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Full Length Research Paper

Investigation of a measles outbreak in a Rural Nigerian community – The Aladura experience

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The global burden of measles has remained a public health challenge. Worldwide, measles is the fifth leading cause of death among under-five children with an estimate of 197,000 deaths in 2007. In Nigeria, measles is an important cause of childhood morbidity and mortality. Measles outbreaks have been increasingly common in the country with 30, 194 and 256 outbreaks reported in 2006, 2007 and 2008 respectively. This paper describes the investigation, findings and mitigation efforts of a measles outbreak in Ogunmakin, a rural community in South-western Nigeria from 7th January to 15th February 2009. The study design was descriptive and cross-sectional in nature. The investigation was multi-disciplinary in nature performed based on the national guidelines for investigating a measles outbreak. This involved data and blood sample collection from the initial cases, notification of the local government health authority, active search and line listing of cases from other health facilities. A household survey was conducted to find additional cases as well as to define the extent of the outbreak. Qualitative techniques were also employed to explore the issues associated with the uptake of immunization in the community. A total of 29 measles cases were identified, all were less than five years old. There were two deaths giving a case fatality rate of 6.9%. Majority of the cases (96.5%) were not immunized against measles. The epidemic spanned 5 weeks with majority of the cases occurring in the 2nd week. There was a clustering of cases in one of the five quarters/settlement – Otesile. The measles immunization coverage for the community was estimated as 22.9%. The stated reasons for the poor uptake of immunization were lack of time, not regarding it as important. A total of 432 children aged 9 months to 15 years received measles antigen during the response vaccination campaign. The measles outbreak in Ogunmakin village was due to low routine immunization coverage resulting in an accumulation of susceptible children. Socio-cultural factors and weak health infrastructure contribute significantly to the low uptake of immunization. There is the need mobilized the entire community on the importance of immunization as well as strengthen the provision of routine immunization.

Key words: Measles, public health, immunization, childhood morbidity, childhood mortality, vaccination.

INTRODUCTION

Despite the enormous efforts by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) at reducing the global burden of measles, it has remained a public health challenge. Worldwide, measles is fifth leading cause of death among under-five children with an estimated 197,000 deaths in 2007 (Strebel et al., 2003). Measles infection is still prevalent in many developing countries especially in parts of Africa and Asia where more than 20 million measles cases are reported annually (World Health Organization, 2009). In the West Africa sub-region, large and recurrent epidemics associated with high mortality have occurred in Niger (2003), Nigeria (2004) and Chad (2004) (Grais et al., 2007). Frequent epidemics continue to occur in countries that have not fully implemented the WHO strategy (Grais et al., 2007; Alemu et al., 2004; Granty County Health District, 2008).

In Nigeria, measles is an important cause of childhood morbidity and mortality. Failure to deliver at least one dose of measles vaccine to all infants remains the main reason for high measles morbidity and mortality as 95% coverage is required to interrupt measles transmission

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(Mayxay et al., 2007). The National Program on Immunization aim of reducing measles case fatality to near zero has depended on the adoption and implementation of the WHO four prong strategy; improving routine immunization with at least one dose of measles vaccine at 9 months, providing a second opportunity for measles immunization through supplemental immunization activeties, establishing case based surveillance with laboratory confirmation and improving case management (World Health Organization, 2001).

However, routine immunization coverage remains low in the country. The national immunization survey conducted in 2003 confirmed that only 12.7% of children age 12 - 23 months were fully immunized (World Health Organization, 2006). To increase the vaccination coverage in the country, there has been provision of second opportunity for measles vaccination through several catch up - multiple antigen campaigns throughout the country. Concurrently, measles laboratories have been established to support the confirmation of measles cases in outbreak situations.

According to World Health Organization African Region (WHO AFRO), a measles outbreak is defined as five or more reported suspected cases of measles in a health facility or local government area in one month with a plausible means of transmission (Federal Ministry of Health/ World Health Organization (Nigeria), (2006). This defines the threshold that should elicit appropriate control measures like case finding, line listing of additional cases, improved case management and concentrated immunization activities in that local government area.

In Nigeria, measles outbreaks have been increasingly common with 30, 194 and 256 outbreaks reported in 2006, 2007 and 2008 respectively (World Health Organization and AFRO, 2008).

