Knowledge, attitude and practice of medical laboratory practitioners in the fight against Ebola virus disease

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Abstract

Introduction: Ebola virus disease (EVD) in West Africa was an enormous public health challenge. Nigeria was able to contain the spread of the virus with a concerted effort and an effective public health response in terms of identification of contacts, rapid laboratory diagnosis, quarantine and symptomatic treatment. We determined the knowledge, attitude and practice of medical laboratory practitioners (MLPs) in this post-Ebola epidemic era.

Methods: This cross-sectional study was carried out in eight hospitals in Kano State for 6 months, between January and June 2016. It involved medical laboratory scientists (MLS), medical laboratory technicians (MLT) and medical laboratory assistants (MLA). Questionnaires were administered and analysed.

Results: Of the 75 participants, mean knowledge score was 5.54 (standard deviation [SD] ±1.44) while the mean attitude score was 13.72 ±2.80, and mean practice score was 3.10 ±0.80. Mean age of participants was 36.82 ± 8.07 years. There was full awareness of EVD among all 75 participants; however, many medical laboratory practitioners (52.7%) did not know EVD prevention methods. The majority (86.1%) knew the source of disease outbreak and most MLPs (66.7%) practised improper hand washing to prevent Ebola transmission. In addition, they had a negative attitude and practice towards EVD. Of 71 MLPs, 52 (73.2%) strongly disagreed that a traditional remedy was preferable in EVD treatment.

Conclusion: Fear of EVD among MLPs has declined.

Keywords: Ebola virus, epidemic, health personnel, medical laboratory practitioners

Introduction

Ebola virus disease (EVD) is caused by a filovirus belonging to the family Filoviridae [1]. The five subtypes that have been recognised include: Zaire Ebolavirus (ZEOBV), Sudan Ebolavirus (SEBOV), Tai Forest ebolavirus (formerly Ivory Coast or Cote d’Ivoire Ebolavirus, ICEBOV or CIEBOV), Bundibugyo Ebolavirus (BEBOV), and Reston Ebolavirus (REBOV) [2]. Mortality from EVD ranges from 40% to 88% [3–6]. The West African EVD outbreak started in December 2013 in Guinea [7] although it was not until March 2014 that it spread rapidly to nearby countries such as Liberia and Sierra Leone [8–10]. The virus spread to Nigeria [11], Senegal [12], and Mali [13] but was contained so that it did not become an epidemic. Outside the African continent, the disease spread to the US [14] and Spain [15]. The confirmed death toll on October 2015 was 11,298, mainly from Liberia, Sierra Leone and Guinea [16,17]. In Nigeria, the source of 19 laboratory-confirmed EVD cases was a single traveller who contracted EVD and arrived through Murtala Mohammed International Airport, Lagos, Nigeria, on 20 July 2014 from Liberia [18]. This last Ebola outbreak proved to be a serious challenge to the health facilities in Nigeria.

There was an increased risk for healthcare workers (HCWs) [19]. At Conakry Ebola treatment centre in Guinea, 19% of confirmed EVD cases [20] and 5.2% of 3854 confirmed cases in Sierra Leone were among HCWs [21]. The major factor for this heightened risk is anxiety resulting from a low level of awareness among HCWs, particularly medical laboratory practitioners (MLPs). Most studies on knowledge, attitude and practice (KAP) involving HCWs in healthcare facilities across Africa have been focused on doctors, nurses and pharmacists; there is very little information on KAP in MLPs. However, as they are key players in the detection and control of Ebola virus, it is important to determine their KAP in this post-EVD epidemic era in order to effectively plan for future health challenges that result in such heavy casualty figures. This study, therefore, determined KAP of MLPs towards EVD in some major healthcare facilities in Kano State, Nigeria, which is an important commercial centre visited by many from African countries.

Methods

Study design

This cross-sectional study was carried out for 6 months, between January and June 2016. It targeted MLPs, who included medical laboratory scientists (MLS), medical laboratory technicians (MLT) and medical laboratory assistants (MLA).

