



Ebola Preparedness of Health Facilities in the Greater Accra Region of Ghana

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Authors' contributions

This work was carried out in collaboration between all authors. Authors OUE and OOHA designed the study, wrote the protocol, administered the questionnaires and wrote the first and second drafts of the manuscript. Authors AAS and VNO joined in writing the protocol, managed the analyses of the study, and edited the first and second drafts of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The recent Ebola virus disease (EVD) outbreak in West Africa exposed many fundamental weaknesses in the healthcare delivery system in affected countries, principally the poor disease surveillance, preparedness and outbreak response mechanisms. The cross-border importation of disease cases prompted many countries to strengthen their internal capacities to prevent or contain possible outbreaks. However, the existing EVD response measures seem inadequate in some high-risk countries. Here, we evaluate the preparedness of health facilities in Greater Accra, Ghana's second most populated region, for a possible EVD outbreak, and identify issues of policy and public health relevance. The study followed a cross-sectional pattern involving 64 health facilities (32 government-owned and 32 privately owned) in eight districts. Data were obtained using a semi-

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structured questionnaire administered to hospital administrators and analyzed qualitatively. Four hospitals in two metropolitan areas were considered adequately resourced to admit EVD patients and had protocols for managing disease cases with surveillance and logistical supplies available. Twenty-one other facilities comprising 17 hospitals, 2 polyclinics and 2 health centres were prepared to attend to initial EVD cases before referring suspected cases to the four adequately resourced hospitals. The remaining 39 health facilities had no capacity for EVD management. Generally, health facilities within the Greater Accra Region were inadequately prepared to handle initial EVD cases.

Keywords: *Ebola virus disease; surveillance; response; health facilities; health care workers; Ghana.*

1. INTRODUCTION

Ebola virus disease (EVD) is a terminal viral disease caused by viruses under the genus Ebola virus in the family *Filoviridae* [1]. Five species of the Ebola virus have been reported. They include the Bundibugyo Ebola virus, the Zaire Ebola virus, the Fai Ebola virus, the Sudan Ebola virus and the Reston Ebola virus [2]. The main symptoms of EVD include fever, headache, vomiting, diarrhoea, muscle pain, stomach pain, and inexplicable bleeding or bruising [2]. Ebola is transmitted through two major routes: (1) through direct contact with asymptomatic infected patient (e.g. bodily fluids, saliva), and (2) through direct contact with contaminated objects. The disease causes significant morbidity and mortality in human and non-human primates, with human fatality rates reaching 90% during epidemics caused by the Zaire subtype with an incubation period of between 2 and 21 days [3].

Ebola virus disease (EVD) outbreak was first documented in September 1976, at the Yambuku Mission Hospital near Bumba in Northern Zaire, which is now referred to as the Democratic Republic of Congo [4]. As of October 1976, 280 fatal human cases of the known viral hemorrhagic fever had been documented around Yambuku, with some occurring later in Kinsasha, along with 38 serologically confirmed survivors [4]. The Reston Ebola virus has never been proven to cause disease in humans but only in non-human primates [5], whereas the other four subtypes have been documented to cause human diseases. The Zaire Ebola virus strain particularly has been associated with over half of the entire Ebola virus outbreaks in the past decades [6].

Although all previous EVD outbreaks occurred in Central Africa, a new epidemic began in the West African nation of Guinea in late 2013 and this was confirmed by the World Health Organization (WHO) in March 2014 [3]. The disease later spread to neighbouring countries

such as Liberia, Sierra Leone and Nigeria, with a few imported cases reported in Spain and the United States of America [7]. The magnitude of the outbreak, especially in Liberia and Sierra Leone, was most likely underestimated, due in part to affected individuals being cared for outside the hospital environment at the early stages of the epidemic [8]. From February 2014 until November 2014, the disease claimed over 2500 lives in the West African sub-region, with Sierra Leone and Liberia recording the highest cases [9].

