# Knowledge, attitude and practice towards control of Ebola infection among community pharmacy workers in Dar es Salaam Tanzania

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**Ebola virus disease (EVD) is an acute and severe illness without specific treatments that has a very high case fatality rate of up to 90%. The disease is a major global health problem, yet the knowledge of the disease to the community, including health care workers, is low. Community pharmacy workers (CPW), being the first line to contact patients, play a crucial role in providing over-the-counter medications, awareness, and knowledge on various diseases and disease prevention strategies in the community. Thus, CPWs should be aware of the signs and symptoms for prompt and appropriate referral of persons suspected of EVD. This study's main objective was to assess the awareness, attitude and perceptions towards the control of Ebola infection by CPWs in Dar es Salaam, Tanzania. A cross-sectional study was conducted using convenience sampling to recruit consenting CPWs surveyed using a self-administered questionnaire. A total of 252 community pharmacy workers were recruited. A female preponderance of 160 (63.5%) was observed with an average age of 30.7±8.5years (mean ± SD), with the majority (55.6%) in the 20-29 years age group. The main source of information about EVD by the CPWs was television (71.8%), newspapers and radio 67.9% and 67.5%, respectively. Direct contact with blood was identified as the main route of transmission of Ebola by 81.3% of CPWs, followed by air (38.5%). When all the individual positive scores for questions on general knowledge of EVD transmission were computed and categorized into low (1-5), average (6-10) and excellent (11-20) knowledge, the majority of respondents (52.8%), had an average knowledge score. However, a positive attitude and practices were revealed by the CPWs towards ways of preventing Ebola. Several misconceptions about Ebola were, however, noted among the participants. Ebola transmission can be prevented by appropriately educating CPWs as a strategy to increase preparedness for an EVD outbreak.**

**Keywords**: Ebolavirus, Ebola virus disease, KAP, Tanzania, Community pharmacy worker

## INTRODUCTION

Ebola virus disease (EVD), formerly known as Ebola hemorrhagic fever, is an acute and severe illness with no specific treatment and has a very high case fatality rate of up to 90% [1, 2]. The zoonotic etiologic agent-Ebola virus belongs to the family filoviridae. The genus marburgvirus, which causes fatal hemorrhagic disease, also belongs to this family. The genus Ebolavirus consists of several species; Bundibugyo virus (BDBV), Zaire virus (EBOV), Reston virus (RESTV), Sudan virus (SUDV), Taiforest virus

(TAFV) and Bombali virus. The EBOV is responsible for the two most recent outbreaks [1].

The first EVD cases were reported in the Democratic Republic of the Congo (DRC) and Sudan in 1976, with the case fatality rate at 88% and 53%, respectively. The EBOV and SUDV species, respectively, were responsible for the outbreaks in these two countries. After a long period, in 1994, an outbreak occurred in Ivory Coast, and in 2007 another in Bebu, Uganda [3]. The latest outbreaks were in Guinea and DRC

[1]. The proceeding outbreak in DRC from 2018 to 2020 affected 3481 cases with a fatality rate of 66% [1]. The most fatal Ebola outbreak occurred in West Africa from 2014 to 2016, killing 11,325 people [4]. It was the most severe and widespread outbreak in Guinea in December 2013 before spreading to Liberia and Sierra Leone. Cases were also reported in Nigeria [5, 6], Senegal, Mali, United States, Spain, Uganda and DRC Congo. During these outbreaks, fatalities were reported among patients as well as health care workers (HCWs).

High fever, intense weakness, headache, muscle pain, nausea, and sore throat, followed by vomiting, diarrhea, both internal and external bleeding and impaired liver and kidney function characterize EVD [3, 7]. EVD diagnosis is usually made by virus isolation, reverse transcription-PCR (RT-PCR), including real-time quantitative RT-PCR, antigen-capture enzyme-linked immunosorbent assay (ELISA), antigen detection by immunostaining and IgG- and IgM-ELISA using authentic virus antigens [8, 9].

