Original Article

Information gaps in surveillance data and effects on the Ghanaian response to the Ebola outbreak in West Africa

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SUMMARY

Background: Complete and accurate information on disease occurrence is crucial for effective public health response to disease outbreaks. In response to the 2014 Ebola epidemic in West Africa, Ghana intensified surveillance for the disease across the country. However, the case definition provided by the Ministry of Health was not uniformly applied at all reporting health facilities.

Objective: This paper analyses the accompanying Case Record Forms (CRFs) submitted to Noguchi Memorial Institute for Medical Research to determine its completeness and appropriateness for instituting an effective response to the epidemic.

Methods: We determined the proportions of completeness in reporting for all criteria provided by the MOH for the clinical diagnosis of Ebola. New indicators were generated to measure the completeness of each variable. Tables and graphs of completeness of indicators were produced and presented

Results: Of the 156 samples, 69% were from males. Approximately 4.5% had no record for age. The date of specimen collection was filled for 96%; 34.6% (54) did not have date of onset of symptoms. In 37.8% (59) of cases, location was blank. In 12% of cases, no symptoms were recorded and about 30% had no record of fever. Travel history, especially to affected areas, was missing for 40.4%.

Conclusions: Gaps on CRFs can significantly reduce the utility of results of laboratory analysis for outbreak control. Although all the samples analysed were negative for Ebola Virus, the high proportion of missing data on the forms should be a source of concern. We recommend that frontline health staff be trained on the importance of capturing all information required on the form.

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Keywords: Ebola Virus Disease, Data Gaps, Ghana, Ministry of Health, Symptoms

INTRODUCTION

A robust and reliable surveillance system is crucial for the establishment of efficient response to disease outbreaks. Any good decision of health care hinges on the quality of information available.[1] Information system is crucial in health system strengthening and this is evident in the fact that health information system is one of the six building blocks of health system.[2] A functioning health information system should be able to guarantee the production, analysis and use of reliable and timely information of health determinants.

In her presentation on a system view and lessons on the recent Ebola outbreak, Agyapong indicates that the weakness of disease surveillance among other factors created a favourable context for the outbreak.[3] A strong health system has very strong surveillance system which is able to identify and minimize health threats. In fact, screening and active case finding are important measures of preventing and halting an epidemic.[4]

The ability to curtail the spread of the 2014 Ebola virus disease (EVD) in Nigeria and Senegal was due to the strong health system structures which included identification of contacts, quarantine of suspected cases, monitoring, analysis and utilization of good quality data.[5,6]

In preparation for the possible introduction of an imported case of the 2014 Ebola epidemic that hit West Africa countries, with Guinea, Liberia and Sierra Leone being the worst affected, Ghana intensified its surveillance for the disease across the country. The Ministry of Health, thus, provided standard case definition including information on the commonest associated symptoms, for clinical diagnoses at health facilities. Also included in this case definition is travel history and contacts among others. Criteria for the clinical suspicion of Ebola at the health facility level included;

1. Any person with sudden onset of fever (temperature 38.5^{o}C or above) and three of the following symptoms; headache, diarrhoea, aching muscles and joints, difficult breathing, vomiting, lethargy, hiccup, loss of appetite, stomach pain and difficulty in swallowing.
2. Or any person alive or dead, suffering or have suffered from a sudden onset of fever (temperature 38.5^{o}C or above) and having had contact with a suspected or confirmed case of Ebola, a dead or sick animal
3. Or any person with unexplained bleeding
4. Or any sudden inexplicable death
5.

Any case satisfying this case definition was to be investigated further for the virus in the laboratory.

The Noguchi Memorial Institute for Medical Research (NMIMR), the only place currently in Ghana that has capacity to confirm the Ebola virus infection, received 156 suspected cases between March 2014 and June 2015 for analysis. This paper analyses the accompanying clinical information on the suspected cases to determine its completeness and appropriateness for instituting an effective response in the face of the epidemic.

METHODS

The data for this study were from Ghana and covers the whole country. Ghana is a member of ECOWAS, and often described as the gate way to Africa. It is one of the West Africa countries which is rich in resources and this has allowed free movement of goods and people across its borders. It has ten administrative regions and 216 districts with the major cities being densely populated.

