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Original Research Article

A report of measles outbreak investigations conducted in two rural communities in a state in southwest Nigeria, 2021

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ABSTRACT

Background: Despite the availability of an effective vaccine, measles outbreaks continue to occur. According to the World Health Organization (WHO), a confirmed outbreak of measles is defined as if any 3 or more of blood specimens collected from a local government area (LGA) and within one month, having reached the laboratory in good condition, is IgM positive. This paper describes the outbreak investigation in two rural communities in a southwestern state in Nigeria.
Methods: This was a descriptive cross-sectional study design. The outbreak investigation was conducted by a team of multi-disciplinary experts. Detailed case investigation of index cases, active case finding, vaccination coverage surveys and social mobilization activities were carried out. Descriptive analysis was using Microsoft excel and quantum geographic information system (GIS) was used to represent cases geographically.
Results: A total of 42 measles cases were detected based on the WHO measles case definition. Blood samples were collected from 12 of the suspected cases for IgM determination, out of which 7 cases were IgM+. Majority of cases were <5 years old. Sixty-nine percent of the cases had received Measles vaccine. Socio-cultural and traditional beliefs were not unconnected to the poor uptake of vaccination.
Conclusions: We confirmed the occurrence of measles outbreaks in Akotogbo and Ala-Elefosu communities, in Ondo State. Both communities had suboptimal measles vaccination coverages, highlighting the need to strengthen routine immunization (RI) services but also immediately addressing the sociocultural factors responsible for poor health seeking behavior and utilization of RI and primary health care (PHC) services.

Keywords: Measles, Nigeria, Outbreak investigation, Vaccination

INTRODUCTION

Measles is a serious and highly contagious disease, caused by a virus in the paramyxovirus family. It is transmitted through coughing and sneezing, direct contact with infected nasal or throat secretions.[1] Measles is a human disease with no evidence of occurring in animals.

The signs and symptoms of measles infection usually include high fever, runny nose, cough, conjunctivitis, watery eyes, small white kolpiks spots inside the cheeks. Rashes erupts from the face and neck and eventually spreading to the hands and feet.[2,3]

Measles-related deaths are largely due to complications associated with the disease.[4] Measles complications are

predominant among children less than 5 years of age and severity of the disease more likely among young children malnourished, especially deficiency in vitamin A or children in whom their immune systems have been compromised by HIV/AIDs infection.[4] Supportive care which ensures good nutrition, sufficient intake of fluids and rehydration treatment using the World Health Organization (WHO) recommended oral rehydration solution. This replaces fluids as well as other essential nutrients lost through diarrhea or vomiting. The use of antibiotics is recommended in treating pneumonia, ear and eye infections.[3,4]

Reduction in mortalities from measles infection has majorly been through accelerated immunization activities. Globally, measles deaths have reduced by 73%.[4] Unimmunized young children with potent measles vaccine place them at higher risk of measles infection and its complications.[4,5] Pregnant women who are unimmunized remain also at risk. Measles vaccination through the routine immunization system complemented with the mass immunization campaigns are critical public health strategies in reducing morbidity and mortality of measles, globally.[4,6] The measles vaccine which has been in use for about six decades, is very safe and effective. It is recommended that children receive two doses of the measles vaccine to confer immunity and prevent outbreaks. This is particularly because an estimated 15% of children vaccinated fail to seroconvert and develop immunity from the first dose.[6]

Intensified disease surveillance helps to promptly identify and investigate cases as wells as outbreaks.[7] It also enables the identification of persons, age groups and geographic areas most at risk and to effectively evaluate vaccination strategies to ultimately improve the measles control efforts. Measles case-based surveillance is integrated with acute flaccid paralysis (AFP) surveillance and for other vaccine preventable diseases such as yellow fever, neonatal tetanus etc., leveraging the same mechanisms of coordination, case reporting network, active surveillance and feedback.[8] Measles case-based surveillance includes laboratory testing for measles specific IgM antibodies from serum samples collected and processed. These laboratory investigations are carried out at the national public health laboratory.[6,9]

Outbreaks of measles can lead to epidemics that can cause many deaths especially among malnourished young children.[4,5] According to the WHO, a suspected outbreak of measles is defined as five or more suspected cases of measles reported in a local government area (LGA) in one month. A confirmed outbreak of measles is defined as if any 3 or more of blood specimens collected from a LGA and within one month, having reached the lab in good condition, is IgM+.[9,10] This threshold implies the institution of appropriate control measures such as case finding, case management and localized immunization activities.[9,10] Measles outbreak investigation is conducted within 24 to 48 hours of receipt of laboratory confirmation to confirm the outbreak and collect all needed data and initiate response activities. The effectiveness of the response in controlling the outbreak depends primarily on how quickly the outbreak is identified. In the year 2021, two confirmed measles outbreaks occurred in Ondo State. The objective of this paper is to describe these confirmed outbreaks of measles and to describe the epidemiological approaches used in the investigation of these outbreaks, summarizing key findings and highlighting public health actions taken.

