KNOWLEDGE OF MEDICAL FACULTY STUDENTS CONCERNING EBOLA IN MALATYA, TURKEY

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Abstract. The purpose of this study was to determine the knowledge levels of Inonu University medical faculty students regarding Ebola. This descriptive, cross sectional study was conducted between November and December, 2014 at Inonu University Medical Faculty. After the researchers performed the literature review, a questionnaire comprising 39 questions was prepared, and the students were asked to fill them out. Nine hundred and eighty-four of 1,298 students (75.8%) participated in the study. Seventy-three point seven percent knew that the Ebola virus disease had high fatality rate, 51.9% of them knew that the primary method of infection was contact with the secretions of dead animals and humans, and 55.2% knew that it was transmitted via the blood of infected animals. The rate of knowing that there was no specific vaccination was 62.1%, while the knowledge that there was no specific treatment was 45.3%; 80.4% knew that all the people entering the patient's room had to wear gloves and liquid-resistant aprons, and 77.3% knew that the number of the staff caring for the patient must be reduced to the minimum level. Three knowledge points were calculated in the study: 'Knowledge Points on Ebola Virus Disease Factor Properties and the Methods of Infection,' 'Ebola Virus Disease Symptom Knowledge Points,' and 'Ebola Virus Disease Protection Knowledge Points.' In terms of these knowledge points, the knowledge levels of the students between the classes were significantly different.

Keywords: Ebola virus, knowledge, medical students, Turkey

INTRODUCTION

The Ebola virus is a zoonotic infection agent and belongs to the Flaviviridae family (Pourrut *et al*, 2005; Morikawa *et al*, 2007). The Ebola virus was first identified in 1976 during the outbreak of epidemics in Sudan and the Democratic Republic of the Congo. It was named because its first outbreak took place near the Ebola River in the Democratic Republic of the Congo (WHO, 2014).

The natural source of the virus is thought to be fruit bats in Africa. The agent, which is an RNA virus of the Flaviviridae family, has five defined species: *Bundibugyo ebolavirus*, *Zaire ebolavirus*, *Reston ebolavirus*, *Sudan ebolavirus*, and *Taï Forest ebolavirus*. However, among these species, *Reston ebolavirus* does not cause disease among humans (Streinu-Cercel, 2014). The Ebola virus is relatively sturdy, except for its host. It may survive for a few days at room temperature down to 4°C (Public Health Institution, 2014). However, the virus is

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susceptible to sodium hypochlorite, lipid solvents, and 2% glutaraldehyde (Public Health Institution, 2014). The virus is inactivated by boiling for 5 minutes and heating to 60ºC for 30-60 minutes.

The Ebola virus infects humans through the body fluids of infected individuals (saliva, semen, tears, blood, sweat, and stools) (Bausch *et al*, 2007). It also infects hosts through contact with the organs, blood, and body fluids of infected animals (Roels *et al*, 1999). It is also thought to infect hosts through the consumption of infected animal meat (CDC, 2014a). Patients infected with the Ebola virus are infectious after the beginning of pyretic symptoms. They are not infectious before the beginning of these symptoms (Public Health Institution, 2014) .

An Ebola virus patient should be cared for while conforming to contact and droplet isolation rules. Such a patient should be monitored in the isolation room if necessary and be allowed to have contact with the minimum possible number of medical personnel and visitors. Because human-to-human infection occurs through the direct contact of the disintegrated skin or mucosa with the blood and body fluids of infected people, it is of primary importance to follow contact isolation rules, as well as the standard isolation rules (Public Health Institution, 2014).

The incubation period of Ebola virus disease (EVD) is often 7 days and may vary between 2 and 21 days (Streinu-Cercel, 2014). The clinical presentation of EVD may appear in many forms. It is generally a disease with an acute onset that may progress to high fever, gastrointestinal symptoms, and bleeding. Hemorrhagic symptoms are observed in some cases, such as petechia, nose-bleeding, and ecchymosis, as well as more serious symptoms, such as gastrointestinal bleeding, shock, and disseminated intravascular coagulation (DIC) (Roels *et al*, 1999).