Any suspected case reporting at any of the health facilities in the country was screened for signs of the Ebola virus disease. Each health facility had case investigation form that elicited the presence or absence of the commonest symptoms, travel history and contacts made either prior to or during the illness. Samples of all suspected cases from health facilities across the country were sent to the Noguchi Memorial Institute for Medical Research (NMIMR) for laboratory investigation. Each sample was accompanied with a case investigation form. All samples received at NMIMR were processed and analysed for the Ebola virus infection. All variables or indicators in the form including the laboratory results were entered into a database.

Stata version12 was used to analyse the data. Each patient's records were checked and each variable checked for completeness. The code 999 was entered for blanks and was recoded as missing values before the analysis. A variable indicating the number of symptoms recorded for each patient was generated by recoding the symptoms for each patient. A variable (symptom) was generated for each symptoms (e.g. fever) for each individual with the value '1' if the response is either 'yes' or 'no' and '0' if the field is blank or don't know. Another variable or indicator (number symptoms) was then generated to contain the sum of the variable symptom for each individual. Descriptive statistics were computed on each of the variables to determine the proportion of missing values or blanks.

RESULTS

Background Characteristics and monthly distribution of suspected EVD cases in Ghana

Various health facilities across the country submitted a total of 156 samples between March 2014 and June 2015 to NMIMR for laboratory investigation. The facilities submitting the samples ranged from clinics or health centres to teaching hospitals. Out of the 156 samples received, 34.6% (54) did not have date of onset of symptoms. The date specimen was taken was however, recorded for 96% (150) of the samples.

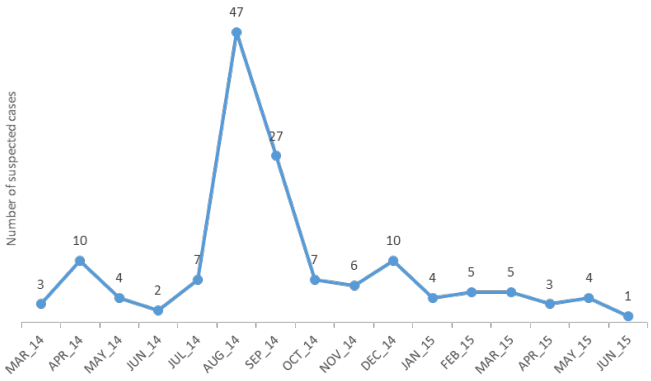


Figure 1 Monthly distribution of EVD suspected cases in Ghana between 2014 and 2015

Out of 150 specimens with dates, 85.3% (128) were in 2014 with 14.7% (22) in 2015. For 2014, most of the samples were taken in April, July, August, September and December. Epi curve for the monthly distribution of cases by date specimen was taken is presented in Figure 1.

In 37.8% (59) of the cases, location was blank. About 69% (108) of patients were males. There were seven (4.5%) of the patients whose ages were not recorded on the case investigation form. For the 149 with recorded age, the mean age was 32.1 (15.0) years. Sixty-six (42.3%) of the patients had their nationality recorded. As expected, for the 66 patients who had nationality recorded, 90.9% (60) of them were Ghanaians. Two (3.0) were Togolese with 1.5% (1) each being American, British, Nigerian and Filipino.

Country in which Suspected EVD cases became ill and health facility submitting sample

Sixty eight percent (106) of the 156 suspected cases had records on the country where they got ill. Out of the 106 cases, 85.6% (91) of them indicated they got ill in Ghana. About 3.8% (4) of them indicated they got ill in Ivory Coast, 2.8% (3) each got ill in Burkina Faso and Liberia, 1.9% (2) got ill in Mali while 1 each got ill in Gambia and Libya. Sixty three (40.4%) of all the suspected cases did not have information on the facility in which they were admitted while 49.4% (43) of those with no information on contact also had no information on facility.

