



## ORIGINAL ARTICLE

## Knowledge, Attitudes and Practices Regarding Ebola Virus Disease among Students at a School of Medicine in Dakar, Senegal

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### Abstract

**Background:** Ebola virus disease (EVD) is a serious and highly contagious viral disease. It constitutes a public health threat and emergency. Therefore, all medical staff, notably medical students, should be trained to lessen the health outcomes during an outbreak.

**Purposes:** The aims of this paperwork are to determine the Knowledge, Attitudes and Practices regarding EVD of students at St Christopher Iba Mar Diop Medical School in Dakar in the one hand and identify the associated factors the other hand.

**Methods:** We carried out a cross-sectional, observational, descriptive and analytical study on St. Christopher School medical students. We collected the information about epidemiological knowledge, modes of transmission, clinical signs, prevention of EVD through a self-administered questionnaire, as well as attitudes and practices towards EVD. The data were analyzed through Epi-info 7.1 software. The chi 2 test and logistic regression were used to identify factors associated to knowledge state, attitudes and practices regarding EVD.

**Results:** We interviewed 510 students. Mostly, the data about EVD were provided by television (89.4%), the Internet (64.1%) and discussions (58.0). The main clinical features of EVD included fever (86.3%), diarrhea (77.1%), headache (64.3%) and abnormal bleeding (62.6%). The most commonly identified modes of transmission were blood (79.8%), contact with an infected dead person (77.8%) and bushmeat (77.6%). The majority of surveyed students (89.2%) identified health workers and family members of a person with EVD (79.8%) to be in higher risk during an EVD outbreak. Less than half of the surveyed students, 39.6%, had a proper global knowledge of the EVD (score  $\geq$  26). Only one-third (32.7%) had a good epidemiological knowledge. However, they had a better knowledge of modes of

transmission (46.9%), clinical signs (49.8%) and prevention of EVD (90.4%). Amongst the 510 surveyed students, 305 (59.8%) had a proper knowledge about the attitudes and practices regarding EVD (score  $\geq$  13).

Educational level was associated with good knowledge EVD, attitudes and practices ( $p < 0.05$ ).

**Conclusion:** Despite global satisfactory outcomes on EVD, capacity building about epidemiology and the clinic should be performed to allow students improve their.

### Keywords

Ebola, KAP survey, Students, Senegal

### Introduction

EVD is a severe and contagious viral hemorrhagic fever transmitted to humans from an infected animal or person. It is a public health threat and emergency, with a high mortality rate range from 25 to 90% [1].

The outbreak in West Africa in 2014 has been the largest and most complex since the virus was discovered in 1976. It covered nearly 28,637 cases with 11,314 deaths, involving 615 caregivers [2], leading to more cases and deaths than any other outbreak. This outbreak has spread particularly from one country to another, from Guinea to Sierra Leone, Liberia, Nigeria and other countries, including Senegal [3]. The factors that explain its rapid spread comprise an unremarkable history of the disease in these regions, the low reactivity of international institutions and the response of populations to EVD [3]. Finally, 10

countries were involved such as Liberia, Sierra Leone, Nigeria, Mali, Guinea, Spain, the United States, the United Kingdom, Italy and Senegal.

The first survey carried by the WHO outlined that 815 confirmed or probable cases involving health workers have been recorded by and large, with two thirds of deaths among them [3]. This situation is explained by some facts, among others, such as the lack of preparation, experience and knowledge regarding this condition. In Senegal, one confirmed case and 74 contacts, including 41 health workers, were recorded in August 2014.

In order to assess knowledge, attitudes and practices, very few studies have been carried out in Senegal. It is in this vires that this survey was conducted at St Christopher Iba Mar Diop Medical School in Dakar with the objectives of determining the Knowledge, Attitudes and Practices of medical students regarding EVD, and identifying associated factors with the Knowledge state, Attitudes and Practices regarding EVD.