Until recently, supportive care rehydration with oral or intravenous fluids and treatment of specific symptoms were the only ways to improve EVD patients' survival. Treatments utilizing blood products, immune therapies and drug therapies are currently being evaluated. Two monoclonal antibodies (Inmazeb and Ebanga) were approved to treat EBOV infection in adults and children by the US Food and Drug Administration in 2020 [1].

About 12 vaccines have been under development. An experimental vaccine called rVSV-SEBOVU received the WHO advisory group's recommendation to be used in case of an Ebola outbreak [4]. The vaccine's efficacy was tested in a study trial involving 11,841 people [10]. The vaccine was approved for medical use in the European Union and the United States [1, 11] and was used in the 2018-2020 outbreak in DRC after being licensed by Merck & Co., Inc. under the trade name Ervebo [12].

The effects of an Ebola epidemic may be prevented by raising awareness of the risk factors and the protective measures to reduce human transmission and death. It includes avoiding close unprotected physical contact and appropriate use of personal protective equipment by HCWs when caring for infected patients [1]. HCWs are at high risk of infection when caring for EVD patients. All 8 HCWs infected during the 2014 outbreak in the DRC died, while more than 890 HCWs were infected during the recent West African EVD epidemic with a case fatality rate of 57% [13].

Even though there is no case of EVD so far reported in Tanzania, there are risk factors of outbreaks in neighboring DRC and Uganda or through importation into the country via international airports of entry, unofficial lake entry points and frequent business transactions between Uganda and Tanzania. The absence of laboratory capacity for specimen diagnosis and outbreak confirmation at the entry point, weak surveillance, and information sharing between the health sectors and wildlife exacerbates the risk.

Even though the world's focus is currently on COVID-19 pandemic prevention [14], it is essential to consider other possible pandemics similarly. Preparedness, strong political leadership, early detection, high awareness, and corporation with partner organizations can help prevent EVD spread as well as work towards eliminating the disease [1].

Community pharmacy workers (CPW), being the first line to contact patients, are at higher risk of being infected with Ebola and transmitting the disease further to the larger community. They play a crucial role in providing over-the-counter medications, awareness, and knowledge on various conditions and disease prevention in the community. Being the first point of contact before the populace presents to the hospital, CPWs should be aware of the signs and symptoms for prompt and appropriate referral of persons suspected of EVD.

So far in Tanzania, there is no published study on awareness of HCW towards control of Ebola infections. Therefore, this study assessed the

knowledge, attitude and practices towards Ebola infection control among CPWs in Dar es Salaam.

## EXPERIMENTAL

### Study design, setting and population

The study was a descriptive cross-sectional survey conducted in Dar es Salaam's community pharmacies, where the CPW mainly acts as the first line of contact with patients as they provide over-the-counter medications and related drug information. Dar es Salaam houses the largest proportion of community Pharmacies and has one of the busiest international airports as a major port of entry into the country. Participants were identified from the three administrative districts of Kinondoni, Ilala and Temeke. The survey was carried out between March 2015 and June 2015. The study population was community pharmacy workers involved in dispensing medicines.

### Sample size and sampling technique

A sample size of 252 CPWs was obtained. Simple random sampling was used to obtain community pharmacies and CPWs in the targeted three districts.

### Data collection methods

Data was collected using a structured interviewer-administered questionnaire with questions on knowledge, attitude, behavior and practice towards Ebola control. The questionnaire, aptly translated into Kiswahili, had sections on socio-demographic information, knowledge on Ebola infection, attitude and the practice in controlling Ebola.

### Data management and analysis

The collected data were first inspected for any errors before entry into the Statistical Package for Social Scientists (SPSS version 20) computer program for analysis. The data was summarized in the form of frequency tables. Ultimately all the positive scores for 20 questions on knowledge were aggregated; the score was computed with a score of 1 for a question that the respondent gave the most appropriate response. The scores were then categorized into low (1-5), average (6-10) and excellent (11-20) knowledge scores.

### Ethical considerations

The ethical clearance to conduct the research was obtained from the Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania IRB. Permission to conduct the study was further obtained from the management of the respective areas. Study participation was only done after obtaining oral informed consent from the CPWs at the respective sites.