Study area

The study was conducted in Kano metropolis in north-western Nigeria. The metropolitan area comprises eight local governments. It is a commercial centre and the most populous state in Nigeria. Means of movement between the city and other West African countries is by road or air. Healthcare services and facilities owned by both state and federal governments are highly concentrated in the metropolis and most MLPs, as well as other health professionals, live and work in the area.

Participants

Participants were registered MLPs working in the laboratory section of the eight hospitals selected for this study. Participation in this study was voluntary.

Data collection

Before the administration of the questionnaire, a pilot test was conducted to validate questions, interpret responses, and ensure its practicability. The purpose of the study was explained to each participant and informed consent obtained. Data were collected from a modified questionnaire adapted from a previous study [22].
Cronbach’s alpha internal consistency coefficient of the KAP questionnaire was 0.76. This reliability result is acceptable for using the questionnaire for data collection. In the questionnaire, general information about the respondent included demographics such as occupation, education level, profession, while other sections assessed knowledge, attitude and practice towards EVD. Questions asked included those on knowledge about causes, transmission, signs or symptoms and prevention, while others were related to misconceptions and false beliefs about EVD.

**Scoring**

All questions in the general information section of the questionnaire were open ended, and not scored. In the knowledge and practice sections, questions with incorrect ‘No’, correct ‘Yes’, and ‘no idea’ responses were scored as 0, 1 and 2, respectively. For attitude, responses were recorded on a Likert scale ranging from 1 to 4, with 1 representing ‘strongly disagree’ and 4 ‘strongly agree’. Total KAP scores for each participant were calculated and maximum scores of knowledge, attitude and practice were 9, 20, and 5, respectively.

**Statistical analysis**

Statistical Package for Social Sciences (SPSS) v20 was used for the analysis (Chicago, IL, USA). Categorical variables were measured as percentages while continuous variables were expressed as mean ± SD.

**Results**

Of the 75 participants, 36 (48%) were male and 39 (52%) female. In total, 62 (82.7%) were MLSs, seven MLTs (9.3%) and six MLAs (8.0%). Based on participants’ educational levels, all MLS possessed a first degree or its equivalent and had obtained a master’s degree (Table 1). The mean knowledge score was 5.54 ± 1.44, mean attitude score was 13.72 ± 2.80, and mean practice score was 3.10 ± 0.80. The mean age of participants was 36.82 ± 8.07 years.

**Knowledge of MLPs on EVD**

All 75 (100%) of MLPs who participated in the study were aware of EVD. While the majority of MLPs (76.0%) correctly identified means of transmission of EVD, 54.7% knew the signs and symptoms of the disease. The majority 62/72 (86.1%) knew the source of the disease outbreak in Africa. Similarly, most MLPs (95.7%) knew that EVD is a fatal disease. However, most MLPs 41/71 (57.7%) were not aware of the age group most affected by the disease and 52.7% did not know EVD prevention methods. Similarly, 53.4% of the MLPs were not aware of the reservoir for Ebola virus, and 59/74 (79.7%) did not know the full list of countries that had experienced an outbreak of Ebola; only 15 (20.3%) had the correct information on this issue (Table 2).

**MLPs’ attitude towards EVD**

The majority of the MLPs (41/74, 55.4%) strongly believed that their occupation exposed them to risk from EVD. Similarly, 37/74 (55.2%) strongly feared the thought of a person or family member being infected with EVD. In total, 37/71 (52.1%) MLPs agreed and 17/71 (23.9%) strongly agreed that the use of gloves during burial practice prevents EVD. Similarly, 26/72 (36.1%) agreed and 29/72 (40.3%) strongly agreed that travelling to an area with EVD caused infection. However, the most MLPs 52/71 (73.2%) strongly disagreed that a traditional remedy is preferable in EVD treatment (Table 3).