## Methods

This is a cross-sectional, descriptive observational study with an analytical purpose, conducted from March 1 to March 31, 2017. The recruitment was exhaustive and comprised all medical students. We enrolled all students from bachelor to doctorate (1<sup>st</sup> to 6<sup>th</sup> year) in medicine at St Christopher Iba Mar Diop School. A questionnaire, based on a literature review and a pre-test implemented before the questionnaire, was designed and submitted to the students. An information session about the objectives of the study was performed with students prior to the distribution of the questionnaires, which was self-administered and took an average of 20 minutes to complete. The questionnaire consisted of 27 questions divided into 4 parts such as socio-demographic data (age, sex, nationality, level of education, country of residence during the 2014 outbreak), perceptions of the EVD (sources of information, feelings about the EVD, possibility of being infected with the EVD), Knowledge state about EVD (Knowledge about its epidemiology, signs, routes and modes of transmission, WHO recommendations for the care of SEM), attitudes and practices regarding EVD (management approach of EVD case, basic preventive steps, control and EVD care management).

The data were registered and analyzed using Epi-info 7.1 software. Firstly, a descriptive study was conducted on the basis of socio-demographic data, perceptions, knowledge, attitudes and practices regarding the EVD. The quantitative variables were sort by average, standard deviation, medians and extremes; while the qualitative ones were organized as proportions and confidence intervals according to the applicability conditions. In the second part, data on respondents' Knowl-

edge, Attitudes and Practices were compared.

The scores were calculated and the students were distributed according to their knowledge state. The correct answers were rated as "1 point" and the incorrect answers as "0 point".

## Scores calculation

### • Knowledge of EVD: 40 points

Knowledge about the epidemiology was rated at 10 points and focused on the definition (1 point) and geographical distribution of EVD (6 points) besides the people at risk (3 points). Whereas modes of transmission and clinical signs (headache, fever, sweat, vomiting, diarrhea, abnormal bleeding, asthenia and anorexia) were respectively rated at 17 points (17 correct answers) and 8 points. As for knowledge on prevention, we rated it at 5 points.

The global knowledge corresponds to the sum of all previous scores, leading to a total of 40 points.

Students were classified into 2 groups according to their knowledge state: good knowledge if two thirds of the answers were correct ( $\geq 65\%$ ) and poor knowledge if less than two thirds of the answers were correct ( $< 65\%$ ).

### • Attitude and practices regarding the EVD: 20 points

We looked for factors associated with the level of knowledge (age, gender, level of education, country of residence during the 2014 outbreak, number of information providers). Chi<sup>2</sup> or Fischer tests according to the applicability conditions were used to compare the proportions in each category.

A 5% risk of error  $\alpha$  has been considered for statistical significance.

## Results

Among 710 students, 510 underwent a survey, representing a response rate of 72%.

### Socio-demographic characteristics

The mean age was  $20.7 \pm 2.2$  years with extremes range from 16 to 32 years. The 18-26 years age group was the most represented (81%). The sex ratio was 1.4 in favor of women and 80% of the respondents were in bachelor period (L) (L1: 32.6%, L2: 19.6%, L3: 20%).

More than half of the respondents (60.3%) came from West African countries including mainly and respectively Senegalese (37.8%), Cameroonian (11.8%), Chadian (10.4%) and Beninese (8.4%). During the last West African outbreak in 2014, 57.2% of the surveyed students were living in Senegal.

### Knowledge of the EVD

Most of the information on EVD were provided by television (89.4%), the Internet (64.1%) and discussions

(58.0%). Almost all students (79.8%) had access to at least two sources of information on the EVD and 88.4% of them were familiar with the definition of the EVD. 307 students (60.2%) were interviewed, indicating that Senegal was affected by the EVD epidemic.

Fever (86.3%), diarrhea (77.1%), vomit (73.9%), headache (64.3%), abnormal bleeding (62.6%), weakness (59.8%) and sweating (54.5%) were the main clinical manifestations of EVD reported by the students surveyed.

The most common modes of transmission of EVD outlined by our study population were blood (79.8%), contact with an infected dead person (77.8%), bushmeat (77.6%), contact with an infected dead animal (76.1%), contact with infected clothing (75.5%), saliva (73.1%), vomiting (61.1%) and stools (54.5%).

The majority identified health workers (89.2%) and family members of a person with EVD (79.8%) to be at higher risk during EVD outbreak.

Regarding individual prevention, gloves (98.2%), masks (96.1%), shoe-covers (75.3%) and safety glasses (69.8%) were the most common outlined items by students as part of personal protective equipment (PPE). However, the combination (26.7%) and the hood (22.5%) were rarely mentioned.