As a neighbour to the countries affected by the recent EVD outbreak, Ghana had (and probably continues to have) a high risk of exposure to the virus due to regular human and animal migration. In fact, Ghana was the country with the highest probability of EVD importation in the 2014 outbreak, based on computational simulation using air traffic connection data [10]. Responding to this threat, Ghana's Ministry of Health, in collaboration with the WHO Regional Office for Africa institutionalized measures to ensure the prevention of the disease importation and possible spread. These measures included: (i) resourcing the regional and district level Public Health Emergency Committees to develop, update and implement reliable epidemic resource plans (ii) training of frontline healthcare staff in safety precautions and EVD disease surveillance, management and public sensitization, (iii) establishment of referral centres for the provision of specialized diagnosis and care of possible cases, (iv) improvement of conditions at primary health facilities to enhance the capacity for initial disease handling prior to transfer of cases to the referral centres and the provision of personal protective equipment (PPE) [11].

It, however, remains largely unknown to the extents to which different categories of hospitals in the country are resourced to respond to potential future EVD epidemics. Thus, this study sought to evaluate the level of preparedness of

health facilities in the Greater Accra region of Ghana towards addressing possible EVD outbreaks.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in eight administrative metropolitan and municipal areas of the Greater Accra region of Ghana. Greater Accra is located at latitude 5.5560198 and longitude -0.1969, in the northern hemisphere. The region is bordered on the north by the Eastern region, on the east by Lake Volta, on the south by the Gulf of Guinea, and on the west by the Central region of Ghana. The Greater Accra region comprises 16 administrative areas. The centre of population of the region is located in the Greater Accra metropolitan area, which comprises the Accra metropolitan, the Tema metropolitan, the Adenta municipal, the Ashaiman municipal, the Ledzokuku municipal, the Ga East municipal, the Ga West municipal, and the Ga South municipal assemblies [12] (see Fig. 1).

2.2 Study Design

The study design followed a cross-sectional survey pattern, selecting 8 out of the 16

administrative districts in the region. Using purposive sampling technique, eight healthcare facilities (comprising four government-owned - and four privately-owned) were selected from each participating municipal within the Greater Accra region. In total, sixty-four hospitals healthcare facilities were selected for the study.

2.3 Data Collection

A well-structured closed-ended questionnaire was administered to each participating hospital administrator to record demographic characteristics followed by knowledge of EVD. Filling the questionnaire lasted a maximum of 45 minutes for each administrator. The knowledge section included questions related to communicability, symptomatology and diagnostics. The administrators were selected to fill the questionnaire because they were aware of the facilities available at the hospitals and in some cases they were trained health care workers as well.

2.4 Data Analysis

Data obtained was entered into Microsoft excel 2010 version and later exported into the Statistical Package for Social Science (SPSS) version 24 for analysis.

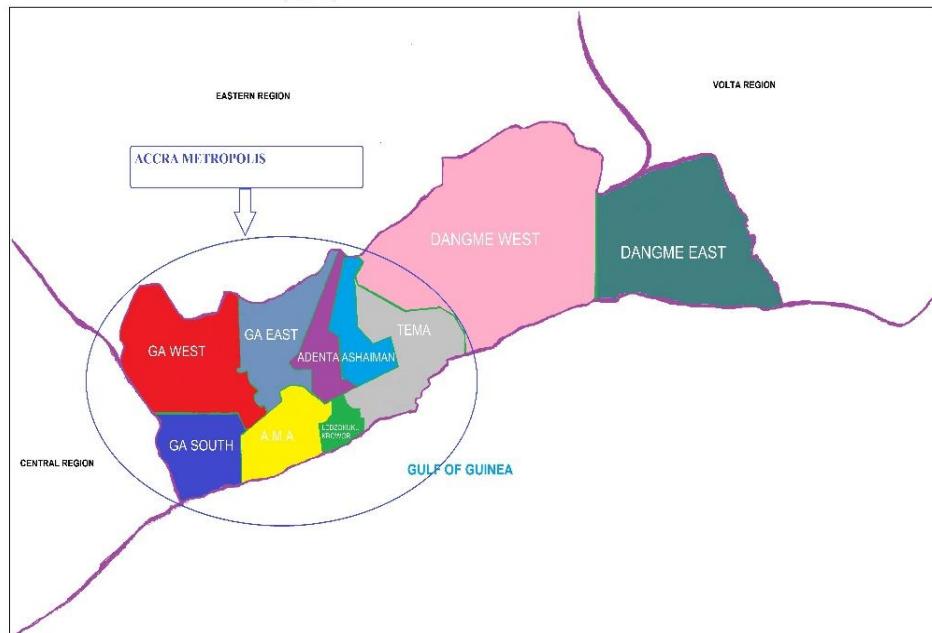


Fig. 1. A schematic illustration of the geographical distribution of the municipal and metropolitan areas where the study was conducted

