

How Prepared Are Nigerian Schools for Ebola Virus Disease Prevention and Control?

Adebimpe Wasiu Olalekan, MPH, FWACP, and Efuntoye Adeola, MBBS, MPH

ABSTRACT

Background: Nigeria was one of the West African countries gripped by the fear of the spread of the Ebola virus disease (EVD), leading to a long period of delay in resumption of primary and secondary schools for academic activities in September 2014. The aim of this study was to assess the preparedness of schools in the north central region of Nigeria toward EVD prevention and control within 1 month of resumption of schools.

Methods: This was a descriptive cross-sectional study among 76 schools selected using a multistage sampling method. Research instruments were self-administered, semi-structured questionnaires. Data was analyzed using the SPSS software version 17.0.

Findings: Half (38) of the schools reported that some of the children could have traveled to EVD-infected areas during the holiday period; 77.6% (59) had their teachers formally trained on EVD prevention and control before resumption; 50% (38) set up a committee on EVD prevention; and 62.9% (63) carried out awareness-raising activities on school assembly ground. Based on some preventive measures criteria, 55.2% (42) were categorized ready, whereas 44.7% (34) were not ready for EVD prevention and control within 1 month of resumption of students back to school. About 76.3% (58) said they would like to sustain these EVD prevention efforts; 14.5% (11) would like to sustain such efforts at least until the end of the present term. Determinants of readiness for EVD prevention and control include being a private school, being an urban school, belief that children could have traveled to an EVD-infected area, and school having standard operating procedure or policy guidelines on EVD prevention and control.

Conclusion: The persistent call for postponement of school resumption might have been due to the unpreparedness of many of schools to meet EVD prevention and control guidelines. Schools need to take more proactive and sustainable measures toward effective control of the ongoing epidemic and prevention of future occurrences.

Key words: Ebola virus disease, preparedness, prevention and control, schools

© 2014 The Authors. Published by Elsevier Inc. on behalf of Icahn School of Medicine at Mount Sinai. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>). *Annals of Global Health* 2014;80:452-457

INTRODUCTION

West Africa has just witnessed the largest outbreak of Ebola viral disease (EVD) ever recorded. During the period of outbreak, the fear of the spread of EVD redefined the importance of epidemiologic surveillance worldwide, most especially in the West African subregion. Economic,

health, and development indices of many counties were badly affected. The apprehension was high to the extent that Nigerian governments postponed resumption of school activities while waiting for a zero-case certification by World Health Organization (WHO). This may be connected with the high infectivity and case fatality rates in EVD epidemics, which could reach 80% to 90%.¹

The mode of transmission of these viruses is through close contact with blood and bodily fluids of those infected.^{2,3} Students on holidays were likely to have traveled to endemic areas and could have contacted the virus given that 18 cases were reported in various parts of Nigeria within the July to September 2014 holiday period. The resultant palpable fear, panic, and uncertainty when students came together when school resumed in October 2014 was reinforced by the realization that there is currently no known cure or treatment for the disease, amid high probability of infection from the infected to the noninfected on a high magnitude. However, indefinite

2214-9996/© 2014 The Authors. Published by Elsevier Inc. on behalf of Icahn School of Medicine at Mount Sinai. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

From the Department of Community Medicine, College of Health Sciences, Osun State University, Osogbo, Nigeria (AWO); Family Health International 360, Abuja, Nigeria (EA). Address correspondence to A.W.O.; e-mail: lekanadebimpe@gmail.com

The authors declare that they have no conflicts of interest.

<http://dx.doi.org/10.1016/j.aogh.2015.02.001>

closure of schools could put the future of the students in peril as many of them might not return and might eventually drop out of school. Whether or not to postpone the resumption of schools depended largely on the readiness of EVD prevention and control programs in the schools. This study assessed preparedness of schools in the north central region of Nigeria toward EVD prevention and control within 1 month of resumption of classes.