**KAP score of MLPs on EVD**

The knowledge score indicates that most MLPs (40/62, 64.5%) have low knowledge of EVD (cut-off point ≥67%). Similarly, the majority (48/68, 70.6%) have an incorrect attitude towards EVD (cut-off point ≥80%). Most MLPs (63/74, 85.1%) had improper practices with respect to the signs and symptoms of EVD (cut-off point ≥85%) (Table 4).

**Discussion**

In 2014, Nigeria received its own share of the West African EVD outbreak, which in total claimed approximately 11,350 lives [23]. The majority of deaths occurred in Sierra Leone, Guinea and Liberia. Nigeria, which accounts for about half of the total population of Economic Community of Western African States (ECOWAS), had eight confirmed deaths. This epidemic recorded a high number of causalities as a result of rapid EVD transmission owing to a high-level of ignorance about methods by which the virus is passed to members of the general public and HCWs, and strong adherence to traditional beliefs. HCWs in affected countries had no or little knowledge on how to handle Ebola virus in terms of prevention, control, management and surveillance owing to persistent problems throughout all healthcare facilities in the region. These problems included an insufficient number of technical personnel and expertise, substandard equipment, overcrowding, poor personal and environmental hygiene, along with a lack of efficient collaboration, communication and networking among laboratory facilities.

Owing to unsatisfactory laboratory investigations in most healthcare facilities in Africa, MLPs especially MLSs were unable to respond swiftly to detect the virus, the virus spread and many lives were lost, with an additional detrimental effect on socioeconomic activity in the regions affected. The outbreak claimed

**Table 1. Sociodemographic characteristics of participants**

| Participant type | Number of participants n (%) | Gender | Educational status |
|------------------|-----------------------------|--------|-------------------|
|                  | Male n (%) | Female n (%) | First degree* n (%) | Master’s degree n (%) | Sub-degree n (%) |
| MLS              | 62 (82.7) | 30 (83.3) | 32 (82.1) | 62 (100) | 10 (100) | – |
| MLT              | 7 (9.3)   | 3 (8.3)   | 4 (10.2)   | –       | –       | 7 (53.8) |
| MLA              | 6 (8.0)   | 3 (8.3)   | 3 (7.7)    | –       | –       | 6 (46.2) |
| Total            | 75        | 36        | 39         | 62      | 10      | 13     |

* First degree includes higher National Diploma (HND) or its equivalent.
MLA: medical laboratory assistant; MLS: medical laboratory scientist; MLT: medical laboratory technician.
heavy casualties because healthcare resources had been focused on dealing with common diseases such as malaria fever and HIV/AIDS with few resources available for the prevention of infectious diseases and basic research [26]. Owing to a lack of accessible and affordable treatment for EVD, and its prompt mortality and spread, HCWs and members of the public were left with no option but to revert to long-abandoned practices for infection control. The practices include hand washing, caution in touching an unknown person, restriction of movement to places where a large number of people congregate, and washing hands immediately upon entry into a home. The prerequisites for effective control of EVD are prompt laboratory diagnosis, increasing the level of awareness of EVD through education, provision of early warning systems and emergency services [9].

In our study, higher educational attainment played an important role in the willingness to participate in the study. Among laboratory workers, a greater number of MLSs who possessed either a first university degree or HND participated than MLTs and MLAs who possessed either certificates or diplomas (sub-degree) (Table 1).