3. RESULTS AND DISCUSSION

3.1 Participants' Characteristics

The health centre has traditionally been the first point of contact between the formal health delivery system and the client. It is headed by a medical assistant and is staffed with programme heads in the areas of midwifery, laboratory services, public health, environment, and nutrition. Each health centre serves a population of approximately 20,000. They provide basic curative and preventive services for adults and children, as well as reproductive health services. They provide minor surgical services such as incision and drainage. They augment their service coverage with outreach services, and refer severe and complicated conditions to appropriate levels. The polyclinic on the other hand is the urban version of the rural health centre. Polyclinics are usually larger, offer a more comprehensive array of services, are manned by physicians, and can offer complicated surgical services. They are mainly in metropolitan areas. Hospitals are the facilities for clinical care at the district and regional level. Hospitals serve an average population of 100,000 to 1.2 million people in a geographically well-defined area. The number of beds in a hospital is usually between 50 and 200. They provide specialized care, involving skills and competence not available at lower health centres and have such personnel as general surgeons, general medical physicians, pediatricians, general and specialized nurses, and midwives. The selection and distribution of these centres in the study was dependent on availability of the centre within the study location.

We selected the most populated metropolitan and municipal areas in the Greater Accra region,

assuming that the possibility of the spread of EVD would be highest in these areas and a total of sixty-four questionnaires were distributed among health facilities within the eight (8) divisions in the Greater Accra Region as shown in Table 1.

3.2 Supplies

The majority of respondents from both government hospitals and private hospitals (87.5% and 84.4% respectively) stated that PPEs (i.e. masks, gloves, eye protection) were easily accessible to healthcare workers, particularly in frontline areas. Among the 55 respondents who confirmed the availability of PPEs, only 11 hospitals (17.2%) admitted having processes in place for regular checks (i.e. expiry date) on PPE items to ensure their appropriate usage. 19 (34.6%) out of the 55 respondents had the full complement of isolation gowns. Most of the respondents (82.8%) reported that even though they had supplies of PPE, they were still uncertain about their ability to combat the disease or care for affected cases.

3.3 Willingness to Admit Ebola Patients

In general, 64 health facilities were included in this study. Four hospitals (6.3%) (3 out of the 32 government-owned facilities and 1 out of the 32 private facilities) were fully equipped to handle EVD cases in the Greater Accra Region and had well trained medical staffs in the area of Ebola care. These hospitals had surveillance systems in place to monitor Ebola cases and also protocols to manage Ebola cases. Personal protective equipment was adequately available in these facilities. Some hospitals (33%) reported that they would prefer transferring Ebola patients to a regional facility rather than treating them

Table 1. Distribution of sampled health facilities within the Areas

Metropolitan and municipal areas	Hospitals		Polyclinics/ Clinics		Health centers		Total facilities
	Govt. owned	Private owned	Govt. owned	Private owned	Govt. owned	Private owned	
Accra	4	4	0	0	0	0	8
Adenta	1	1	2	3	1	0	8
Ashiaman	3	4	1	0	0	0	8
Ga East	4	4	0	0	0	0	8
Ga South	1	4	0	0	3	0	8
Ga West	2	3	2	0	0	1	8
Ledzokuku	3	4	0	0	1	0	8
Krowor							
Tema	4	3	0	0	0	1	8
TOTAL	22	27	5	3	5	2	64

within their own facility. This, they indicated was as a result of lack of basic amenities to administer care to suspected Ebola patients. The choices of the hospitals differed greatly depending on the type and size of the hospital involved as shown in Fig. 2.

3.4 Availability of Written Protocols

Most respondents (49 [76.6%] of the 64 health care facilities) reported that their facility had written protocol for managing and testing suspected Ebola patients. Out of the 76.6% health facilities, seven facilities (14.3%) reported that they reviewed their protocols very often while twenty-four facilities (49.0%) occasionally reviewed their protocol. Nine facilities (18.4%) rarely reviewed their protocol while nine other facilities (18.4%) never reviewed their protocol. Fifteen (23.4%) of the health facilities had no written protocol in place for the assessment of EVD cases.