METHODS

Study Area

The study was carried out in north central region of Nigeria, comprising five states. Nigeria was certified EVD free by the WHO in late September 2014 after about 6 months of EVD outbreak that ravaged the country. Educational institutions postponed the resumption of schools after the holidays twice to allow for better preparedness and control of the disease. Schools included private or public, primary or secondary, or mixed (boys and girls) and stand-alone models.

Study Population

The study population consisted of all schools within the study area. Only schools registered and recognized by their respective state Ministries of Education were selected for this study.

Study Design

This was a descriptive cross-sectional study on preparedness for EVD prevention and control among selected schools in the north central region of Nigeria.

Sample Size Estimation

Using modified Leslie Fischer's formula for calculation of sample size for population <10,000 and prevalence figure of 0.5,⁴ a sample size of 72 schools was calculated, and this was increased to 80 schools to account for nonresponse.

Sampling Methods

A multistage sampling method was adopted in sample selection. In the first stage, 2 of 6 states in the region were selected using simple random sampling employing simple balloting, and these evolved Federal Capital Territory and Nassarawa states. In stage 2, half of local government areas (LGAs) per state were selected using simple random sampling employing simple balloting. A list of schools per LGAs were collected from the local education authority in stage 3, and 1 in 2 schools on the list were selected using systematic random sampling methods. These schools were visited to collect data on their preparedness for an EVD outbreak when schools are back in session.

Research Instruments

Research instruments included semi-structured, self-administered and pretested questionnaires prepared by

the headmaster, principal, or proprietor or the most senior academic staff (as applicable) in the school. Pre-testing was done among 5 schools in neighboring Kwara State, and the responses were used in questionnaire modification. Questionnaires were divided into 2 sections; the social characteristics of the school and the efforts, preparedness or readiness of the school regarding EVD prevention and control.

Ethical Approval

Approval to conduct this study was obtained from UNIOSUN health ethics committee. Further permission was obtained from the state Ministries of Education, local education authorities, and designated heads of selected schools.

Data Management

Questionnaires were manually sorted out, followed by data cleaning. Data were entered into the SPSS software version 17.0 after ensuring validity checks through double-entry, random checks and looking for outlier variables. Frequency tables and charts were generated including calculation of relevant summary indices. Readiness of schools was based on 11 effort-making questions on EVD prevention; such as ability to organize hand washing stand and session, buying hand sanitizers, making soap and water available, holding regular health education sessions on school grounds, taking daily temperatures using infrared thermometers.

A positive effort toward each of the 11 criteria was scored +1, whereas no effort was scored 0. Aggregated scores of 0 to 5 were categorized as (apparently) not ready, 6 to 8 as apparently ready, and 9 to 11 as very ready. Ultimately, aggregate scores of ≥ 6 were categorized as ready, whereas < 6 were categorized as not ready. Bivariate analysis of some variables in relation to the readiness of the schools was carried out in addition to some related binary logistic regression. $P < 0.05$ was considered statistically significant for all inferential statistics.

Study Limitations

Because the outbreak in Nigeria occurred within the period when the WHO considered declaring Nigeria EVD free, many schools did not want to volunteer information that would describe them as EVD prone because of stigmatization associated with the disease. This issue was handled by the persuasive nature of the data collectors and the assurance that all information would be kept strictly confidential.

FINDINGS

Thirty-two (42.1%) of the schools were <10 years old; 41 (53.9%) were privately owned; 16 (21.1%) were primary schools; and 60 (78.9%) were secondary. Sixty-seven (88.2%) schools were mixed-sex schools (Table 1).

Table 1. Characteristics of Schools Surveyed

Variable	F	%
Number of years in existence		
<10 y	32	42.1
≥10 y	44	57.9
Type of school		
Private	41	53.9
Public	35	46.1
Level of school		
Primary	16	21.1
Secondary	60	78.9
Kind of school		
Boys only	4	5.3
Girls only	5	6.6
Mixed sex	67	88.2
Location of school		
Urban	54	71.1
Rural	22	28.9

Table 2 showed that only 7 (9.2%) of the schools would have preferred to extend further the resumption of school activities due to readiness. Fifty-four (71.1%) of the school heads had special sessions or training on EVD; 73 (96.1%) of school officials said their teachers willingly accepted the reopening of schools, whereas 73 (96.1%) of schools said parents willingly submitted their children to resume schooling. Thirty-eight (50%) of the school officials admitted that some of the children could have traveled to EVD-infected areas during the holiday period.