## RESULTS

### Demographics

A total of 252 community pharmacy workers were recruited, with a female preponderance of 160 (63.5%) and 92 (36.5%) males. The participants' age ranged from 19 to 71 years, with a mean and standard deviation of 30.7±8.5yr. The majority (55.6%) of CWPs were in the 20-29 years age group (Table 1). Most of the participants (40.5%) were from the Kinondoni districts (Figure 1).
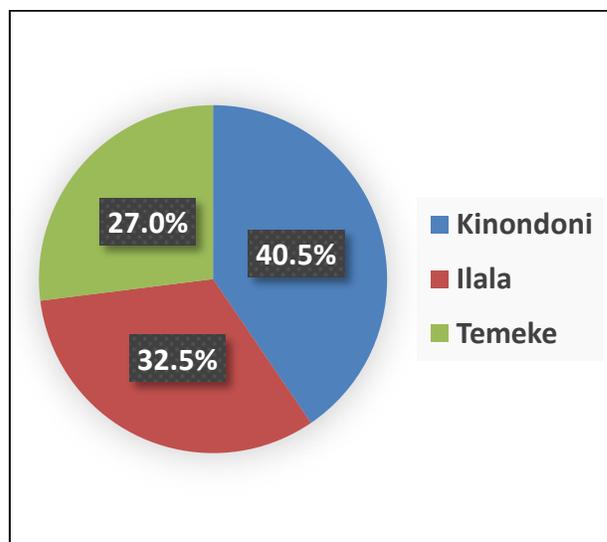


**Figure 1: Distribution of CPWs in the three districts of Dar es Salaam, Tanzania**

**Table 1: Distribution of community pharmacy workers by age and gender**

| Age group | Male N (%) | Female N (%) | Total N (%) |
|-----------|-----------|--------------|-------------|
| ≤ 19 | 1 (1.1) | 1 (0.6) | 2 (0.8) |
| 20-29 | 53 (57.6) | 87 (54.4) | 140 (55.6) |
| 30-39 | 23 (25.0) | 59 (36.9) | 82 (32 5) |
| 40-49 | 8 (8.7) | 10 (6.3) | 18 (7.1) |
| 50-59 | 3 (3.3) | 1 (0.6) | 4 (1.6) |
| ≥ 60 | 4 (4.3) | 2 (1.3) | 6 (2.4) |
| **Total** | **92(36.5)** | **160 (63.5)** | **252(100)** |

The majority of respondents were nurses (49%) (Table 2), followed by the Accredited Drug Dispensing Outlets (ADDO) trainees (24.2%). Of the ADDO trainees, 30 (49.2%) and 1 (1.6%) had nurse and pharmaceutical assistant professional identity, respectively. Pharmacists represented only 9.1% of the respondents. The other 7.5% CPWs comprised other professions such as clinical officer, doctor, manager, owner, procurement officer, storekeeper, and cashier or fieldwork student who had not received any formal training in pharmacy practice (Table 2).

**Table 2: distribution of community pharmacy workers according to their profession**

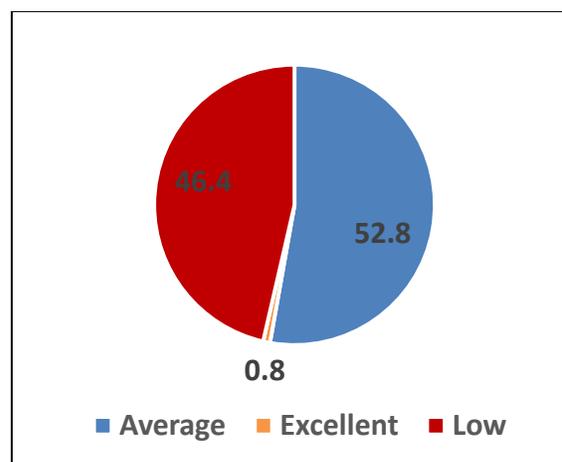| Qualification | N (%) |
|---------------|-------|
| Nurse | 124 (49.2) |
| ADDO trainee | 61 (24.2) |
| Pharmacist | 35 (13.9) |
| Pharmaceutical assistant | 23 (9.1) |
| Pharmaceutical technician | 21 (8.3) |
| Other professions | 19 (7.5) |

**Source of information on Ebola**

About 248 (98.4%) had prior knowledge of Ebola, which they had acquired from different information sources. The most frequently reported source of information about Ebola was television (71.8%) (Table 3). The least frequent source of information was from relatives at home (13.9%).