Travel history and contacts

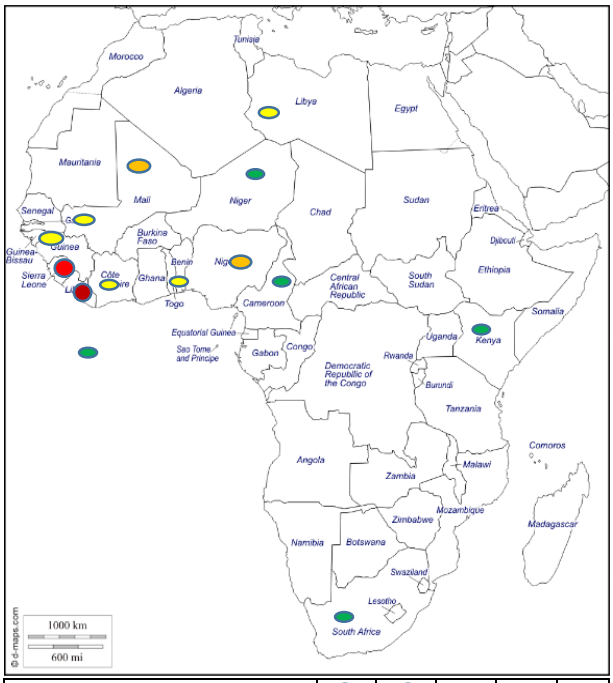
Travel history and contacts made with suspected EVD cases are shown in table 1. Travel during illness and contact with a suspected case had blanks of more than 50%.

Table 1 Travel history and contacts prior or during illness

Indicator	Yes n (%)	No n (%)	Blank n (%)
Contact with a suspected case	3 (1.9)	66 (42.3)	87 (55.7)
Travel prior to illness onset	49 (31.4)	44 (28.2)	63 (40.4)
Travel during illness	17 (10.9)	18 (11.5)	121 (77.6)

Country Suspected Cases travelled to prior to illness onset

As seen in Figure 2, the 49 suspected cases that travelled before onset of illness had travelled to a number of African countries. About 67% of them had travelled to the affected countries prior to illness onset. One person travelled out of Africa (Brazil). The map below shows the countries they travelled to within Africa before the onset of sickness.



Symbol					
Size (number of people)	6	5	4	2	1

Figure 2 A map showing the countries suspected cases travelled to prior to illness onset

Clinical Characteristics of suspected EVD cases in Ghana

Out of the 156 suspected cases, 12.2% (19) had no single recordings for the commonest symptoms on the case investigation form. These forms were left blank for all the fields. Only 20.5% (32) of the suspected cases had all fields for the symptoms filled. Table 2 presents symptoms recorded for the suspected cases. About 28.9% (45) of them had blank records for fever while 64.1% (100) had history of either reported or documented fever.

Nearly half of the patients reported history of vomiting 50.6% (79) while 42.3% (66) reported history of headache. However, proportions of blank records for vomiting and headache are 29.5% (46) and 34.0% (53) respectively. About 54.5% (85) of the patients had history of inexplicable bleeding. Some however, indicated bleeding from the nose, ears, gums, injection site and stool among others.

Table 2 Clinical Characteristics of suspected EVD cases in Ghana (2014/2015)

Symptom	Proportion with n (%)	Proportion without n (%)	Proportion with B blank n (%)
Fever	100 (64.1)	11 (7.1)	45 (28.9)
Headache	66 (42.3)	37 (23.7)	53 (34.0)
Vomiting	79 (50.6)	31 (19.9)	46 (29.5)
Anorexia	58 (37.2)	30 (19.2)	68 (43.6)
Diarrhoea	52 (33.3)	45 (28.9)	59 (37.8)
Lethargy	74 (47.4)	25 (16.0)	57 (36.5)
Abdominal Pain	55 (35.3)	45 (28.9)	56 (35.9)
Muscle pain	50 (32.0)	41 (26.3)	65 (41.7)
Difficulty in breathing	30 (19.2)	61 (39.1)	65 (41.7)
Difficulty in swallowing	21 (13.5)	64 (41.0)	71 (45.5)
Hiccups	8 (5.1)	76 (48.7)	72 (46.2)
Skin rashes	14 (9)	70 (44.9)	72 (46.2)
Conjunctivitis	11 (7.1)	75 (48.1)	70 (44.9)
Inexplicable bleeding	85 (54.5)	34 (21.8)	37 (23.7)
Bleeding from gum	17 (10.9)	59 (37.8)	80 (51.3)
Bleeding from an injection site	12 (7.7)	64 (41.0)	80 (51.3)
Bleeding from nose	35 (22.4)	52 (33.3)	69 (44.2)
Bleeding from stool	36 (23.1)	45 (28.9)	75 (48.1)
Blood in vomitus	80 (51.3)	31 (19.9)	45 (28.9)
Bloody tears	4 (2.6)	58 (37.2)	94 (60.3)
Bleeding from vagina	7 (4.5)	59 (37.8)	90 (57.7)
Outcome	n(%)		
Dead Alive Status not known	28(18.0) 105 (67.3) 23 (14.7)		

Twenty-eight (18.0%) of the suspected cases were dead at the time of receiving the sample. For 14.7% (23) the status was not known while 67.3% (105) were alive Table 2. All suspected cases except one were investigated and found to be negative. One case could not be investigated because it was deemed dangerous due to inappropriate packaging.