3.5 Ebola Health Care Team and Guidelines

29 (45.3%) health facilities had a specific team of healthcare personnel to care for Ebola patients while 35 (54.7%) lacked such personnel. The difference between the two groups was observed to be statistically significant ($P < 0.001$). The majority of facilities (52; 81.25 %) were aware of national guidelines in place for the implementation of appropriate measures upon the notification of a suspected case of EVD and

15 facilities had developed their own internal guidelines in addition to the national guidelines.

3.6 Communication

Communiqués that provided information on Frequently Asked Questions (FAQs) in response to the EVD outbreak had been implemented in all the four hospitals that admitted EVD suspected cases and in all the twenty-one facilities that will refer EVD cases. Visual tools such as PPE teaching posters and videos in respective languages were available and had been disseminated in these facilities. Internal communication mechanisms were also in place providing regular updates to healthcare workers.

3.7 Training Activities of Healthcare Workers

Information on training activities to ensure that healthcare workers were informed about standard precautions and information relating to visitors who visited health facilities and their awareness of cough etiquette and hand hygiene were assessed. Preparedness activities in response to the EVD outbreak incorporated education and training. 14 out of 25 hospitals that would manage EVD patients had plans in place to conduct regular in-house training, to ensure that the necessary systems were put in place. Evidence of training activities to ensure healthcare workers were informed about standard precautions was observed in all of the facilities enrolled in the study (Table 2).

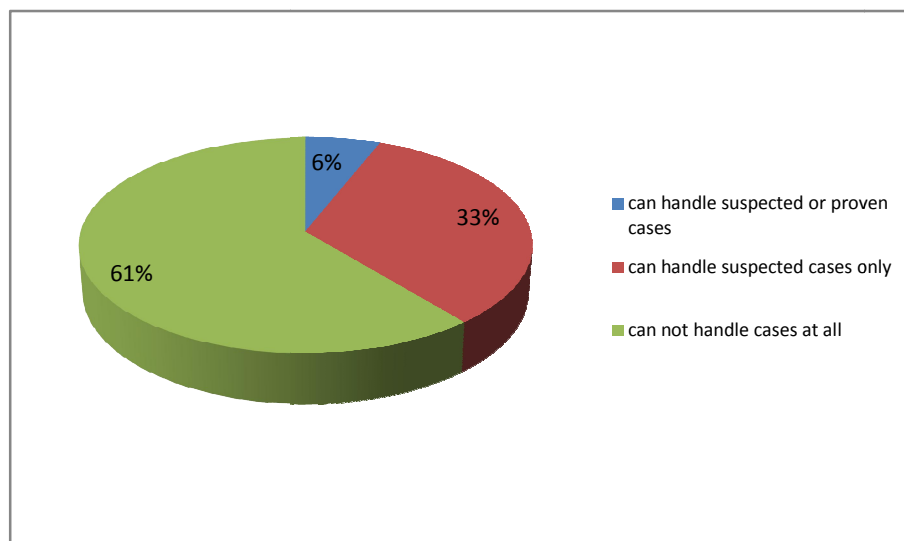


Fig. 2. Willingness of facilities to handle EVD cases

Table 2. Prevention strategies for health care workers and visitors to health facilities

Vigilance and awareness of healthcare workers and visitors to Health facilities	Facilities that would admit and treat EVD patients (Have Functional isolation units) (4, (6.25%))		Facilities that would refer EVD patients (Not having functional isolation units) (21, (32.81%))		Facilities that cannot handle EVD patients (39, (60.94%))	
	In place	Action needed	In place	Action needed	In place	Action needed
There is evidence of training to ensure all healthcare workers (HCWs) know about standard precautions and isolation precautions	4	0	21	0	39	0
HCWs are aware of cough etiquette and hand hygiene	4	0	21	0	39	0
Patients are aware of cough etiquette and hand hygiene	4	0	21	0	39	0
Visitors are aware of cough etiquette and hand hygiene	4	0	21	0	39	0
There are training teams in place who can rapidly train all staff in a hospital on infection control	4	0	21	0	31	8
Training and exercises are conducted periodically to ensure staff competency and safety in use of PPE	4	0	21	0	37	2
Where applicable, training and competency assessment is planned for staff handling human waste management e.g. the use of the autoclave machine	4	0	21	0	35	4

For the purpose of comparing the preparedness of facilities within both the government and private health sector in the handling of suspected Ebola cases, nine cardinal parameters were selected. The Table 3 below provides more details on information gathered.