Among the respondents, 73% replied that EVD could be cured and almost all (95%) reported that it could be prevented.

Patient isolation (93.7%) and professional care in a health centre (89.8%) were the main recommenda-

tions from the WHO highlighted by students. Two-third of the students mentioned that care could not be provided at home.

### Attitudes and practices against EVD

Regarding the management approach in a case of EVD, notifying the authorities (97%) and isolating the patient in their room (72%) were the most common feedback provided by the respondents. The main preventive measures for EVD (avoid contact with anyone with EVD, avoid direct contact with the blood of an infected person or other body fluids, systematically wash hands after contact with an infected person, avoid eating bushmeat) are known by more than 90% of students and almost all (95%) responded that PPE is necessary for the management of a person with EVD.

Overall, we found that less than half of the surveyed students (40%) had a good global knowledge of EVD (score  $\geq 26$ ) and only one-third of the respondents (33%) had a good knowledge about the epidemiology. However, they had a better knowledge of modes of transmission (47%), clinical signs (50%) and prevention of EVD (90%). In addition, 60% of them had a good knowledge of attitudes and practices against the EVD with a score of  $\geq 13$  (Table 1).

### Factors associated with knowledge, attitude and practice against the EVD

In univariate analysis, age ( $p = 0.0002$ ), education level ( $p < 0.001$ ), country of residence ( $p < 0.001$ ), number of information sources ( $p = 0.04$ ), were associated

**Table 1:** Distribution of surveyed students according to knowledge state, attitudes and practices regarding the EVD, KAP EBOLA Survey, Saint Christopher School of Dakar (Senegal), 2017 (n = 510).

Variables	Absolute frequency (n)	Relative frequency (%)
<b>Knowledge</b>		
<b>Epidemiology</b>		
Good (score $\geq 7$ )	167	32.7
Bad (score $< 7$ )	343	<b>67.2</b>
<b>Mode of transmission</b>		
Good (score $\geq 11$ )	239	46.9
Bad (score $< 11$ )	271	<b>53.1</b>
<b>Clinical signs</b>		
Good (score $\geq 5$ )	<b>254</b>	49.8
Bad (score $< 5$ )	<b>256</b>	<b>50.1</b>
<b>Prevention</b>		
Good (score $\geq 3$ )	<b>461</b>	<b>90.4</b>
Bad (score $< 3$ )	<b>49</b>	9.6
<b>Global</b>		
Good (score $\geq 26$ )	<b>202</b>	39.6
Bad (score $< 26$ )	<b>308</b>	<b>60.4</b>
<b>Attitude and Practices</b>		
Good (score $\geq 13$ )	<b>305</b>	<b>59.8</b>
Bad (score $< 13$ )	<b>205</b>	40.2

to global knowledge about EVD and good attitudes and practices.

In regard to the knowledge, in multivariate analysis, students over 21 years of age (ORa = 10.26; 95% CI: 2.4-43.7) and those living in West Africa at the time of the 2014 outbreak (ORa = 8.66; 95% CI: 4.7-15.94) had a better global knowledge of EVD than their comparison group. The number of information sources was also associated with the global knowledge state (ORa = 1.59; 95% CI: 1.07-2.36) (Table 2).

As for attitudes and practices, in multivariate analysis, age ( $p = 0.01$ ), education level ( $p < 10^{-6}$ ) and country of residence ( $p < 10^{-6}$ ) were factors associated to practices and attitudes regarding EVD (Table 3).

## Discussion

### Perceptions of Ebola virus disease (EVD)

Several communication tools and supports can be used to raise public awareness of the symptoms and

**Table 2:** Factors associated with global knowledge on EVD in multivariate analysis; KAP EBOLA survey, Saint Christopher School of Dakar (Senegal), 2017 (n = 510).

Variables	ORa	IC95%	p-value
<b>Age (years)</b>			
> 21	1		<b>0.001</b>
≥ 21	10.26	2.40-43.7	
<b>Residency</b>			
West Africa	1		<b>&lt; 10<sup>-6</sup></b>
Other countries	8.66	4.70-15.9	
<b>Amount of information sources</b>			
< 4	1		<b>0.02</b>
≥ 4	1.59	1.07-2.36	

ORa: Odd ratio adjusted; IC95%: 95% confidence interval.