Students in 55 (72.4%) of the schools were evidently seen sharing EVD information among one another on resumption. EVD prevention and control-specific meetings were held for teachers in 50 (65.8%) and Parent-Teachers Associations (PTA) in 30 (39.5%) of the schools, respectively. Only 25 (33%) of the schools eventually had a history of where their students traveled to during the holiday period. Upon resumption, 33 (43.4%) of the schools conducted a general medical checkup on returning students.

As compared with 7 (9.2%) before the outbreak, 30 (39.5%) of the schools instituted hand-washing facilities in each class. Thirty-eight (50%) of the schools set up a committee on EVD prevention; 63 (62.9%) carried out awareness efforts during an assembly; 22 (28.9%) held class sessions on EVD; and 34 (44.7%) used a peer education method to educate other students. Twenty-eight (36.8%) schools had hand-washing kits on school property; 40 (52.6%) demonstrated proper hand washing techniques during an assembly; and 59 (77.6%) had their teachers formally trained on EVD prevention and control. Seventy (94.7%) had a sustainable source of water.

Forty (52.6%) schools purchased infra-red thermometers; 40 (52.6%) purchased hand sanitizers;

46 (60.5%) made soap and detergents available; 5 (6.6%) made some gloves available as a form of personal protective equipment (PPE); and 12 (15.8%) established sick bays. Thirteen (17.1%) schools had standard operating procedure (SOP) guidelines or policy documents on EVD prevention and control; 38 (47.4%) had designated teachers for EVD monitoring, and 10 (13.1%) of the schools printed health education pamphlets. More than half (76.3%) said they would like to sustain these preventive efforts (11 until at least the end of the present or starting term; 24 until the end of the year, 35 until Nigeria is declared EVD free, and 6 on a continuing basis).

Twenty-eight (36.8%) were categorized as very ready, 14 (18.4%) as apparently ready, and 34 (44.8%) as apparently not ready to resume school with prevention and control plans in place. By adding those schools that were either as very ready or apparently ready, 42 (55.2%) were ready and 34 (44.7%) were not ready for EVD prevention and control within 1 month of resumption of students back to school (Fig. 1).

Table 3 revealed that a statistically significant association was found between readiness for EVD prevention and control and type of school, kind of school, willingness to sustain present preventive efforts, and having a policy document or SOP on EVD prevention and control ($P < 0.05$). No such association exists between readiness for EVD prevention and control and level of school, preference of school for further postponement of resumption, and belief that some of the children could have traveled on holidays to infected areas. Binary logistic regression analysis showed that the private schools were 6 times more likely to have been ready for EVD prevention and control compared with the public schools (odds ratio [OR], 6; 95% confidence interval [CI] 0.221–1.624; $P = 0.001$). Urban schools were 1.6 times more likely to have been ready for EVD prevention and control compared with rural schools (OR, 1.6; 95% CI, 0.620–4.182; $P = 0.169$). Schools having SOPs or policy guidelines on EVD were 6 times more likely to have been ready for EVD prevention and control compared with those without SOPs or policy documents (OR, 6.666; 95% CI, 0.808–5.495; $P = 0.048$).

Determinants of readiness for EVD prevention and control include being a private school, being an urban school, belief that children could have traveled to an EVD-infected area, and school having SOP/policy guidelines on EVD prevention and control.