**Table 3: Respondents source of information about Ebola disease**

| Source | N (%) |
|--------|-------|
| Television | 181 (71.8) |
| Newspaper | 171 (67.9) |
| Radio | 170 (67.5) |
| Internet | 79 (31.3) |
| Health care workers | 65 (25.8) |
| School teachers | 36 (14.3) |
| Home/relatives | 35 (13.9) |

**General Knowledge on EVD control and prevention**

When all the positive scores for 20 questions were aggregated and individual scores computed, a mean and standard deviation of 5.7±2.2 was obtained. The individual scores were categorized into low (1-5), average (6-10) and excellent (11-20) knowledge, as shown in Figure 2. The majority of respondents, 52.8%, had an average knowledge score.



**Figure 2: Proportions (%) of the aggregate knowledge score among the CPWs after scoring 20 questions' responses**

**Knowledge on routes of transmission of Ebola**

More than 50% of the participants mentioned only one Ebola transmission route, whereas about 26% mentioned more than one Ebola

transmission route. About 81.3% (Figure 3) mentioned direct contact with body fluids as the main route of transmission, while 38.5% mentioned air. Other routes mentioned were blood transfusion, contact with fomites touched by the patient, eating undercooked food, sexual intercourse with Ebola patient, sharing a sharp instrument, contact with infected animals and breastfeeding.

## Knowledge of symptoms of EVD

Of the 252 participants interviewed, about 80.6% reported that they could correctly notice the signs and symptoms of EVD. About 60.7% mentioned internal and external bleeding and 65.5% high fever as one of Ebola symptoms. Other EVD symptoms reported were headache, body weakness, diarrhea, vomiting, loss of appetite, sweating, red eyes, body rashes, wounds, loss of consciousness and muscle pain (Table 4).

## Knowledge on prevalence and transmission of Ebola

About 81.3% of the participants were aware of the most affected Ebola areas as West and Central Africa, while only 56% knew that Ebola cases had been reported in USA and Spain.

Most of the participants, about 42.6%, believed that Ebola could be transmitted by handshaking without body fluids. About 37.3% believed that there were vaccines and cures for Ebola at the time of this study. Another key question probed was if Ebolavirus could be transmitted by a mosquito bite or through the air, whether traditional healers or spiritual beliefs can treat EVD or bathing in salty water helps prevent Ebola transmission (Table 5).