**Table 3:** Factors associated with attitudes and practices about the EVD in multivariate analysis; KAP EBOLA survey, Saint Christopher School in Dakar, 2017 (Senegal) (n = 510).

Variables	ORa <sup>*</sup>	IC95% <sup>*</sup>	p-value
<b>Age (years)</b>			
> 21	1		<b>0.01</b>
≥ 21	5.58	1.50-20.50	
<b>Education level</b>			
Bachelor (1-3)	1		<b>&lt; 10<sup>-6</sup></b>
Master/Doctorate	27.06	6.50-112.60	
<b>Country of residency</b>			
West Africa	1		<b>&lt; 10<sup>-6</sup></b>
Other countries	4.82	3.03-7.68	
<b>Amount of information sources</b>			
< 4	1		0.53
≥ 4	1.13	0.75-1.71	

ORa: Odd ratio adjusted; IC95%: 95% confidence interval.

prevention measures of the disease. In our survey, the main sources of information for respondents about EVD were television (89.4%), the Internet (64.1%) and discussions (58.0%). Almost all students (79.8%) had access to at least two sources of information related to EVD. Elsewhere in Africa, similar results are found. Indeed, Tamrat in Ethiopia [4], and Mbuk in Nigeria [5], observed in their work that media such as television and radio were the main sources of information with 62% and 42% respectively. In contrast, another study conducted by Olowookere in Nigeria [6] reported that colleagues (40%) and radio (37.2%) were the main sources of information.

The spread of new information and communication technologies (ICT) has taken a significant proportion of student life, so it is easy to understand why the Internet is among the main sources of information quoted by medical students (64.1%) in Africa and elsewhere. It was reported by 92% of respondents in an American study [7]. However, it should be noted that the information available on the Internet is sometimes incorrect, hence the importance of setting up official websites.

During an outbreak the communication needs to be transparent, targeted and understandable; information should be easily accessible, complete and accurate.

The most common feelings raised by students when discussing the EVD were fear (68%), indifference (15%) and worry (3%). Among six students, five had interrupted their internship because they were afraid of being infected. This main feeling of "fear" felt by students is probably related to the fact that EVD is a highly contagious disease, with high lethality and effective vaccine was yet to be available for therapeutic purpose. In a study conducted in Ethiopia by Tamrat and coll [4], 78% of health workers were afraid of being infected and

56% of respondents were "uncomfortable in hospitals to treat Ebola patients".

The impact of this "fear" in managing the previous EVD outbreak that occurred in West Africa represent a range of measures undertaken by countries to deal with this epidemic, namely the closure of borders.

### Knowledge of Ebola virus disease (EVD)

In our survey, we focused on medical students' knowledge about EVD, with a particular interest on the definition, the epidemiology, the modes of transmission and clinical signs of EVD and its preventive measures. Regarding the definition, 89% of the respondents gave correct answers. This was similar to a study carried in Turkey about 984 medical students [8]. In the survey conducted in the United States by Rolison and coll [7], 67% of respondents were aware of the definition of the EVD.

As for epidemiology, 60% of our study population were aware that Senegal had recorded cases of EVD and 93% knew the exact number of cases recorded.

Clinically, the incubation period for EVD ranges from 2 to 21 days. Only 44% of the respondents had given a correct answer to this question. This observation is similar to the work of Mahwish and coll (55%), conducted among medical students in Pakistan [9]. A lower rate (27.5%) was reported by Ozer and coll in Turkey [8] on medical students. In contrast, in countries affected by the outbreak, a higher percentage was found. Indeed, in Nigeria, two studies conducted in 2014 on health workers; one by Oladimedji [10] and the other by Olowookere [6] reported rates of 78% and 62% of correct answers respectively. Similarly, Touré [11] in Guinea found that 98% of health workers were aware of the incubation period of the EVD. This disparity could be explained by the increased awareness in countries affected by the epidemic, and the training of health personnel. In fact, the incubation period is an information that appears in the case definitions.