DISCUSSION

Only about 10% of the schools would have preferred further extension of the resumption of schools, a postponement could have favored the schools having more time to put EVD preventive efforts in place. Further extension, however, may not translate that schools were ready for EVD

Table 2. Schools' Preparedness for EVD Prevention and Control

Variable	F	%
School would have had further extension of resumption (yes option only)	07	9.2
School lead or proprietor had special session or training on EVD	54	71.1
Teachers willingly agreed to resume classes	73	96.1
Parents willingly submitted their wards to resume	66	86.6
Some children could have traveled to EVD-infected area during holidays	38	50.0
Students were seen sharing EVD news among one another	55	72.4
There was an EVD control-specific meeting among teachers	50	65.8
There was an EVD control-specific meeting among PTA members	30	39.5
School eventually had history of where students traveled to	25	32.9
School conducted general medical checkup on returning students	33	43.4
School had hand-washing facilities per class before outbreak	07	9.2
School now had hand-washing facilities per class	30	39.5
School set up a committee on EVD prevention	38	50.0
Raising awareness of students on assembly ground	63	62.9
Holding class sessions on EVD	22	28.9
Used peer-education method to educate students	34	44.7
Hand-washing kits on assembly ground	28	36.8
Hand-washing demonstrated on assembly ground	40	52.6
Teachers formally trained on EVD prevention	59	77.6
Dispelling rumors about EVD	54	71.1
Sustainable source of water now	72	94.7
Purchase of infra-red thermometer	40	52.6
Provision of hand sanitizers	40	52.6
Provision of soap and detergents	46	60.5
Provision of PPE like gloves and overalls	05	6.6
Provision of EVD pictorial charts	34	44.7
Sick bay newly established	12	15.8
School has SOP or policy on EVD	13	17.1
There are teachers designated for EVD monitoring	38	47.4
School printed health education pamphlets	10	13.1
School would like to sustain these efforts	58	76.3
How long the school wishes to sustain these efforts		
End of the term	11	14.5
End of the year	24	31.6
Until Nigeria declared EVD free	35	46.1
Continuous	06	7.8

EVD, Ebola virus disease; PPE, personal protection equipment; SOP, standard operating procedure.

prevention and control, but many schools (especially the private schools) were losing money while the schools remained closed because they are fund- or fee-driven schools compared with public schools, most of which use the government's free educational system.

Half of the schools felt that it was possible that some of the children might have traveled to EVD-infected areas during the holiday period. This is significant because those students might have been infected. In school, children are in close contacts almost at all times and generally have low immunity toward disease.

Students discussing EVD information among themselves once school resumed testified to a generally high awareness about the disease during the 3 months of

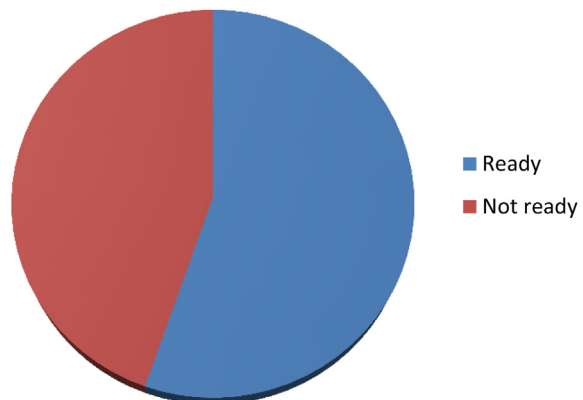


Figure 1. Pie chart showing assessed readiness of schools for EVD prevention and control.

Table 3. Association between Readiness of Schools to Prevent and Control EVD and Some Selected Variables