DISCUSSION

The analysis of the accompanying case report forms indicates that there are a lot of information gaps in the clinical data on suspected Ebola cases in Ghana. These gaps can however, significantly reduce the utility of the results of laboratory analysis; especially when needed for effective public health actions. For instance, 12.2% (19) of the suspected cases had no information on a single commonest symptom, not even on fever. The question then is how these people were classified as suspected cases if the presence or absence of all these symptoms were not known.

Similarly, 37.8% (59) of the suspected cases had no records on location or the village in which they got ill. This means it would have been difficult to trace these patients' locations if their laboratory results had come out positive. In addition, it would be difficult to trace any of the contacts of the 55.8% (87) of the suspected cases if any of them had a positive laboratory results. Contact tracing, however, is key in the Ebola response management. Frieden and colleagues (2014) on their perspective on the 2014 Ebola outbreak and its new challenges, global response and responsibility alluded to the fact that contact trancing is among the three core interventions that stopped previous outbreaks.[7] It will be difficult to contain an outbreak if contacts of confirmed cases are not identified early enough for isolation and monitoring. Health workers inability to identify contacts has been cited as a contributing factor for the progression of the EVD in the recent outbreak [8] and that the maximum risk of getting infected with Ebola virus is not from the confirmed cases but the contacts of these cases.

Vigorous public health response for identification of close contacts of EVD cases for prompt monitoring has been suggested as one of the effective strategies for curtailing spread of the disease. This was evident in Senegal[9] and Nigeria[10] where the recent outbreaks were controlled within two months and three months respectively due to good response systems which included contact tracing. It is therefore worrying that the data received by NMIMR on EVD suspected cases had such a high proportion (55.7%) with no information on their contacts during the illness. Moreover, 49.4% (43) of those with no information on contact also had no information on the submitting or reporting health facility while 27.6% (24) had no information on the place of residence. This would definitely weaken the response system in the event of any epidemic.

Besides the fact that information on contacts was missing for a large number of patients, information on the travel history of the patients during the illness was also missing for more than three quarters (77.6%) of the suspected cases. However, travel aids the spread of the disease as in the cases of Senegal and Nigeria where the cases were imported into the countries by travel of the infected persons [11]. Since this information was missing, it would be difficult to trace to potential contacts during the travel. The cultural practices such as hand shaking, hugging, and bathing and burial of dead bodies which catalysed the spread of the epidemic in 2014 [12] also exist in Ghana and as such, any delayed identification of infected case would be disaster for the country.

Although all the samples analysed were negative for Ebola virus, the single case that was not investigated should be a source of concern, given the fatal nature of the Ebola virus. Only one infected case, if not detected could result in a serious epidemic.

From the Epi curve above, the data do not indicate any consistent trend in season. This might be due to the fact that the peak of the sample collection coincided with the time that WHO declared the epidemic a Public Health Emergency of International Concern (PHEIC). During the recent Ebola epidemic, health staff in the country acted more out of fear or other concerns besides a thorough clinical evaluation. This has effect on resource utilization especially as in the outbreak situation samples had to be analysed singly as against being batched to reduce reagent use. It will be essential for clinicians and health workers to adhere to guidelines especially in the face of epidemics so that efficient responses can be fashioned out. The data that accompanied the samples analysed during the last epidemic were inadequate to do this.

CONCLUSIONS AND RECOMMENDATIONS

The accompanied clinical data showed a high proportion of missing data for all variables.

- We recommend that frontline health staff be trained on the importance of capturing all the information required on the form by Ghana Health Service.
- Ghana Health Service should strengthen the national surveillance system and train laboratory staff on proper packaging of samples.

Ghana Health Service needs to further strengthen health information systems in order to improve Infection Prevention and Control and better management of infectious diseases.

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