METHODS

Outbreak setting

In 2021, confirmed measles outbreaks occurred in Akotogbo community in Irele LGA on the 6th of July 2021 and in Ala-Aladura camp, Ala Elefosu in Idanre LGA on 30th of October 2021, both in Ondo State, Nigeria. Irele LGA situated in the southern senatorial district of Ondo state, 6º29'0"N 4º52'0"E, has an area of 963 square kilometers and a projected population of 173,336 based on the 2006 census population by the national population commission. Idanre is in the north central senatorial district, 7º05'32"N 5º07'56"E, has an area of 1,914 km^2 and a projected population of 154,061. Both communities are rural in nature and hard-to-reach areas. Residents are mainly farmers and traders. Both communities have a government owned primary health care center which provides routine immunization services alongside other basic primary health care services. However, residents in both communities were noted for their poor utilization of routine immunization services and other primary health care services in general.

Study design

A descriptive cross-sectional study design was used to describe the outbreak, from an epidemiological perspective.

Operational definitions

The standard case definition for a suspected measles case is as any person with fever, rashes and any of the following: conjunctivitis, coryza and cough or anyone suspected by a clinician to have measles. The community case definition is as any person with fever and rash, while a confirmed case is who has either been laboratory confirmed with acute measles infection (IgM positive) or who is epidemiologically-linked to a laboratory confirmed case.[9,10]

Investigation and response activities

The investigation team consisted of the state epidemiologist (SE), state disease surveillance and notification officer (DSNO), World Health Organization cluster coordinators and other field epidemiologists, public health physicians, laboratory scientists, risk

communicators, the LGA health team led by the primary health care coordinators (PHCCs)/medical officers of health (MOH) as well as health workers and other members from the communities.

Outbreak investigation commenced immediately in line with the national guidelines (24-48 hours) upon receipt of laboratory confirmation of measles specific IgM+ antibodies from the central public health laboratory in Lagos State, Nigeria. Detection of IgM antibodies indicates recent infection or vaccination. The specific objectives of the outbreak investigation were to ascertain whether there were additional unreported cases of Measles in the community and to determine the measles vaccination coverage in the affected communities.

The investigation involved a number of activities: advocacy visits to the community and village heads as points of entry into the communities, case finding in the health facilities within the affected communities, the settlement and adjoining settlements where the index cases resided, household measles coverage surveys, and risk communication and community engagement (RCCE). Advocacy visits were also conducted to the regent of Akotogbo community in Irele LGA and to the chairman, Ala-Elefosu community, after which the team proceeded into the settlements. The Nigerian Centers for Disease Control (NCDC) line listing template was used to collect all relevant data (age, sex, place of residence, date of onset of symptoms, immunization and migration history etc.) from the two primary health care facilities where the cases were managed with clinical suspicion of measles and to report new or missed cases found. In order to identify additional cases and to ascertain the extent of the outbreak, the team proceeded into the community. This entailed house to house active case search for suspected measles cases in 100 households using the community case definition. The community case definition for measles which is any person with fever and rash was used to detect additional cases within 30 days of onset of symptoms. Household coverage survey was conducted concurrently with the active case search for additional cases, in the settlement of confirmed cases and in adjoining settlements to determine measles vaccination coverage with evidence of vaccination cards or by history.

Sample collection and laboratory analysis

A total of 15 and 27 suspected cases were identified during the outbreak investigation process in Irele and Idanre respectively. Blood samples were collected from 12 suspected cases for measles in Irele (4) and Idanre (8) and transported to the central public health laboratory (CPHL) in Lagos state, Nigeria, for IgM determination.

Data analysis

All data collected was entered into Microsoft excel version 2021 and used to obtain descriptive frequencies and proportions, quantum geographic information system (GIS) was used to represent measles cases geographically. In order to characterize the outbreak, the data was analyzed by person, place and time.