**Table 4: Symptoms of EVD mentioned by respondents (N=252)**

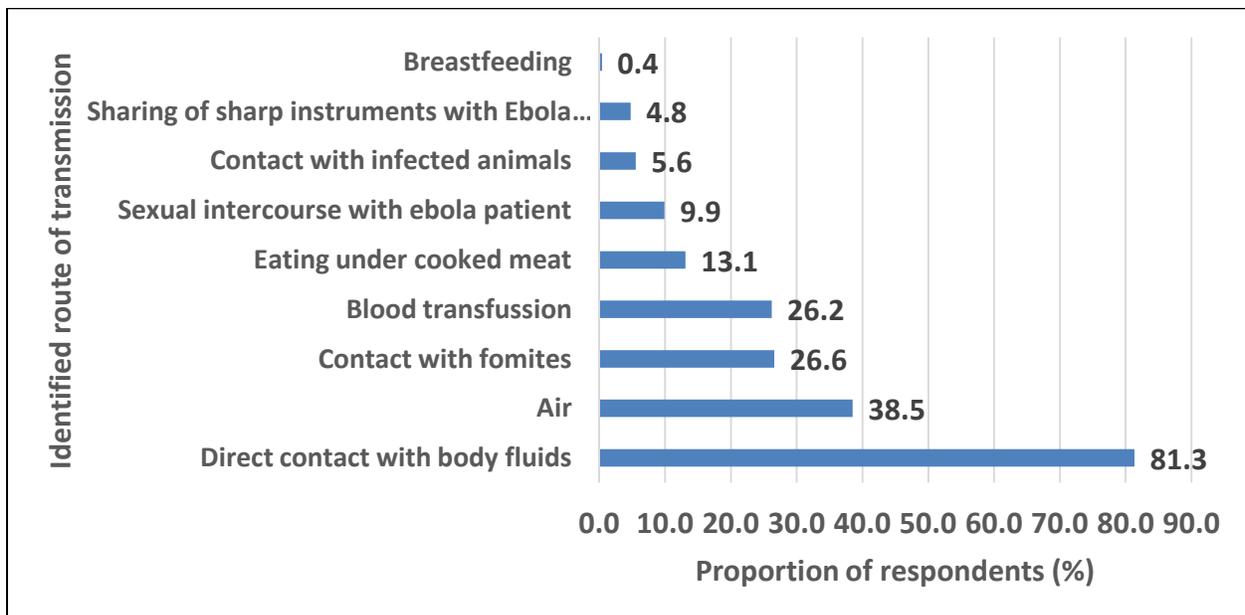| Symptoms of Ebola | n | (%) |
|---|---|---|
| High fever | 165 | 65.5 |
| Internal and external bleeding | 153 | 60.7 |
| Headache | 65 | 25.8 |
| Vomiting | 50 | 19.6 |
| Diarrhea | 42 | 16.7 |
| Body weakness | 39 | 15.5 |
| Sweating | 7 | 2.8 |
| Red eyes | 3 | 1.9 |
| Body rashes | 3 | 1.9 |
| Loss of appetite | 2 | 0.8 |
| Muscle pain | 2 | 0.8 |
| Wounds | 1 | 0.4 |
| Loss of consciousness | 1 | 0.4 |



**Figure 3: Knowledge of CPW on routes of transmission of Ebola**

**Table 5: Knowledge of CPW on transmission and prevention of Ebola**

| Key questions | Yes, n (%) | No, n (%) | Don't know, n (%) |
|---|---|---|---|
| Ebola can be transmitted by handshaking without body fluids | 107 (42.6) | 106 (42.1) | 39 (15.5) |
| There is no vaccine or cure for Ebola | 158 (62.7) | 62 (24.6) | 32 (12.7) |
| Mosquito bites can transmit Ebola | 55 (21.6) | 129 (51.9) | 68 (26.6) |
| Ebola can be transmitted through the air | 163 (64.7) | 55 (21.6) | 34 (13.5) |
| Ebola can be treated by traditional healers or spiritual beliefs | 43 (17.1) | 182 (72.2) | 27 (10.7) |
| Bathing in salty hot water helps to prevent Ebola transmission | 40 (15.7) | 155 (61.5) | 57 (22.6) |

**Attitude towards Ebola prevention and control**

Community pharmacy workers were found to have a positive attitude towards ways of preventing Ebola, as more than 90% believed that avoiding contact with body fluids, sending suspected persons to the hospital, avoiding handling of materials contacted by the patient and avoiding making direct contact with a symptomatic infected person or infected animals

are the main ways to reduce transmission (Table 6).

**Association of demographics and level of knowledge**

When all the knowledge questions were scored, it was found that 0.8%, 52.8% and 46.4% of respondents had excellent, average and low knowledge scores, respectively. The association between profession and the knowledge score is shown in Table 7.