Knowledge of EVD contraction, its mode of transmission and prevention is key in fighting EVD. In this post-EVD epidemic study, awareness of EVD was very high (Table 2). It is believed that awareness or information on EVD among HCWs or members of the general public on Ebola prior to the 2014 outbreak in Nigeria was low as it had never been experienced before and outcomes had not been followed up from previous outbreaks in east African countries. Following the deaths of some key HCWs in Nigeria and

| Question category                                      | Correct n (%) | Incorrect n (%) | Total |
|--------------------------------------------------------|---------------|----------------|-------|
| Awareness about EVD                                    | 75 (100)      | 0 (0.0)        | 75    |
| Ways EVD is transmitted*                               | 57 (76.0)     | 18 (24.0)      | 75    |
| Signs and symptoms of EVD                              | 41 (54.7)     | 34 (45.3)      | 75    |
| Source of EVD outbreak in Africa                       | 62 (86.1)     | 10 (13.9)      | 72    |
| Age groups mostly affected by EVD                      | 30 (42.3)     | 41 (57.7)      | 71    |
| EVD prevention methods                                  | 35 (47.3)     | 39 (52.7)      | 74    |
| Ebola virus reservoir                                   | 34 (46.6)     | 39 (53.4)      | 73    |
| EVD fatality                                           | 66 (95.7)     | 3 (4.3)        | 69    |
| Countries that experienced widespread (outbreak)        | 15 (20.3)     | 59 (79.7)      | 74    |

**MLPs’ practice towards EVD**

| Action taken on person showing the signs and symptoms of EVD | 64 (85.3) | 9 (12.0) | 73 |
| Type of hand washing used to prevent EVD transmission      | 22 (29.3) | 50 (66.7) | 72 |

**How often do you wash your hands?**

| Frequency       | Total n (%) |
|-----------------|-------------|
| Once            | 3 (4.2%)    |
| Twice           | 0 (0.0%)    |
| Three times or more | 69 (95.8%) |

* From animal to human and human to human are correct ways of EVD transmission. EVD: Ebola virus disease, MLP: medical laboratory professional.

| Questions                                                                 | Strongly disagree n (%) | Disagree n (%) | Agree n (%) | Strongly agree n (%) | Total |
|--------------------------------------------------------------------------|--------------------------|----------------|-------------|----------------------|-------|
| My occupation is at risk from EVD                                       | 1 (1.4)                  | 7 (9.5)        | 25 (33.8)   | 41 (55.4)            | 74    |
| Fear of family member or friend infected with EVD                        | 1 (1.5)                  | 6 (9.0)        | 23 (34.3)   | 37 (55.2)            | 67    |
| Using gloves in burial practice can prevent EVD                         | 6 (8.5)                  | 11 (15.5)      | 37 (52.1)   | 17 (23.9)            | 71    |
| Travelling to affected area will cause Ebola infection                   | 2 (2.8)                  | 15 (20.8)      | 26 (36.1)   | 29 (40.3)            | 72    |
| Traditional remedy is preferred in EVD treatment                         | 52 (73.2)                | 14 (19.7)      | 0.0 (0.0)   | 5 (7.0)              | 71    |

EVD: Ebola virus disease

| Questions                                                                 | Strongly disagree n (%) | Disagree n (%) | Agree n (%) | Strongly agree n (%) | Total |
|--------------------------------------------------------------------------|--------------------------|----------------|-------------|----------------------|-------|
| Using gloves in burial practice can prevent EVD                         | 6 (8.5)                  | 11 (15.5)      | 37 (52.1)   | 17 (23.9)            | 71    |
| Travelling to affected area will cause Ebola infection                   | 2 (2.8)                  | 15 (20.8)      | 26 (36.1)   | 29 (40.3)            | 72    |
| Traditional remedy is preferred in EVD treatment                         | 52 (73.2)                | 14 (19.7)      | 0.0 (0.0)   | 5 (7.0)              | 71    |