RESULTS

A total of 42 measles cases were detected based on WHO measles case definition. Of the 42 cases reported, 15 cases were reported from Irele LGA in June 2021 while 27 cases were reported from Idanre LGA in the month of October 2021. More than half of the cases reported were male (57.8%) with 1:2.1 male to female ratio (Table 1). Children under five years of age were mostly affected, 26 (61.9%), 15 (35.7%) were between the age of 5 to 14 years of age and only 1 (2.4%) case was above the age of 15 years. All 42 (100%) cases were from rural communities and no death was recorded during the outbreaks. Although majority (69%) of the cases had been immunized with measles vaccine, 21.4% had no vaccination history, while 9.5% were ascertained as unimmunized (Table 1).

Table 1: Characteristics of reported measles cases (n=42).

Characteristics	N	Percentage
Gender		
Female	19	42.2
Male	23	57.8
Age group		
<5 years	26	61.9
5-14 years	15	35.7
≥15 years	1	2.4
Place of residence		
Rural	42	100
Urban	0	0
Disease outcome		
Died	0	0
Alive	42	100
Vaccination status of measles cases		
Immunized	29	69.0
No immunization	4	9.5
Unknown	9	21.4
Source of reported cases		
Health facility	86	75
Community	12	10

A total of 100 households were surveyed to ascertain measles vaccination coverage. Over three quarter of children sampled reported to have been immunized against measles at 9 months, only 10% had not been immunized and 15% had unknown vaccination history (Figure 2a). Ascertaining vaccination status, among children sampled, majority (54.8%) self-reported to have been immunized with measles vaccine by word of mouth and with no evidence of vaccination card. About forty

five percent had evidence of vaccination cards with the dates of measles vaccination clearly written (Figure 2b).

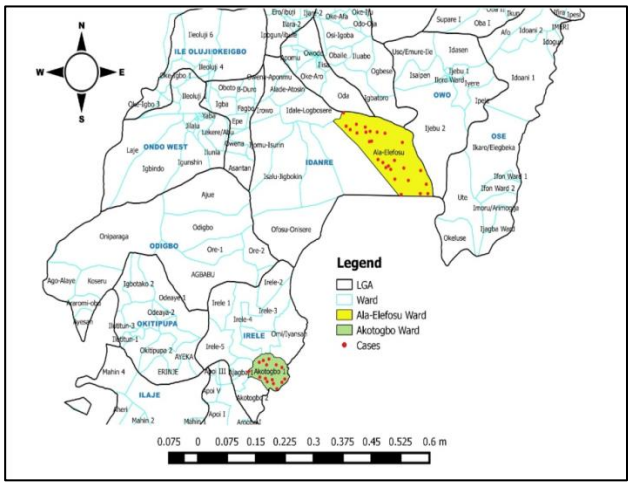

Figure 1: Map showing measles cases in Akotogbo and Ala-Elefosu communities in Irele and Idanre LGAs of Ondo State Nigeria.

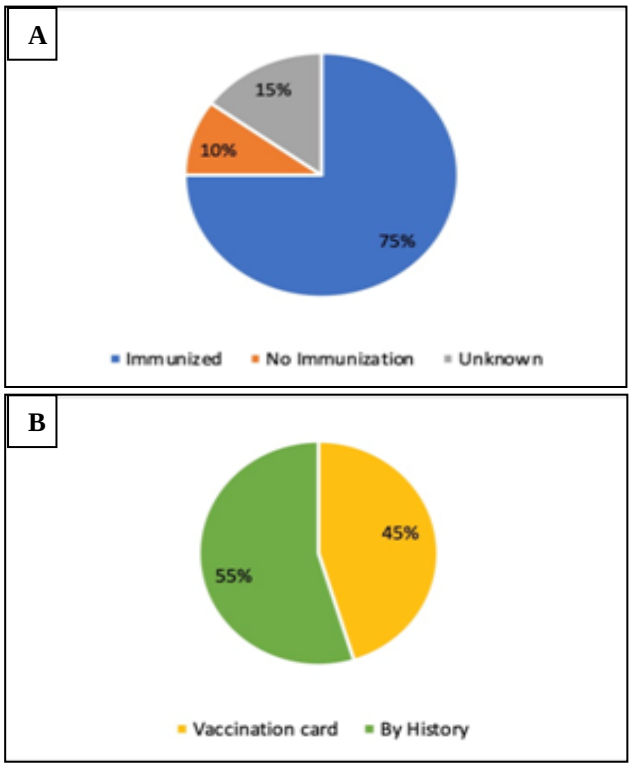

Figure 2: Measles coverage survey and evidence of vaccination: A) measles coverage from 100 household coverage surveys; B) source of evidence of vaccination.

All cases, 100% had clinical history of fever and generalized body rash. Another significant proportion presented with cough, 62% had catarrh and only 38% had symptoms of conjunctivitis (Figure 3). A higher percentage (76%) of reported cases were from the community and the other 24% of the cases were reported from the primary health care facilities within the communities (Table 1).