Most of these outbreaks occurred in the first quarter of the year affecting mostly under-five children. This paper describes the investigation, findings and mitigation efforts of a measles outbreak in Ogunmakin, a rural community in South-western Nigeria from 7th January to 15th February 2009. The investigation and control were performed in collaboration with the health department of Obafemi Owode Local Government Area (LGA). The objectives of the investigation was to notify the LGA of an outbreak, to actively search for cases in other health facilities as well as within the community level, to explore the reason for the outbreak, to implement control mea-sures and mitigate further spread of the infection. Finally, to report the experience and document the lessons learnt.

METHODS

Outbreak location

The outbreak occurred in Ogunmakin village, Obafemi Owode LGA, Ogun State, Nigeria. Ogunmakin consists of five major settlement areas; Otesile, Ayegbami, Ago-ilorin (a predominantly Hausa community), Mosafejo and Dairo. Residents from these five adjoining settlements meet regularly on market days at the market square. It is a typical rural community with few social amenities like motorable roads, electricity, few primary schools and one secondary school. Their source of water supply is from the stream, although there is a borehole which is not being utilized because of cultural reasons. It has one market that is run on every fifth day. Her people are mostly farmers and traders with very few civil servants.

Although a large proportion of the people patronize traditional health care providers, it has one government owned Primary Health Care (PHC) Centre (that provides routine immunization once a month) and one private-owned clinic that serve the health needs of the people. The Aladura rural health outreach clinic in the neighbouring village provides additional health services to the community. The clinic was established by collaboration between a private foundation and the University College Hospital/College of Medicine, Ibadan. It runs on a twice weekly basis. The investigation of the outbreak commenced in this facility.

Investigation and control efforts

The investigation team consisted of public health physicians, public health nurses, social workers, LGA health team including the monitoring and evaluation officer as well as two members of the community. The investigation commenced following the presentation of the initial six cases of measles at the Aladura Clinic (Five survivors and one death). Information was collected on age, sex, vaccination status, home location and outcome of infection. These cases were reported to the health department of the LGA and blood samples were collected for the laboratory confirmation of measles-specific Immunoglobulin M (IgM) antibodies at the Public Health Laboratory Yaba, Lagos State. Measles IgM antibodies are markers of recent infection or vaccination. The investigation also involved case finding exercise within and outside the village. Line listing forms were used to collect relevant information from the facilities who had managed persons with a clinical suspicion of measles.

In addition, a more detailed study was conducted in order to find more cases as well as to define the extent of the outbreak in the community. This involved an active house to house search for children with a history of febrile rash associated with cough or conjunctivitis in the preceding 30 days in Otesile settlement (were majority of the cases reside). The survey was performed by administering questionnaires to the mothers of under-five children. Focussed Group Discussions (FGDs) and a Key Informant Interview with the local chief ('Baale') were conducted. This was to explore the issues associated with uptake of immunization in that community. Many of the measles cases were managed according FMOH/WHO guidelines which included supportive treatment, administration of antibiotics and vitamin A. Following the suspicion of an outbreak and the notification of the Local Government Area (LGA) authorities, an advocacy visit was paid to the Supervisory Councillor of Health in order to enlist his support in the control efforts. Thereafter, a catch-up measles immunization campaign targeting children within the age group of 9 months and 15 years was instituted within the community and the primary schools.

RESULTS

A total of 29 measles cases based on WHO clinical case definition, were detected from 7th January to 15th February, 2009. Four of these had their blood samples collected for laboratory confirmation. Figure 1 shows the various sources of the measles cases within Ogunmakin village. Majority of the measles cases were detected from the active search of cases within the community – house to house search (34%) and Sacred Heart Rural Health

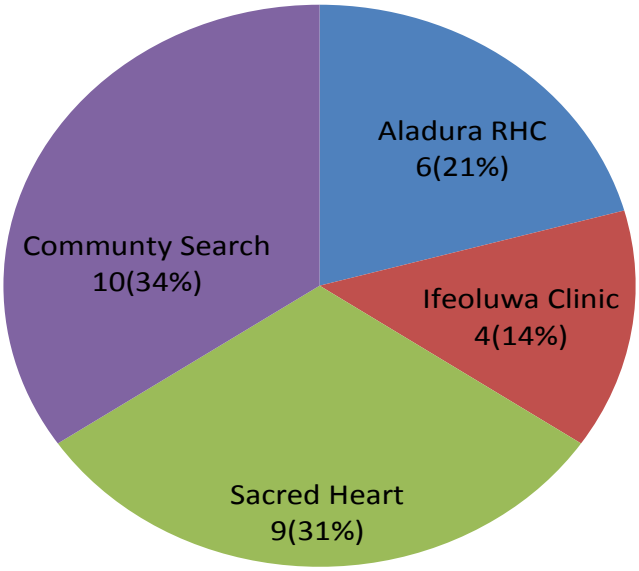

Figure 1. Sources of Measles cases in Ogunmakin village, Jan – Feb, 2009.