General symptoms, such as fever (>38°C), headache, fatigue, exhaustion, muscle and joint pain, nausea, and vomiting may occur (Streinu-Cercel, 2014). The disease may also cause cardiac, renal, neurological, gastrointestinal, and hepatic systems (Wiwanitkit, 2014a). Hemorrhagic findings were identified in less than half of the cases during the outbreak in Middle-Western Africa in 2014. Therefore, the clinical picture has been more accurately termed EVD, or Ebola virus disease, instead of Ebola hemorrhagic fever (Elisha and Adegboro, 2014).

The 2014 EVD outbreak began in Guinea in December 2013 and then spread to Liberia, Nigeria, and Sierra Leone (Baize *et al*, 2014). As of October 2014, the total number of cases in the world for all time was 13,567, the number of confirmed laboratory cases was 7,728, and the number of total deaths was 4,960 people (CDC, 2014a).

EVD-induced death frequently takes place after the 9th or 10th days following the development of clinical findings due to septic shock, multiple organ failure, and DIC (Ansari, 2014).

Laboratory tests are used to diagnose Ebola virus disease. Antigen tests, antibody tests, RT-PCR, and virus isolation may be used for its original diagnosis (Public Health Institution, 2014). However, these laboratory tests should be conducted in high-biosafety laboratories (Wiwanitkit, 2014b). Underdeveloped and developing countries remain incapable of diagnosing the disease in this respect. Other diseases that can be encountered in the region, such as malaria and shigellosis,

cholera, typhoid, leptospirosis, ricketsiosis, hepatitis, and other viral hemorrhagic fevers, should also be taken into consideration for differential diagnosis (Public Health Institution, 2014).

There is no specific treatment for EVD. The main treatment approach is supportive treatment. Hydration, oxygenation, secondary infection treatments, and supportive treatment intended for other symptoms should be carried out. In addition, preclinical and clinical studies conducted in Europe found monoclonal antibodies, RNA polymerase inhibitor, and viral mRNA translation inhibitor production activities (Streinu-Cercel, 2014). Disease vaccination studies continue. However, no FDA-approved specific vaccines have been produced thus far.

Medical students contact to patients with various disease types including EVD during their clinical practice. Therefore, it is important for them to have knowledge about the characteristics, transmission and protection methods of EVD. To the best of our knowledge, there has not been any study in the literature assessing the knowledge level of medical students about EVD, hence detecting the knowledge level of medical students emerges as a research problem. In this study, we questioned whether medical students lack knowledge of EVD. The purpose of this study is to determine the knowledge levels of medical students at Inonu University regarding Ebola virus disease.

MATERIALS AND METHODS

Study design and repondents

This descriptive, cross sectional study was conducted between November and December 2014 at the Inonu University Medical Faculty. All 1,298 students at the Inonu University Medical Faculty were asked to participate in the study. Sampling selection was not performed.

Ethical considerations

This study was approved by the Malatya Clinical Research Ethics Committee and Inonu University Medical Faculty Deanery (Ref Nº 2014/171; 2014 Nov 19) in order to conduct the study. Students were informed about the study before handing out the questionnaires. It was indicated that participation in the study was subject to their own consent, and then the questionnaires were distributed.

Instrument

A 39-question questionnaire was prepared by the researchers, utilizing literature sources. The questionnaires were filled out under the supervision of researchers and then collected. Every correct answer given to each one of the 15 questions asked concerning EVD agent characteristics and methods of transmission was rated as one point (Table 2). These points were added, and an "EVD agent characteristics and ways of transmission knowledge score" of up to 15 points was obtained. Nine questions related to EVD symptoms (Table 3) and seven questions related to disease protection methods (Table 4) were rated in the same manner, and the "EVD symptom knowledge score" and "EVD protection knowledge score" were also calculated.

Data analysis

The Statistical Package for the Social Sciences®, version 22 (IBM, Armonk, NY) was used to perform statistical analyses. It was observed in the Kolmogorov-Smirnov test that the 'EVD Agent Characteristics and Methods of Transmission Knowledge' score, 'EVD Symptom Knowledge' score, and 'EVD Prophylaxis Knowledge' score did not comply with a normal distribution ($p<0.05$). A Kruskal-Wallis test was used for

Table 1
Students' characteristics.