EVD: Ebola virus disease

| KAP category | Score | n (%) |
|--------------|-------|-------|
| Knowledge    |       |       |
| Low          |       | 40 (64.5) |
| High         |       | 22 (35.5) |
| Total        |       | 62    |
| Attitude     | Incorrect | 48 (70.6) |
| Correct      |       | 20 (29.4) |
| Total        |       | 68    |
| Practice     | Improper | 63 (85.1) |
| Proper       |       | 11 (14.9) |
| Total        |       | 74    |
other West African countries coupled with panic, fear of contact with patients or their relatives may have informed knowledge on the EVD mode of transmission, signs and symptoms [11]. However, knowledge not directly related to safety, such as the most-affected age groups, the source of the outbreak in Africa, and the Ebola virus reservoir was low among the respondents (Table 2). Only 47.3% of MLPs in this study, 82.7% of whom were MLS, understood preventive measures against EVD (Table 2). The reason for such a discrepancy is because of a high-level of knowledge due to continuous education by the Medical Laboratory Scientists Council of Nigeria or interaction of members in conferences and regular group discussions. This is in conformity with another study, where Australian pilgrims who received health advice before embarking on annual Hajj ritual were more informed about Ebola, compared to those who were not informed [24]. On the contrary, a US report indicated individuals with lower educational attainment were more concerned about Ebola than those with higher attainment [13]. At the onset of the EVD outbreak in 2014, fewer educated Nigerians and other Africans were concerned, but later on during the epidemic, more became concerned because of fear of EVD and because they later acquired improved messages on EVD from relevant authorities [16].

MLPs in this study believed the nature of their occupation predisposed them to EVD (Table 3). Surprisingly, stigma of an affected patient or family was high among the participants. They expressed fear about touching infected patients or members of their families. This indicates that despite the training and awareness campaign by international experts aimed at HCWs in the affected areas, levels of stigmatisation among some HCWs is still high, which may affect prevention and control measures. Also, reports of stigmatisation of affected persons and families is high in other studies in parts of Africa [25]. The attitude of MLPs towards improving infection prevention and control techniques through use of gloves during work and burial rights and restricting travel to pandemic areas is good. However, the use of gloves is not new in healthcare delivery in Nigeria. Despite high patronage of traditional medicine among Africans for many infections and diseases, the majority of participants strongly disagreed with the use of traditional medicine to cure EVD. In this study, the practice of MLPs towards EVD prevention was good with 85.3% of MLPs having had correct practice on how to attend to a person presenting with the signs and symptoms of EVD (Table 2). This could be attributed to past experience, where renowned HCWs from both developed and developing countries became infected and died following contact with infected patients. Although the majority of MLPs (95.8%) practised hand washing at least three times in a day in their respective hospitals, 66.7% practised incorrect hand washing techniques to prevent Ebola transmission. A preventive measure of not allowing family members to bury their loved ones during the EVD outbreak was applied to some members of the Nigerian populace and in most affected West African countries [26]. Surprisingly few people (7%) held such beliefs, which indicates their strong adherence to traditional beliefs and an unwillingness to change cultural perspectives. A previous study in a Nigerian state reported that people had good knowledge of personal protection and were willing to adjust their culture to overcome EVD transmission [16]. This study shows that acquisition of formal education alone is not enough to change the minds of individuals, and using other means such as social media, community awareness and engaging religious leaders are required to bring about change. Studies have reported mass and social media as the main source of knowledge on Ebola virus [23,26]. However, there has to be proper integration of health professionals because the same media, especially social media, is also the source of misinformation on Ebola [24,27]. Studies on HCWs’ KAP from other countries have shown that exposing HCWs to correct and regular health messages through training and workshops can improve their KAP towards EVD and other infectious diseases [13,16,24,27].

Conclusion
Although findings from this study cannot be used as a national representation for all MLPs, it will provide important information about KAP among MLPs in Africa’s most populated state. Fear of EVD among MLPs has declined and there are few data on public compliance to avoid contact with, or eating of, suspected reservoir hosts that may trigger re-emergence of an EVD outbreak. There is therefore much need for continuous education for MLPs, HCWs and the public by public health authorities, community and religious leaders in order to avoid contact with the Ebola reservoir host. In addition, studies are needed to appraise HCWs and the public’s KAP information to formulate policies and safeguard public health. This study serves as a basis for active surveillance by researchers.

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Conflicts of interest
All authors declared no conflicts of interest.

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