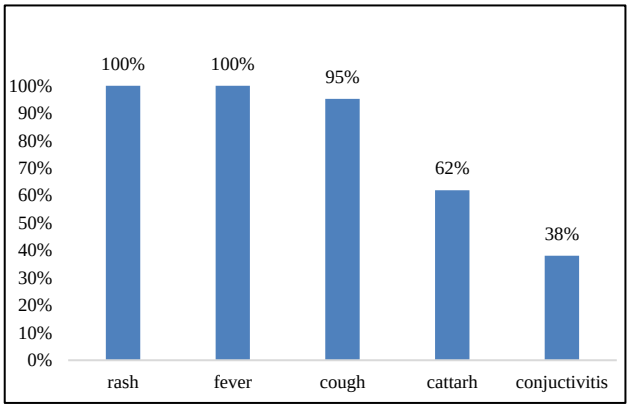

Figure 3: Distribution of clinical symptoms of measles cases.

Table 2: Measles IgM laboratory investigation results.

Lab result	LGA		Total
	Irele (n=4)	Idanre (n=8)	
IgM positive	4 (100)	3 (37.5)	7 (58.3)
IgM negative	-	5 (62.5)	5 (41.7)
Indeterminate	-	-	-
Total	4 (100)	8 (100)	12 (100)

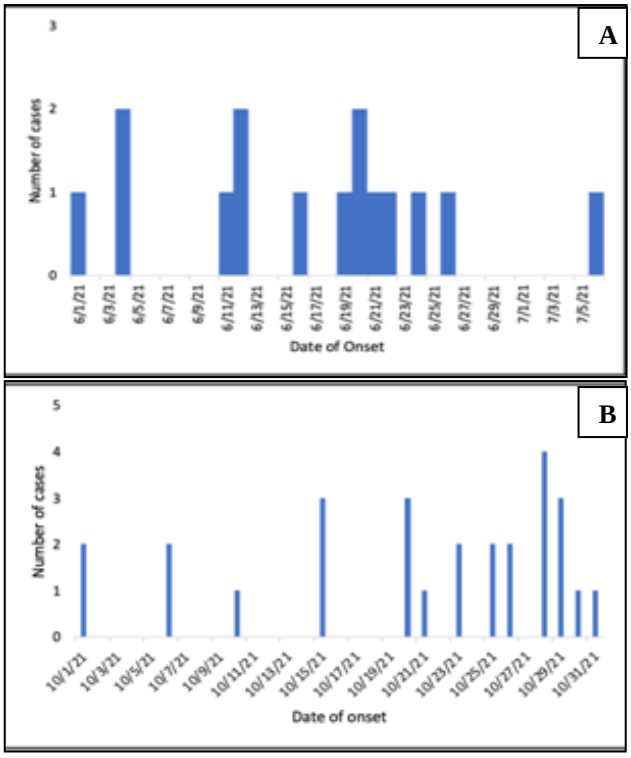

Figure 4: Epi curve of measles cases by date of onset: A) in Akotogbo, Irele LGA, Ondo state; B) Ala Elefosu, Idanre LGA, Ondo state.

Blood samples were collected from 12 cases; 4 from Irele and 8 from Idanre and sent to the CPHL, Lagos for laboratory confirmation.

All 4 (100%) of blood samples collected from Irele LGA were IgM positive for measles and 3 of 8 samples from Idanre LGA were IgM positive for measles, the remaining 5 samples returned IgM negative. There were no indeterminate laboratory results (Table 2). The outbreak in Akotogbo community in Irele LGA started on the 1st of June 2021 and peaked on the 3rd, 12th and 20th of June 2021 (Figure 4a).

The outbreak in Ala Elefosu community in Idanre LGA began with 2 cases on the 10th of October, and peaked on the 28th of October 2021 (Figure 4b). The administrative measles coverage for Akotogbo and Ala Elefosu was 48% and 53% respectively (Figure 5a). At LGA level, administrative measles coverage for Irele and Idanre was at 83% and 84% respectively (Figure 5b).