Characteristics	No. (%)
Gender	
Male	510 (51.8)
Female	474 (48.2)
Marital status	
Single	968 (98.4)
Married	16 (1.6)
College year	
1st	214 (21.7)
2nd	224 (22.8)
3rd	188 (19.1)
4th	144 (14.6)
5th	102 (10.4)
6th	112 (11.4)
Total	984 (100.0)

statistical analyses, and a Mann-Whitney *U* test was used as the *post hoc* test after Bonferroni correction. A $p<0.05$ was accepted as significant in all evaluations.

RESULTS

Seventy-five percent of the students (984 people) could be reached. Table 1 illustrates the socio-demographic characteristics of the students. Forty-eight point two percent of the respondents were female, and 98.4% of participants were single. The average age of the students was 21.4±2.2 years (min-max: 17-44). Among respondents, 21.7% were First Year, 22.8% were Second Year, 19.1% were Third Year, 14.6% were Fourth Year, 10.4% were Fifth Year, and 11.4% were Sixth Year students.

Table 2 illustrates participants' knowledge levels regarding EVD agent characteristics and forms of transmission. Thirty-four percent of students were aware that the Ebola virus was nondurable and could not survive outside of a host, forty-one point seven percent of students knew that Ebola virus was a lipid-enveloped RNA virus, and 73.7% were aware that the virus was highly fatal. Fifty-one point nine percent of the students knew that infection was possible through contact with dead animal and human secretions and the blood of infected animals. Thirty-four point five percent knew that it was possible through the consumption of the meat of infected wild animals and 62.5% knew that it was possible to become infected through contact with the body fluids of infected patient. Eighteen point nine percent knew that infection was not possible through respiration, and 8.1% knew that infection was not possible through contact with the body fluids of people who were virus-infected but did not yet have any symptoms.

While the most commonly known symptom related to EVD in the study group was fever (84.2%), the least commonly known symptom was throat ache (34.0%) (Table 3). While 78.6% of students indicated that fatigue and exhaustion may be observed, 62.9% specified that nausea, vomiting, diarrhea, and muscle and joint pain may occur.

The most commonly known method among the protective precautions that should be taken by medical personnel was the use of non-sterile gloves and liquid-tight aprons (80.4%) (Table 4). The least commonly known method was the use of face shields and glasses for eye protection (66.2%). The necessity of using patient-specific medical equipments and devices was known by 77.3% of the students. Similarly, 70.1% of the students were aware that the number of personnel providing the patient with care should be as small as possible. Sixty-two point one percent of students were aware that there was no vaccination for the disease.

Table 2
Questions regarding 'EVD Agent Characteristics and Methods of Transmission' score.

EVD characteristics	Correct response No. (%)
EVD agent	429 (43.6)
Ebola virus agent characteristics	
It is nondurable, cannot survive outside of host.	319 (32.4)
It is a lipid-enveloped RNA virus.	410 (41.7)
It is highly fatal.	725 (73.7)
It was seen in Middle-Western Africa for the first time.	339 (34.5)
There is a laboratory test for a definitive diagnosis.	249 (25.3)
Transmission methods of Ebola virus	
Transmitted through contact with dead animal and human secretions.	511 (51.9)
Transmitted through contact with blood of infected animals.	543 (55.2)
May be transmitted through consumption of infected wild animal meat.	339 (34.5)
May be transmitted through contact with body fluids of infected patient.	615 (62.5)
Not transmitted through respiration of infected patient.	186 (18.9)
Not transmitted through contact with body fluids of someone who does not have symptoms.	80 (8.1)
Incubation period of EVD is 2-21 days.	271 (27.5)

Table 3
Questions regarding 'EVD Symptom Knowledge' score.

Symptoms	Correct responses No. (%)
Fever	829 (84.2)
Bleeding inside or outside of body	337 (34.2)
Fatigue, exhaustion	773 (78.6)
Joint and muscle pain	634 (64.4)
Nausea, vomiting, diarrhea	619 (62.9)
Throat ache	335 (34.0)
There is no deterioration in heart muscle function	111 (11.3)
There is no hypotension	123 (12.5)
There is no jaundice	179 (18.2)

Table 4
Questions regarding 'EVD Protection Knowledge' score.

Questions	Correct response No. (%)
People entering patient rooms must use gloves and liquid-tight aprons.	791 (80.4)
People entering patient rooms must use glasses and face shields.	651 (66.2)
Patient must have patient-specific equipment and medical devices.	761 (77.3)
The number of personnel involved in patient care must be kept to a minimum.	690 (70.1)
There is no routine vaccine in use for the Ebola virus disease.	611 (62.1)

Table 5
Comparisons of resondents' EVD knowledge by college year.