This survey showed a substantive degree of preparation for the screening, diagnosis, and management of EVD cases with the larger hospitals reporting a higher level of preparedness. Regardless of the number of respondents who indicated that they would prefer to transfer Ebola patients to specialized treatment centres rather than care for them at their facility, some showed further preparation efforts indicating recognition of the importance of their ability to effectively prepare as well. The government is stepping up efforts at containing any Ebola case that may rear its head in the country. Four operational isolation centres were noted during the study in Greater Accra. The Isolation centres had facilities such as wards, changing rooms for male and female infected persons, change rooms, a cadaver holding bay, among others.

Ghana has a delicate health system, with the majority of medical staff concentrated in the Greater Accra region [13]. The surveillance system is also fragile, with challenges identified in collection, analysis and reporting of data and intelligence [14]. The Ebola virus is of great risk to healthcare workers. It is a serious nosocomial disease which requires strict infection control procedures. Contact with body fluids of an infected person is probably the major mode of spread [15]. Ghana has a peculiar risk in view of the combination of a varied number of factors which have the potential to facilitate importation of the virus and trigger an outbreak, one of which is the intense traffic between Ghana, Nigeria and

Liberia, as well as with other neighbouring countries. It is estimated that on the average, 30 flights land and depart from the Kotoka International Airport on a daily basis, transporting around 4,000 to 10,000 passengers on daily basis. Air, land and sea border crossing are frequent [16]. An estimated 57 approved entry points are used daily, and the number of unauthorized crossing points is estimated to be higher than the approved ones. There are measures for screening at the borders/points of entry. The resources needed to manage the entry borders are; staff for public health issues and case management, resources for screening (material and logistic), an isolation unit, quarantine facilities, and ambulance on standby at the heavy entry points. These resources which are needed to manage the nations' borders should be made readily available.

Education is an important means to prevent the spread of the Ebola virus [17]. One of the problems in past outbreaks was lack of knowledge. It is therefore important for the public to understand the disease and its mode of transmission in order to curb it. Ebola Virus Disease (EVD) is inevitable and will continue to emerge in communities in Africa and also around the world. This is a disease that can be contained with the first few victims. People first have to recognize the disease early so that it does not spread.

Although the current outbreak has ended in most countries in West Africa, we must not forget that many features of this tragic outbreak strongly supports the benefit of continued investment in global health security efforts. Preparedness, vigilance and community awareness will be crucial to the success in the fight against complex public health crises like Ebola. The public and medical personnel should be aware of

Table 3. Preparedness of Government and private health facilities in respect of EVD

Comparison of Preparedness	Government hospital (n = 32) (%)	Private hospital (n = 32) (%)	P-value (<0.05)
Ebola Preparedness	78.13	37.5	0.0010
Outbreak Management Team Available	56.25	25.0	0.0109
Protocol for Management of EVD Available	56.25	34.38	0.0789
PPE Education Available	75.00	34.38	0.0011
Equipped for EVD Outbreak	71.88	37.50	0.0057
Ebola Care Supply	53.13	18.75	0.0042
Admit EVD Suspected Cases	25.00	9.38	0.0000
Have Intensive Care Units	15.63	6.25	0.0001
Have Microbiology Laboratory	18.75	6.25	0.0004

the early signs and symptoms of the Virus. They should know the measures that should be taken in order to protect themselves from acquiring and spreading the disease.

4. CONCLUSION

This study revealed that the general preparedness levels for management of potentially suspected cases of Ebola virus disease are only partially adequate in hospitals. Healthcare facilities that would admit EVD suspected and proven patients had more frequently implemented Infection Control Preparedness activities than Healthcare facilities that would prefer to transfer potential EVD cases to other centres. The government hospitals were evidently adequately resourced and more prepared especially in terms of facility availability than the private hospitals. This calls for a framework aimed at future efforts to improve the general preparedness of hospitals in Greater Accra and other regions as the case may demand.

CONSENT

All authors declare that 'written informed consent was obtained from the Hospital Administrators for publication of this report.

ETHICAL APPROVAL

The study was granted permission by the Greater Accra Regional Directorate of the Ghana Health Service. All participants provided their consent prior to participation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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