**Table 6: Attitude of CPW on Ebola prevention**

| Key questions | Yes, n (%) | No, n (%) |
|---|---|---|
| Ebola can be prevented by avoiding contact with blood and body fluids | 232 (92.1) | 20 (7.9) |
| The suspected person avoids the chance of transmission by immediately sending him/her to the hospital | 242 (96.1) | 10 (3.9) |
| A suspected person has a higher chance of survival by immediately sending to a hospital | 241 (95.6) | 11 (4.4) |
| Prevention is through avoiding handling materials contacted with the patient | 244 (96.6) | 8 (3.2) |
| A person who come in direct contact with a symptomatic infected person or infected animal are at risk | 246 (97.6) | 6 (2.4) |

**Table 87: Association of gender, profession and the level of knowledge on Ebola**

| Characteristic | Attribute | Level of knowledge | | | Total (%) | Chi-square p-value |
|---|---|---|---|---|---|---|
| | | Average | Excellent | Low | | |
| Gender | Male | 57 | 1 | 32 | 90 (63.3) | |
| | Female | 76 | 1 | 81 | 158 (48.1) | 0.109 |
| Pharmacist | Yes | 28 | 1 | 5 | 35 (80.0) | 0.001 |
| Pharmaceutical technician | Yes | 14 | 0 | 6 | 20 (66.7) | 0.281 |
| Pharmaceutical assistant | Yes | 15 | 0 | 8 | 23 (65.2) | 0.59 |
| Nurse | Yes | 53 | 1 | 69 | 124 (42.7) | 0.08 |
| ADDO | Yes | 22 | 1 | 37 | 60 (36.1) | 0.024 |

**Practice on Ebola prevention and control**

The respondents exhibited positive behavior and practice towards controlling and preventing EVD since more than 80% gave acceptable responses to practice questions, with only a few participants responding to unacceptable behavior and practices (Table 8).

**DISCUSSION**

This study explores the community pharmacy workers' factors towards preparedness in combating the emergence of Ebola in the community by exploring their knowledge, attitude and practice. Many participants working in community pharmacies report having trained as nurses (49.2%) and ADDO (24.2%). Only 13.7% were pharmacists, 9.1% pharmaceutical assistants and 8.3% pharmaceutical technicians.

About 248 (98.4%) had prior information concerning Ebola. The major source of information was televisions (71.8%), magazines (67.9%), radios (67.5%) and 31.3% from health workers and health facilities. This shows that community pharmacy workers have various sources of information concerning Ebola and its epidemic at their disposal. These are similar results to that obtained in Nigeria in September 2014, where television was the main source of information concerning Ebola [5, 6, 15]. In Senegal, the important source of information about EVD was also television( 89.4%) [15].

When all the positive scores for knowledge questions were aggregated, an average collective knowledge among the CPWs was recorded. Another study in Tanzania among drug dispensers showed inadequate knowledge regarding the transmission, prevention and treatment of H1N1/09 influenza [16]. Salespersons without formal training in pharmaceutical or medical sciences were found dispensing and supervising the pharmacies. Most participants had misconceptions about how H1N1/09 virus was transmitted [16]. In Nigeria, surmountable gaps in EVD knowledge, negative attitudes and sub-standard preventive practices were also noted, showing a lack of continued training of HCW and provision of adequate materials and resources [5].

**Table 8: Behavior and practice of CPW towards Ebola control and prevention**

| Key questions | Yes n (%) | No n (%) | Not sure n (%) |
|---|---|---|---|
| Washing of hands with soap and water when touching a suspected patient with Ebola | 220 (87.3) | 4 (1.6) | 28 (11.1) |
| Wear gloves and protective clothing when handling a person suspected to have Ebola | 241 (95.6) | 5 (1.9) | 6 (2.4) |
| Avoid physical contact with people suspected to have Ebola | 238 (94.5) | 4 (1.6) | 10 (3.9) |
| Do not handle any material touched by Ebola patient | 211 (83.7) | 15 (5.9) | 26 (10.3) |
| You should be checked for Ebola if you have seated near an Ebola patient | 222 (86.1) | 10 (3.9) | 20 (7.9) |
| If you have stayed in an area where Ebola case has recently been reported, seek medical attention if you feel symptoms | 232 (92.7) | 4 (1.6) | 16 (6.4) |
| After talking to and helping Ebola suspect, you should visit a doctor for a medical checkup. | 231 (91.7) | 6 (2.4) | 15 (5.9) |
| Those who have been cured of Ebola should be received and welcomed into the community | 231 (91.7) | 7 (2.8) | 14 (5.6) |
| A child who has been cured from Ebola should return to school | 229 (90.7) | 4 (1.6) | 19 (7.5) |
| If there is a suspected Ebola person in your family, can you hide the information? | 16 (6.4) | 230 (91.3) | 6 (2.4) |