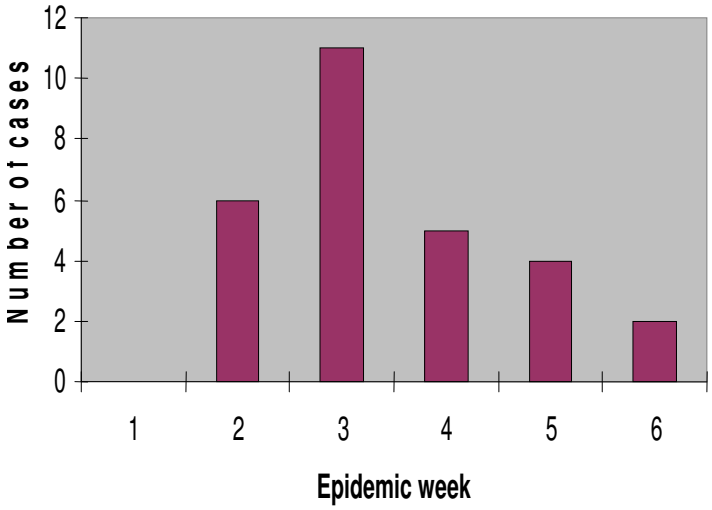

Figure 2. Measles cases by week of onset Jan-Feb 2009.

Table 1. Measles cases by certain personal characteristics Ogunmakin, Jan- Feb 2009

Characteristic	N (29)	Percentage
Age-group		
Less than 9 months	3	10.3
9 - 60 months	26	89.6
Sex		
Male	17	58.6
Female	12	41.4
Vaccination status		
Measles vaccine at 9 months	1	3.5
None	28	96.5
Never received vaccination	23	79.3
Incomplete vaccination	5	17.4
Complete vaccination	1	3.3
Disease outcome		
Alive	27	93.1
Dead (Case fatality rate)	2	6.9

Table 2. Measles IgM Laboratory test result.

Lab result	Number (%)	
	Measles (N = 4)	Rubella (N = 4)
IgM positive	1(25.0)	-
IgM negative	-	4(100.0)
Indeterminate	3 (75%)	-
Total	4(100)	4(100)

Station Ajebo (31%) as shown in Figure 1. Notably, all the cases managed in Ajebo were residents of Ogunmakin village.

All the cases were children less than 5 years old with a male to female ratio of 3:2. A vast majority of affected children had not been immunized against measles (96.5%) and 79.3% had not received any form of vaccination at all. Most of the cases survived the infection with a mortality rate of 2(6.9%) as shown in Table 1.

The outbreak spanned a period of five weeks with majority of the cases 10(34.5%) occurring within the second week. Thereafter, there was a gradual decline with only two cases reported by the fifth. The epidemic curve revealing the time of onset of measles by epidemic weeks is shown in Figure 2.

The measles antibody result of the four suspected cases from those whom blood samples were taken. Only one of the four cases had sufficiently elevated titres of measles antibodies (IgM) hence was labelled positive. The other 3 cases were indeterminate but on further testing were found negative for rubella antibodies (a differential diagnosis for febrile rash) as shown in Table 2.

The pattern of immunization uptake among children under the age of five in Ogunmakin is shown in Figure 3. A total of 100 households and 140 under – five children were studied in the house to house search for cases in Ogunmakin village. Less than a quarter 32(22.9%) of children were reported to have been immunized against measles at 9 months. Similarly, about one in every four (23.6%) had received complete immunization. A third had never received any immunization (30.7%) and about half had not been completely immunized (45.7%).