Bivariate Analysis	Readiness of School (χ^2)			Statistics χ^2 , df, P Value
	Ready	Apparently Ready	Apparently Not Ready	
Type of school				2.877, 2, 0.001
Private	26 (65.0)	4 (10.0)	10 (25.0)	
Public	2 (5.6)	10 (27.8)	24 (66.7)	
Level of school				1.373, 2, 0.503
Primary	4 (25.0)	4 (25.0)	8 (50.0)	
Secondary	24 (40.0)	10 (16.7)	26 (43.3)	
Kind of school				11.045, 1, 0.026
Boys only	1 (25.0)	1 (25.0)	3 (75.0)	
Girls only	1 (25.0)	1 (25.0)	3 (75.0)	
Mixed sex	28 (41.2)	14 (20.6)	26 (38.2)	
Location of school				
Urban	25 (41.4)	4 (10.0)	21 (52.6)	
Rural	10 (16.7)	2 (5.6)	14 (20.6)	
School would have preferred further postponement of resumption				1.922, 2, 0.383
Yes	2 (33.3)	0 (0.0)	4 (66.7)	
No	26 (37.1)	14 (20.0)	0 (0.0)	
Some of the children could have traveled				3.630, 2, 0.163
Yes	14 (36.8)	10 (26.3)	14 (36.8)	
No	14 (36.8)	4 (10.5)	20 (52.6)	
School has SOP/policy document				4.181, 2, 0.001
Yes	3 (10.0)	2 (6.7)	2 (6.7)	
No	2 (4.3)	1 (2.2)	8 (17.4)	
Would like to sustain efforts				1.067, 2, 0.005
Yes	26 (44.8)	12 (20.7)	20 (34.5)	
No	2 (11.1)	2 (11.1)	14 (77.8)	

Readiness for EVD Prevention and Control

Binary Logistics Regression	OR	95% CI		P Value
		Lower	Upper	
Type of school (constant = private schools)	6.0	2.215	16.247	0.001
Kind of school (constant = mixed schools)	0.4	0.106	1.600	0.1090
Location of school (constant = rural)	1.6	0.620	4.182	0.169
Children could have traveled to EVD area (constant = no)	1.9	0.761	4.762	0.088
School have SOP/policy guideline on EVD (constant = no)	6.666	0.808	5.495	0.048

df, degree of freedom; EVD, Ebola virus disease; SOP, standard operating procedure; χ^2 , Chi square.

outbreak and control in Nigeria. Social media might have provided the opportunities for senior secondary school students to acquire, generate, share, receive, and comment on social content among multiusers through multisensory communication.^{5,6} Many of the youths studied could not ascertain the origin of information. Thus, quality issues have always been a limitation to the use of social media.^{7,8} Thus it is important that students get in-depth and accurate information about the subject matter, in this case EVD.

High awareness would bring about a positive attitude and behavioral changes toward disease control. However, awareness may not translate into in-depth knowledge on the subject matter because of a reported high level of

misconception and misinformation spread by the general public on EVD despite generally high awareness.⁹ Additionally, schools should have a high index of suspicion because many of the EVD symptoms resemble that of malaria and may be misdiagnosed. Schools thus have a large role to play in sensitizing students and giving them correct, guided information on EVD that would assist prevention efforts.

Schools having hand-washing kits and EVD control committees as a result of the EVD outbreak are good developments for both the health and education system in Nigeria. If sustained, these efforts could instill the culture of good personal and environmental hygiene and disease prevention. This is especially true

of hand washing, which is a practice that is poorly followed in Nigeria^{10,11} Simple hand washing had been reported to have the ability of repelling attacks of many microorganisms as well as preventing the occurrences of many infectious diseases.¹²⁻¹⁴

Like training teachers, use of soap and water and hand sanitizers¹⁵ is also good disease-prevention strategies. All these efforts should be regarded as part of the Nigerian success story. Other countries groaning under EVD should take a cue from this and other collaborative efforts on EVD control. Some schools (especially public schools) may not be able to afford some of these preventive kits because of poor funding, unlike private schools where the guardians and parents of students pay high fees and hence can afford purchase of these kits.

It was encouraging that schools reported they would like to sustain control efforts. EVD is still a threat to all African countries according to WHO in November 2014. Prevention efforts and surveillance should be ongoing everywhere including schools.