More than half of the students (55.2%) reported that someone who had been in contact with a confirmed case of Ebola was contagious. Similar results were reported in the survey by Lal and coll in India [12], where 82% of medical students reported that a person without clinical signs could transmit EVD. Thus, it would be necessary during teaching to correct this erroneous information because, actually, the subject who has been in contact with a case only becomes potentially contagious when he presents clinical signs.

The clinical signs of EVD are multiple. Fever (86.3%), diarrhea (77.1%), vomiting (73.9%), headache (64.3%) and abnormal bleeding (62.6%) were the main features reported by students. This is identical to the results of

Oladimedji's survey in Nigeria [10] where fever (89.8%), vomiting (77.9%) and diarrhea (66.4%) were the main symptoms outlined by health workers. In Guinea Conakry [13], the three major signs highlighted by more than 90% of health workers were fever, diarrhea and asthenia. In contrast, in survey conducted by Hisam in Pakistan [13], asthenia (67%), myalgia (62%), bleeding (58%) and vomiting (53%) were the most quoted signs. This diversity found in these studies is understandable since the clinical signs of EVD are diverse, varied and non-specific. However, fever remains almost everywhere as the major sign. The diversity of symptoms of EVD explains the differential diagnosis issues with many diseases in tropical environments.

We found that medical students had a good knowledge of the main modes of transmission of EVD, which were known by more than 70% of the respondents. This is a positive point because the mastering this information should guarantee a reduction in the risk of transmission of EVD. Most of the interviewed students had identified health workers (89%) as being at higher risk during an epidemic. This is similar to Mahwish's results in a Pakistani study in 2014 [9] where health workers were identified by 60% of students to have a higher risk. The latter are at risk of contamination when they provide patient care without proper personal protective equipment (PPE) and do not strictly apply universal precautionary measures. Proportionally, depending on their function, care-givers were 21 to 32 times more affected than the general population. At the beginning of the epidemic, the lack of protective equipment and insufficient training contributed to the death of many people [14].

Besides health workers, family members of a person with EVD are also at risk and this was outlined by 80% of the students. In the survey conducted by Mbuk and coll in Nigeria [5], a higher rate of 94% was reported. Unlike, only one-third of medical students, surveyed in Pakistan [9] considered family members to be at risk. However, the latter can become infected through contact with biological fluids, bedding, etc. Moreover, during the previous epidemic, studies showed that some cultural practices and unsecured burials contributed to the spread of EVD, sometimes decimating an entire family.

The difference in the education level of interviewed students probably explains the low rate of adequate responses to the fundamental questions about the EVD virus belonging to the filoviridae family and its inactivation by sodium hypochlorite solutions (43%) and heat (28%).

During the management of suspected or confirmed cases, PPE is systematically worn. When asked about the different elements of PPE: gloves (98%), masks (96%), shoe covers (75%) and safety glasses (70%) were the most common tools identified by students. This re-

sult is similar to another survey conducted in Pakistan by Hisam and coll [13], where the main equipment mentioned were: dress (74%), mask (72%), gloves (70%), hood (64%), shoe covers (63%) and safety glasses (62%).

EVD is a serious condition responsible for high lethality. However, it's possible to treat it and 73% of students answered correctly to the question. A rate of 68% was reported by Mbuk and coll [5] in his survey of the military in Nigeria. Elsewhere, regarding Touré's work [11], less than half of the respondents thought that the EVD was incurable. From 2014 to 2016, among 28,637 cases, 17,323 people have a good outcome, representing a cure rate of 60.5%. However, among the survivors, some had sequelae or complications involving the eyes [15], muscles, joints [16] and psychiatry [17] that were identified in the "POSTBOGUI" cohort study conducted in Guinea after treating 802 people [18].

Students' knowledge assessment about preventive measures and WHO recommendations for case management outlined that 95% gave a positive answer to the possibility of prevention. In addition, patient isolation (94%) and professional care in a treatment center (90%) were the main recommendations pointed out by students. In the Mahwish survey in Pakistan [9], 61.4% of respondents had mentioned patient isolation as one of the management measures. Indeed, WHO recommends to place suspected or confirmed cases of hemorrhagic fever in individual rooms in isolation while strictly separating suspected and confirmed cases. While taking care of cases, it is also recommended to start with suspected cases and end with confirmed ones.