College year	Knowledge		
	Agent-transmission (Min/Med/Max)	Symptom (Min/Med/Max)	Protection (Min/Med/Max)
1st	0/6/12[a]	0/4/8[a]	0/5/7
2nd	0/6/12	0/4/9[a]	0/4/7
3rd	0/6/13	0/4/8	0/4/7[a]
4th	0/6/14[a]	0/4/8	0/5/7
5th	0/7/12[b]	0/5/9[b]	0/5/7[b]
6th	1/7/13[b]	0/5/8[b]	0/5/7
p-value	0.001	0.001	0.004

[a]is significantly different than[b].

Table 6
Correct responses to number of EVD cases and treatment.

Questions	Correct response No. (%)
There are no people diagnosed with EVD in Turkey.	248 (25.2)
There is a specific treatment for Ebola virus disease.	446 (45.3)
Supportive treatment should be provided.	697 (70.8)
Immune-system-supportive treatment should be provided.	669 (68.0)
Treatment of secondary infections should be provided.	504 (51.2)

Table 5 illustrates the EVD knowledge scores of students based on school year. The median EVD agent-transmission knowledge scores of the First, Second, Third, and Fourth Year students was 6, the median knowledge scores of the Fifth and Sixth Year students was 7. The median knowledge scores of the Fifth and Sixth Year students were significantly higher than the scores of the First and Fourth Year students ($p<0.01$).

The median 'EVD Symptom Knowledge' score of the First, Second, Third, and Fourth Year students was 4, whereas the median of the Fifth and Sixth Year students was 5. The 'EVD Symptom Knowledge' scores of the Fifth and Sixth Year students was significantly higher as compared to the scores of 1st and 3rd Year students ($p<0.01$).

The median 'EVD Protection Knowledge' score of the First, Fourth, Fifth, and Sixth Year students was 5, whereas the median of Second and Third Year students was 4, and the knowledge scores of Third and Fifth Year students were significantly different from one another ($p<0.01$).

Twenty-five point two percent of participants knew that no EVD diagnosis had yet been established in Turkey (Table 6). Moreover, 45.3% of students knew that there was no specific treatment for EVD, and 70.8% knew that patients should be provided with supportive treatment.

DISCUSSION

EVD is an important public health problem. The outbreak, which started as an endemic in Middle-Western Africa, affected not only Africa but also the entire world (CDC, 2014a). Protection is very important, because there is no treatment for EVD. In addition, medical faculty students are required to have high levels of knowledge regarding the disease in order to manage epidemics and protect themselves and other individuals from the disease. Therefore, medical faculty students should have sufficient levels of knowledge regarding EVD during both their educations and their professional lives.

EVD has a high fatality rate (Rodriguez *et al*, 1999; Feldmann and Geisbert, 2011), and 73.7% of medical faculty students who participated in our study were aware that EVD has a high fatality rate (Table 2). One-fourth of students were not aware of these high fatality rates. All medical faculty students must know that the epidemics have serious consequences, and that a new outbreak may seriously affect many people. Medical faculty students should be made aware that protecting against the disease is easier than struggling with the disease. At the beginning of this study, the number of total cases in the world for all of time was 13,567, the number of confirmed laboratory cases was 7,728, and total number of deaths was 4,960 (CDC, 2014b). As of March 2015, the number of total number of all-time cases in the world was 25,030, the number of confirmed laboratory cases was 14,753, and the total number of deaths has been 10,398 people (CDC, 2014b). Although there have been no final diagnoses made in Turkey thus far, only one-fourth of students were aware of this fact (Table 6).

The Ebola virus is a nondurable, lipid-enveloped virus (Public Health Institution, 2014). In other words, infection may be prevented by hand-washing or exposure to washing agents, because the virus cannot survive for long in external environments (CDC and WHO, 1998). Taking precautions to avoid transmission through contact will also be eminently helpful. However, one-fifth of the medical faculty students who participated in our study were not aware that gloves and liquid-tight aprons should be used; whereas, one-third were not aware that face shields and glasses should be used for eye protection.