In our assessment of the CPWs' level of knowledge concerning Ebola and its transmission routes, 81.3% identified direct contact with body fluids as the main Ebola transmission route, whereas 61.5% of the respondents mentioned air as the main route of Ebola transmission, one among misconceptions concerning Ebola. Such misconceptions about the routes of transmission are indicative of a low level of knowledge by CPWs concerning Ebola. The results are similar to a Sierra Leone study where a low level of knowledge concerning Ebola was also portrayed [17]. In a study in Senegal, the most common modes of transmission of EVD outlined were blood (79.8%), contact with an infected dead person (77.8%), bush meat (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%) [15].

Regarding the symptoms of EVD, most respondents (80.6%) reported that they could identify EVD symptoms. Of these, 60.7% mentioned internal and external bleeding as one of the major symptoms of Ebola. Other symptoms mentioned were high fever (65.5%), headache (25.8%), body weakness (15.5%), diarrhea (16.7%), vomiting (19.6%), loss of appetite (0.8%), sweating (2.8%), red eyes (1.9%), body rashes (1.9%), wounds (0.4%), loss of consciousness (0.4%) and muscle pain (0.8%). These results are also similar to the study done in Nigeria, as they reported that most healthcare workers knew EVD symptoms [5, 6]. In Senegal, 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 EVD symptoms reported by the students surveyed [15].

The majority of the CPWs (81.3%) knew that Ebola afflicted most of the West and Central Africa regions and 56% knew that Ebola cases had been reported elsewhere, including USA and Spain. Most CPWs (42.6%) believed that Ebola could be transmitted by handshaking without body fluids contact. About 33.7% believed at the time of the study, in 2015, there were a vaccine and cure for EVD. Certain misconceptions were reported, with several participants

acknowledging that Ebola could be transmitted via mosquito bites (21.6%) or through the air (64.7 %). Similar results were also obtained by a study done in Lagos, Nigeria, where 15% thought Ebola could spread through the air [18]. Several misconceptions regarding prevention and treatment were noted, such as the belief that Ebola can be treated by traditional healers or through spiritual beliefs (17.1%) and that bathing in salty water helps prevent Ebola transmission (15.7%). In Guinea, similar misconceptions were revealed by about 40% of the respondents who believed that they could prevent Ebola by bathing in salty water.

In a study done in Sierra Leone, positive attitudes towards Ebola prevention were reported, with 87% agreeing that avoiding contact with body fluids helps prevent Ebola; avoiding handling dead bodies (85%) and immediate sending suspected persons to the health facility can prevent transmission (91%) [17]. In comparison, about 20% believe that spiritual healers can successfully treat the disease [19].

The study also reveals a positive attitude towards ways of preventing Ebola among CPW as more than 90% believe that avoiding contact with body fluids, sending suspected persons to the hospital, avoiding handling of materials contacted with the patient and avoiding direct contact with a symptomatic infected person or infected animals are the main ways to reduce transmission. These results are the same as those obtained by a study in Sierra Leone, where 87% agreed with avoidance of blood and body fluid contact as the means of prevention. There was also agreement on avoidance of touching a dead body (85%), sending the infected person to the hospital immediately (91%), avoiding contact with people suspected of Ebola (95%) and handwashing with disinfectants and handwashing with soap and water [17].

Community pharmacy workers displayed positive behavior and practice towards controlling and preventing Ebola. More than 80% gave positive responses to practice questions, with only a few responding to unacceptable behavior and practices. The

practices include regular handwashing with soap and water, wearing gloves, avoiding contact with suspected persons, and medical checkups when feeling suspicious symptoms. The same results were also obtained in a Nigerian where positive behaviors and practices like frequent handshaking, avoiding physical body contact, and wearing gloves to avoid contact with patients [8, 9] were recognized for preventing and controlling Ebola. (91.7%).