Half of the schools categorized as being ready for EVD control in the new school term could be a pointer to a general nonreadiness in the general population and rationale for further postponement of resumption of schools for academic activities. Readiness is an indication to giving support to international efforts at EVD control. However, nonreadiness may mean encouraging outbreaks. It is expected that all schools would have complied within 1 month of reduction. It could be concluded that the education authority in Nigeria gambled with the EVD outbreak while giving the directive to schools to resume, although this could have been due to pressure most especially from private schools and the desire not to allow the schools to lose a whole term. What if a school-based outbreak had occurred in any of the schools? Educational authorities should have put a monitoring system on the ground to affirm readiness and also to monitor ongoing compliance with school EVD prevention and control programs after resumption. One major limitation of this study is the paucity of data on EVD awareness and practices, most especially how it relates to school health. Almost all available citations are used in this study.

CONCLUSION

Schools in central Nigeria put a great deal of effort into preventing the spread of EVD among students upon resumption of school. The fact that Nigeria was later declared EVD free could justify these efforts. However, the nonreadiness of almost half of the schools justified

calls for schools to remain closed in October 2014 for fear of further EVD spread. The adequate preparation for EVD outbreak in schools either now or in the future underscored the need for schools to take more proactive measures in instilling the culture of disease prevention among school children toward a more effective control of the ongoing epidemic and disease prevention in the future.

ACKNOWLEDGMENT

The authors acknowledge the local Ministry of Education in the Nigeria's Federal Capital Territory (FCT) and Nasarawa State, and the heads of the schools from which data were collected, for their cooperation during the period of data collection.

References

1. Bray M, Murphy FA. Filovirus research: knowledge expands to meet a growing threat. *J Infect Dis* 2007;196(Suppl 2):S438.
2. Bray M. Pathogenesis of viral hemorrhagic fever. *Curr Opin Immunol* 2005;17:399.
3. Mahanty S, Bray M. Pathogenesis of filoviral haemorrhagic fevers. *Lancet Infect Dis* 2004;4:487.
4. Araoye MO. *Research Methodology with Statistics for Health and Social Sciences*. Ilorin, Nigeria: Nathadex Publishers; 2004.
5. Kaplan AM, Haenlein M. Users of the world, unite! The challenges and opportunities of social media. *Business Horizons* 2010;53:59–68.
6. Kamel Boulos MN, Wheeler S. The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Info Libr J* 2007;24:2–23.
7. Kim S. Content analysis of cancer blog posts. *J Med Libr Assoc* 2009;97:260–6.
8. Adams SA. Revisiting the online health information reliability debate in the wake of "web 2.0": an inter-disciplinary literature and website review. *Int J Med Inform* 2010;79:391–400.
9. UNICEF (Sierra Leone)/CRS. Study on public knowledge, attitudes, and practices related to EVD prevention and medical care in Sierra Leone. Available at: http://www.mamaye.org.sl/sites/default/files/KAP%20Summary_Sept302014.pdf. Accessed December 24, 2014.
10. Jasper C, Tam Le T, Bartram J. Water and sanitation in schools: a systematic review of the health and educational outcomes. *Int J Environ Res Public Health* 2012;9:2772–87.
11. Vivas A, Gelaye B, Aboset N, Kumie A, Berhane Y, Williams MA. Knowledge, attitudes, and practices (KAP) of hygiene among school children in Angolela, Ethiopia. *J Prev Med Hyg* 2010;51:73–9.
12. Lopez-Quintero C, Freeman P, Neumark Y. Hand washing among school children in Bogotá, Colombia. *Am J Public Health* 2009;99:94–101.
13. Grimason AM, Masangwi SJ, Morse TD, et al. Knowledge, awareness and practice of the importance of hand-washing amongst children attending state run primary schools in rural Malawi. *Int J Environ Health Res* 2014;24:31–43.
14. Purva M. Hand hygiene: back to the basics of infection control. *Indian J Med Res* 2011;134:611–20.
15. Meadows E, Le Saux N. A systematic review of the effectiveness of antimicrobial rinse-free hand sanitizers for prevention of illness-related absenteeism in elementary school children. *BMC Public Health* 2004;4:50.