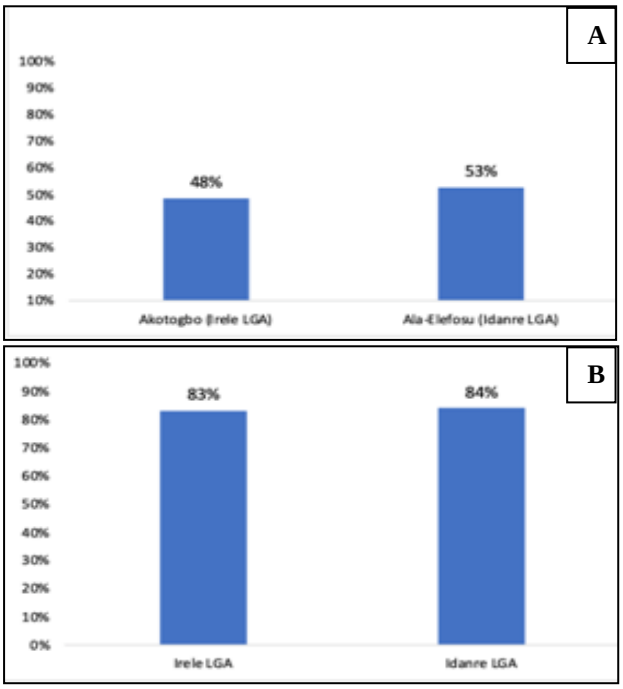

Figure 5: Measles-1 administrative coverage (District Health Information System 2): A) in Akotogbo and Ala Elefosu communities; B) in Irele and Idanre LGA.

DISCUSSION

This paper describes the investigation of confirmed measles outbreaks in two rural communities in Ondo State, in the year 2021. Findings from this study showed that the measles infection occurred mainly among males. This is in keeping with other findings in Ogun and Zamfara states but contradicts findings in Kaduna State, where only 27.6% of the cases were males.[11-13]

Most of the cases were below the age of 5 years. Findings in Ogun state of Nigeria reported all measles cases to be less than 5 years of age.[11] In this study, 69% of affected children had received measles vaccination while in another significant proportion we couldn't ascertain vaccination status of the children. This finding of 69% vaccination coverage is above the cutoff of 50% vaccination coverage in the algorithm for the determination of the likely cause of measles outbreak in cases under five years, by the Federal Ministry of Health and WHO.[9,10] However, herd immunity of 95% is the requirement to interrupting measles community transmission.[10]

Although administrative measles vaccination coverage at LGA level was 83% and 84% in Irele and Idanre LGA respectively, the measles coverage in the two affected communities were below 60%.[14] Findings from the 100-household survey revealed only 75% of children sampled were vaccinated with measles containing vaccine. This may imply low immunization coverage and a consequence of accumulation of susceptible unimmunized children.[15,16]

Our study also observed poor health seeking behaviors of members of these rural communities, despite the availability of a public health care facility within both communities. This negative behavior was not unconnected to their cultural and traditional beliefs. Many families of affected children believed the infection was common and was directly from their deities. Poor knowledge on the importance of routine immunization and utilization of other essential health care services could also be attributed to this.[17,18] A study describing measles outbreaks in three countries in West Africa, reported low immunization coverage and among children less than five years of age to be risk factors for the incidence of outbreaks.[16]

The source of cases was predominantly reported from the community when compared to the number of cases reported from the health facility. This underscores the need to intensify disease surveillance at community level and expansion of community informant surveillance network. Community sensitization on disease prevention, modes of transmission, community case definition of priority diseases and reporting channels remains critical. Frequent community engagements and sensitizations are necessary to demystify cultural and traditional beliefs that were observed to affect health seeking behaviors of residents.

However, during the outbreak investigation, we conducted advocacy visits to village and traditional leaders, community sensitization on the importance of measles vaccination alongside other routine vaccines in the national expanded program on Immunization (EPI), as well as immediate identification and referrals of all suspected cases to health facilities. During these outbreaks, both epi-curves revealed a propagated epidemic pattern which may indicate disease transmission from person to person. Being a highly contagious disease,

recent contact as well as overcrowding are disease risk factors for transmission during outbreaks of measles.[19]

A notable limitation of this study was the self-reported vaccination status of the cases which may not be verifiable. In many cases, there was no evidence of vaccination cards.

CONCLUSION

We confirmed the occurrence of measles outbreaks in Akotogbo and Ala-Elefosu communities in Irele and Idanre LGAs respectively. Suboptimal routine immunization coverage is a risk factor to the incidence of outbreaks including measles outbreaks from the accumulation of susceptible unimmunized children, consequently reducing herd immunity against measles infection. A critical public health intervention from this study is the need to strengthen routine immunization services (fixed and outreach sessions) but immediately addressing the sociocultural factors responsible for poor health seeking behavior and utilization of routine immunization and primary health care services. Sensitization of health workers including all traditional health institutions and members of the community on the importance of immediate reporting of all suspected measles cases alongside other priority diseases (using the health facility standard and community case definitions) and the conduct of active surveillance visits to health facilities and communities should be strengthened.

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