In this study, about 91.7% reported receiving and welcoming back those cured of Ebola, contrary to a UNICEF study in Sierra Leone. About 76% reported not being willing to welcome someone back into their community after recovery from Ebola [17]. Encouragingly, about 90.7% of respondents in this study accepted that a recovered child from Ebola should promptly be sent back to school. On the contrary, about 32% of respondents in the Sierra Leone UNICEF study in [17] believed that a fully recovered school pupil from Ebola would still put other pupils in their class at risk. In this study, only 6.4% report the possibility of hiding information if a family member is suspected of Ebola, identical to the Sierra Leone UNICEF study [17], where 9% report needing to keep information secret if a family member contracts Ebola.

Gender and age were not associated with the level of knowledge scores. The CPWs cadre was positively associated with knowledge, with the pharmacists' cadre being significantly associated with appreciable knowledge on EVD ($\chi^2$, p-value = 0.001), as was the nurses cadre and ADDOs. This cadre variation may reflect the differences in the depth of prior training on the knowledge about EVD. In an earlier Tanzanian study of drug dispensers' knowledge on the transmission, prevention and treatment of H1N1/09 influenza, salespersons without formal training in pharmaceutical or medical sciences reported several misconceptions about how H1N1/09 virus was transmitted [16].

In a study of Ebola preparedness among HCWs in India, the knowledge of physicians and experienced workers ($\geq$ 10 years) was significantly higher than other groups. Although the respondents' overall attitude was positive, significant positive correlations between knowledge and attitude were observed [19]. In Saudi Arabia, most respondents in a study were knowledgeable about the etiology, mode of transmission, signs and symptoms, and treatment of EVD. All participants had significantly high levels of concern about EVD and the implementation of strict standard infection control preventive measures [20]. Overall, in Nigeria, there was good knowledge, attitude and practice among public and private HCWs with no statistically significant differences in the two sectors [5]. Another study in Nigeria discovered that HCWs, especially doctors had good knowledge. However, only a small proportion reported good practices and were not trained to identify suspected EVD patients [5, 6]. Therefore, timely and intense social mobilization and awareness campaigns are the best tools to educate all community segments about public health emergencies. It is also important that travelers leaving a country affected by EVD be given awareness and knowledge immediately at the departure area or at the entry area to avoid further transmission of the EVD to the community in the destination. Travelers or residents in the affected area should avoid contact with body fluids such as blood, saliva, feces, vomit and urine. Also, they should avoid contact or handling of dead or sick animals and avoid sexual intercourse with the person infected with Ebola for at least seven weeks. These people should report to the hospital immediately if they experience Ebola symptoms within 21 days after leaving infected areas [1].

This quantitative survey was conducted in only one region in Tanzania, considered an essential port of entry. The results may not be generalizable to the other regions bordering countries that periodically experience EVD outbreaks, such as Uganda and DRC. Moreover, the obtained data being self-reported would likely be influenced by social desirability bias, which was not measured in the survey. Additionally, because no EVD outbreak has ever been reported in Tanzania, the CPWs' responses may purely be based on their training and knowledge from varied information sources

other than actual EVD epidemics experience. This study only involved CPWs and future studies may consider other HCWs. Additionally, further research with larger sample size is necessary to give population-representative findings for other emerging infectious diseases.

**CONCLUSION AND RECOMMENDATIONS**

This study reports an average level of knowledge about EVD among CPWs. However, a positive attitude was revealed towards preventing the transmission of Ebola. In addition, positive behavior and practice towards the control and prevention of EVD was noted. Some misconceptions were observed regarding the main routes of Ebola transmission, preventive and treatment methods. The study provides evidence for further research and training of health care workers to increase awareness of Ebola and other emerging infectious diseases such as COVID-19. It further calls for education towards high knowledge acquisition as part of preparedness to prevent the disease's spread. Some form of community awareness campaigns or other means, such as print and electronic media involving television, magazines and radio campaigns, need to be promoted. Such campaigns, preferably by health professionals and the Ministry of Health, will counteract some socio-cultural perceptions and misconceptions.

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