The need to use patient-specific medical equipment and devices as a protective precaution was unknown by one-fourth of students. Again, 29.9% of students were not aware that the number of personnel providing the patient with care should be as small as possible (Table 4).

It is apparent that there was a lack of knowledge among students in terms of protection against EVD. All medical faculty students must know about the relevant prophylaxis precautions, which have a very important role in preventing the occurrence of the disease and preventing the spread of infection from ill individuals to healthy individuals. A lack of knowledge may lead to insufficiency in terms of protecting oneself and others as the students encounter patients during their educations.

EVD is transmitted to people through close contact with the organs, blood, and body fluids of infected humans and animals (CDC and WHO, 1998). The transmission of the infection from one human to another is possible through contact between disintegrated skin or mucosa and the blood or body fluids of infected

people (Piercy *et al*, 2010).

Almost half of the students did not know that EVD was transmitted through contact with the secretions of dead animals and humans and with the blood of infected animals. Two-thirds of the study group were not aware that EVD was transmitted through the body fluids of infected animals (Table 2). EVD is not transmitted through contact with the body fluids of a person who is virus-infected but does not yet have symptoms (CDC, 2014a). However, only 8.1% of students were aware of this fact (Table 2). Students who participated in our study had a serious lack of knowledge regarding Ebola virus disease's methods of transmission. This indicates the significance of the need that in case of an outbreak in the world, medical students at all medical faculties should be urgently informed about the disease causing this outbreak through non-scheduled additional courses.

Common symptoms observed during the natural course of EVD include fever, fatigue, muscle pain, headache, and throat ache (Baize *et al*, 2014). The most commonly known symptom of EVD in this study was fever, with a rate of 84.2%; whereas, the least commonly known symptom was throat ache (34%) (Table 3). The medical faculty students are inadequate in terms of knowing the symptoms of this disease. As the doctors of future who will work at emergency units or as primary care physicians when they begin their professional lives, the great majority of students should be more equipped in terms of understanding disease symptoms.

Also, 80.4% of participants in this study were aware that people entering patient rooms must use gloves and liquid-tight aprons, 66.2% were aware that those entering patient rooms must use face shields and glasses, and 77.3% were aware that the number of personnel in patient care must be kept at a minimum (Table 4). It is important for medical personnel to know the methods of protecting themselves and others around them from infection.

When the Ebola virus epidemic took place in 1976 in Sudan, 81% of nurses who provided infected patients with care and 23% of family members who slept in the same rooms with patients caught the disease (Baron *et al*, 1983).

The median 'EVD Agent-Transmission Knowledge' score' of the students was 6.0. Considering that the highest possible score was 15, it was observed that students had a lack of knowledge in terms of the agent characteristics and methods of EVD transmission. The median EVD agent-transmission knowledge score (Table 5) of First, Second, Third, and Fourth Year students was 6; the median of Fifth and Sixth Year students was 7; and the median knowledge scores of Fifth and Sixth Year students was significantly higher than those of the Fourth and First Year students ($p<0.01$). This may be related to the fact that students increase their command of diseases during their medical faculty education.

The median 'EVD Symptom Knowledge' score of the students was 4.0. Considering that the highest possible score was 9, the students had a lack of knowledge in terms of the symptoms of EVD. The median EVD symptom knowledge scores (Table 5) of the First, Second, Third, and Fourth Year students was 4; whereas, the average score of Fifth and Sixth Year students was 5. The EVD symptom knowledge scores of the Firth and Sixth Year students were significantly higher than the scores of the First and Third Year

students (p<001).

This may be interpreted as being similarly related to the increasing command of diseases over the course of medical education. The median EVD prophylaxis knowledge score of the First, Fourth, Fifth, and Sixth Year students was 5; whereas, the median of the Second and Third Year students was 4, and the knowledge scores of Third and Fifth Year students were significantly different (p<0.01).

There is no specific treatment for EVD (Hwang, 2014). In our study, the rate of knowing that there is no specific treatment was 45.3% (Table 6).

Like all medical personnel, medical faculty students are at risk of contracting EVD, and as was clear from this study, the knowledge level of students was low. Therefore, medical faculty students should be provided with courses related to the disease's symptoms, methods of transmission and protection, and treatments as additional courses.

This study has two limitations: first, the involvement of medical students was only from Inonu University; second, our questionnaire was not pre-tested. However, the pre-testing is less of a concern with medical students.

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