### Attitudes and practices regarding Ebola virus disease

In our study, we found that the majority of students had a good knowledge of how to handle a suspected case of EVD. Indeed, 97.4% replied that the authorities should be notified and 72.1% reported the need to isolate the patient. In Senegal, this notification must be made to the District Medical Officer or contact the national EMAS.

More than half of the respondents (52.1%) had conveyed that they would help the patient to go to hospital. This initiative should be avoided as it could promote the disease spread. The patient must be transported in an ambulance dedicated to this purpose and the health personnel will be dressed as PPE at the time of transport.

This study revealed that the main measures to prevent EVD (avoid all contact with a person with EVD, avoid direct contact with the blood of an infected person or other body fluids, systematic hand washing, avoidance of bushmeat consumption) were known by more than 90% of students. These results are similar to the literature data where the main pre-

vention measures pointed out by respondents are hand washing with soap and water, avoiding contact with other people's blood or body fluids, and wearing gloves [5,10,19].

The control of EVD requires active disease surveillance, information sharing and technical assistance at the country level. These different measures are outlined by 90% of the surveyed students. However, 40.1% of students reported the importance of a daily shower and using antiseptic as an attitude to adopt for EVD control. These results are significantly higher than those reported by Mahwish in Pakistan [9] where only 14% of respondents quoted it. Daily showering with antiseptic as a mean of preventing EVD is not included in the WHO recommendations.

### Factors associated with the global knowledge state, attitude and practices against EVD

Global knowledge about EVD was good (score  $\geq 26$ ) in 39.6% of respondents. Only one-third (32.7%) had a good epidemiological knowledge. However, they had a better knowledge of modes of transmission (46.9%), clinical signs (49.8%) and prevention of EVD (90.4%).

We noted in our study that there was a relationship between age ( $p < 10^{-6}$ ), country of residence ( $p < 10^{-6}$ ), number of information sources ( $p = 0.002$ ) and global knowledge on EVD in both univariate and multivariate analysis.

In univariate analysis, there was also a link between the education level ( $p < 10^{-6}$ ) and global knowledge on EVD. Indeed, Master/Doctoral students had a better knowledge on EVD than those in Bachelor degree. This observation is identical to the ones provided by Holakouie-Naieni [20] in his study carried on students in Iran. Indeed, those in Master and Doctorate had a better knowledge of clinical signs. Similarly, in Turkey Ozer and coll [8] observed that students in 5<sup>th</sup> and 6<sup>th</sup> year of medicine had more knowledge about modes of transmission and clinical signs than students at a lower level. Other surveys on health workers have focused on the difference in knowledge by occupational category. For instance, in a Nigerian study [6], nurses and doctors had a better knowledge than other health workers. In addition, Oladimedji [10] found in multivariate analysis, other factors associated with a good knowledge on EVD (age, gender, number of years of experience, ERM training, type of health facility). In our study, the level of knowledge was better among those who had access to at least four sources of information (ORa = 1.59; 95% CI: 1.07-2.36), while elsewhere in the USA, in an American study [7], a good level of knowledge was associated with the use of Internet.

More than half (60%) of the students knew the good attitudes and practices (score  $\geq 13$ ). There was a relationship between age ( $p = 0.01$ ), education level ( $p < 10^{-6}$ ), country of residence ( $p < 10^{-6}$ ) and the correct an-

swer to questions about attitudes and practices about EVD. These results are comparable to those of Mbuk [5] who observed among military personnel in Nigeria that age ( $p = 0.01$ ), education level ( $p < 10^{-6}$ ), rank, religion and ethnic group were factors associated with attitudes about EVD. In Oladimedji's study [10], the practice was the only assessed item and those who received a training on EVD had a better practical approach of EVD.

## Conclusion

Besides its significant socio-economic consequences, the EVD outbreak in West Africa in 2014 had also significant health impact. From January 1, 2014 to March 31, 2015, overall 815 confirmed and probable cases of EVD were reported among health workers. In Senegal, with the case of EVD imported from Guinea, there were 33 health workers among the contacts, but they did not develop the disease. Thus, it seems necessary to train health workers on viral hemorrhagic fevers in general and EVD in particular, and to promote capacity building of medical students on these diseases. In addition, an awareness and communication plan for behaviour change among the population will need to be developed.

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