the Wilcoxon statistical test. Results were found statistically significant with a value of $p<0.05$.

RESULTS

2855 emergency medical personnel (973 from Poland, 527 from Spain, 544 from Turkey and 811 from USA) participated in this study. There were 348 physicians, 1043 nurses and 1464 paramedics. 45.8% of participants were female. 1034 participants (619 female, 59.8%) worked in hospital emergency units, 1821 participants (689 female, 37.8%) in EMS teams. Mean age was 34.5±14.6 years, and mean work experience was 11.7±8.2 years.

The total knowledge of EVD in the examined four countries varied and amounted to: 35.4 pt. vs. 46.6 pt. vs. 52.4 pt. vs. 60.3 points (Poland, Spain, Turkey, USA: respectively; Table). There is a statistically significant difference between EVD knowledge held by emergency medical personnel from Poland and personnel from Spain ($p<0.001$), Turkey ($p<0.001$) and USA ($p<0.001$). This relationship exists in all study dimensions.

Discussion

Ebola virus hemorrhagic fever is a zoonotic disease transmitted accidentally by direct contact with infected live or dead animals [12,13]. The first recorded human outbreak was in 1976 [6,10]. Ebola hemorrhagic fever is caused by a negative-strand RNA virus [14]. Genetic and antigenic characterization of Ebola virus isolated during human outbreaks has led to the identification of four subtypes [15] – Ebola Sudan, E. Zaire, E. Ivory Coast and E. Reston, however this last type has never been reported to cause human infection [16]. Fatality rates are about 80% with E. Zaire [17,18,19] and 50% with E. Sudan [19,20]. A meta-analysis from Lefabvre et al. indicated a high case fatality rate (65%, CI 95%) [14]. Ebola hemorrhagic fever follows an incubation period of 2-21 days (mean 4-10) and is characterized by fever, chills, malaise and myalgia. EVD can be suspected in acute febrile patients with the symptoms described and with a history of travel to an endemic area, or having contact with an infected person [22,23].

Current reports indicate the rapid spread of the epidemic. According to data from the WHO on the 5th September 2014, there were 3944 cases of EVD and 1759 deaths [4]. Subsequently, the WHO report of 8th October 2014 shows 8399 confirmed, probable and suspected cases of EVD. There have been 4033 deaths [11]. This high fatality rate, combined with the absence of treatment and vaccination options, makes Ebola virus an important public pathogen [24], classified by the Centers for Disease Control and Prevention (CDC) as a pathogen of category A [25].

Unlike previous outbreaks, which were centered on rural communities, infection has also been detected in large urban areas in 2014 [26]. Moreover, EVD infection cases do not concern only the Sub-Saharan Africa, but cases of EVD (confirmed, probable or suspected) have been found in the USA, Spain, Italy and the Czech Republic [11]. This situation represents a global EVD threat.

The study showed a significant disproportion between countries regarding the preparedness of medical personnel for EVD victims. As can be seen from the table presented, medical personnel from the United States showed the highest level of knowledge, however this level was also unsatisfactory. It should be emphasized that knowledge of the nature and transmission of the Ebola virus and its rapid diagnosis , as well as adequate protection against medical personnel becoming contaminated with the bodily fluids of patients may be crucial in reducing the spread of the epidemic [15,27,28,29].

Unfortunately, this study proved that emergency medical personnel's knowledge of EVD is far from satisfactory. Lack of information on EVD knowledge in medical literature poses a problem when comparing the results of our research with the studies of other authors, and at the same time provides the impetus for further research aimed at education systems in the field of infectious diseases.

The low level of knowledge among emergency medical personnel in Poland may be due to the fact although Poland is a developing country, it was not able to draw experiences from other countries for many years due to political considerations and its citizens' limited ability to travel, thus the tradition associated with the prevention of tropical infections that can be found in Western Europe or the USA do not exist in Poland.

In the present study a 3-band distribution of respondents' knowledge was adopted (low knowledge (0-33.3%), medium (33.4-66.6%) and high (66.7-100%)). However, due to the nature of the spread of EVD and its high mortality rate, only medical personnel who score 100% in the test should be considered well-prepared to deal with suspected EVD. This is all the more relevant because medical personnel are most vulnerable to the occurrence of human to human EVD transmission, especially when performing invasive medical procedures.

The study has several limitations. Firstly, is confined only to issues related to EVD, not all infectious diseases, but the importance of EVD and the real threat of EVD in every corner of the globe calls for attention to this problem. The second limitation is the narrow target group which was taken only from emergency medical personnel. It should be borne in mind that it is the personnel working in EMS teams or hospital emergency units that are particularly vulnerable to contact with potential EVD victims. The strength of the study lies in the fact that it is a study covering four countries which differ in terms of location, culture and education systems, assisted by the large number of respondents including physicians, nurses and paramedics.

Participants' knowledge was shown to be highest in the United States. However, it should be emphasized that these participants' knowledge needs to be systematized. The Ebola virus training in the United States seems to be the most efficient when it is analyzed in terms of the level of knowledge of respondents. The unification of education systems in the field of infectious diseases in all countries should be considered, and based on the analysis of this research the implementation of the United States' training system seems justified in other countries.

Conclusions

As the analysis of the research material shows, the level of knowledge varies in the countries surveyed. We conclude that knowledge of EVD held by emergency medical personnel is insufficient. The best knowledge was displayed by emergency medical personnel from the United States. Unification of EVD education between countries should be considered, taking the United States' system as a model. Mandatory training to recognize EVD and treat suspected victims needs to be implemented.

Conflict of Interest:

None declared.

Table. The mean and standard deviation (SD) of percentage of obtained knowledge scores about EVD by participants.

Period Areas of knowledge	Poland		Spain		Turkey		USA		Wicoxonstatistical test
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Self assessment knowledge (scale of 1 to 5)	4.3	2.1	4.2	2.5	4.2	1.7	4.4	2.3	NS
The concepts and nature of EVD (3 – questions)	40.7	24.5	54.3	17.3	61.4	19.7	62.3	17.5	Poland vs. Spain <0.001 Poland vs. Turkey <0.001 Poland vs. USA <0.001 Spain vs. Turkey <0.001 Others: NS
The transmission of EVD (2 questions)	33.9	16.8	49.7	21.4	69.6	25.4	71.9	21.4	Poland vs. Spain <0.001 Poland vs. Turkey <0.001 Poland vs. USA <0.001 Spain vs. Turkey <0.001 Spain vs. USA <0.001 Others: NS
The detection of EVD (2 questions)	23.5	22.5	25.6	10.9	26.7	19.7	48.6	15.5	Poland vs. USA <0.001 Spain vs. USA <0.001 Turkey vs. USA <0.001 Others: NS
The PPE and care of Ebola victims (3 questions)	36.5	17.8	47.5	15.9	50.6	18.4	73.5	20.3	Poland vs. Spain <0.001 Poland vs. Turkey <0.001 Poland vs. USA <0.001 Spain vs. USA <0.001 Others: NS
The totally knowledge of EVD	35.4	18.5	46.6	17.5	52.4	20.9	60.3	14.7	Poland vs. Spain <0.001 Poland vs. Turkey <0.001 Poland vs. USA <0.001 Spain vs. USA <0.001 Turkey vs. USA <0.001 Others: NS
NS = Not statistically significant									

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