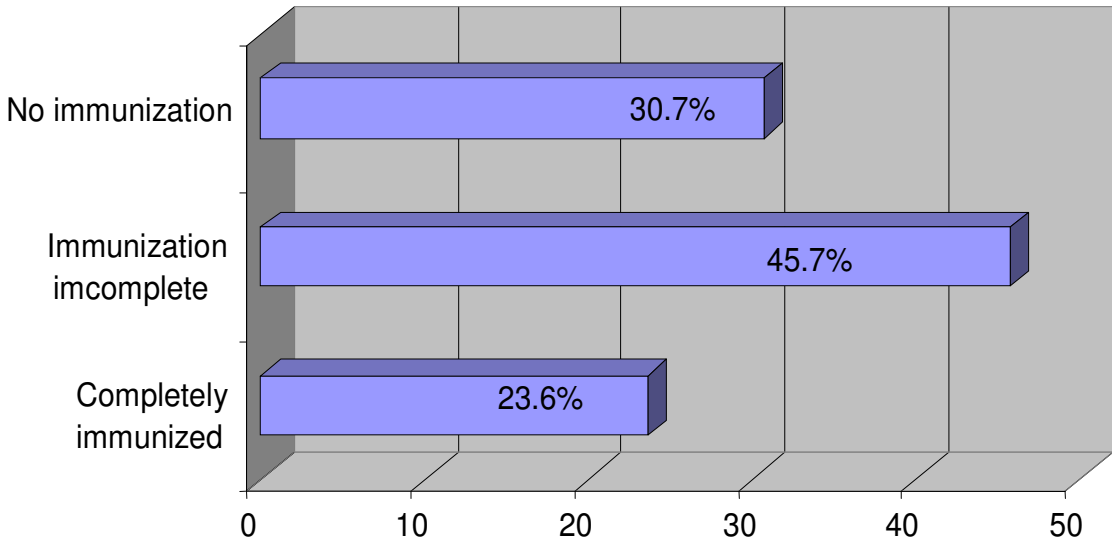

Figure 3. Patterns of immunization uptake in Ogunmakin.

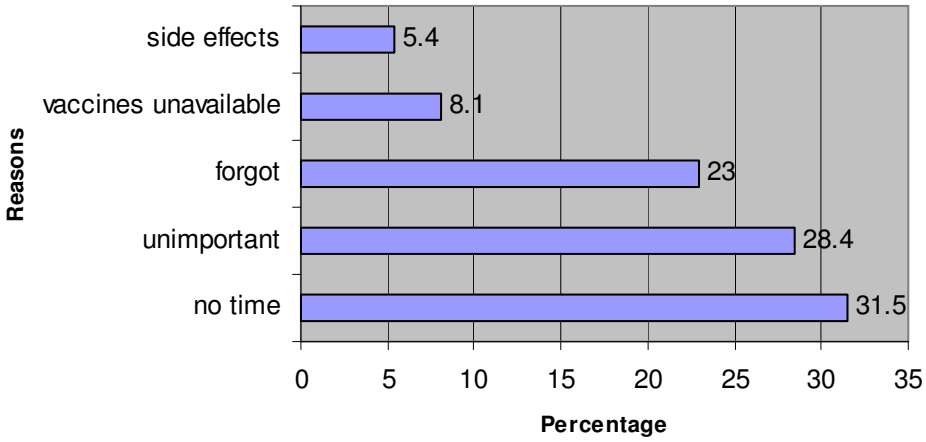

Figure 4. Reasons for poor uptake of measles vaccination in Ogunmakin.

The main reasons given for the poor uptake of immunization were lack of time to take the children for vaccination (35.1%), failure to regard as immunization as important (28.4%) and failure to remember to take the children for immunization (23.5%) as shown in Figure 4.
Some of the excerpts from the qualitative study are stated below:

Extract 1: “Taking your child for immunization takes a lot of time, we cannot sacrifice this time particularly when immunization falls on market days and there is market almost every day”. [A mother during the FGD session].
Extract 2: “Some children have had terrible experiences from taking immunization for example children have swollen buttocks so people are discouraged from other people’s experience”. [A mother during the FGD session].
Extract 3: “The fathers sometimes disapprove of taking the child for immunization because they do not believe in it”. [A mother during the FGD session].
Extract 4: “I took my child for immunization once or twice that should be enough”. [A mother whose child was not completely immunized].
Extract 5: “Why should our children receive immunization? We do not know what it contains; it could be beneficial or harmful”. [The village head during the Key Informant Interview].

Figure 5 displays the number of children aged 9 months to 15 years who received measles antigen during the catch-up campaign that followed outbreak. So far, a total of 432 children between 9 months and 15 years had been immunized as at the time of writing this paper. The exercise, even though is still ongoing, has been slow because of poor logistic support available to the health

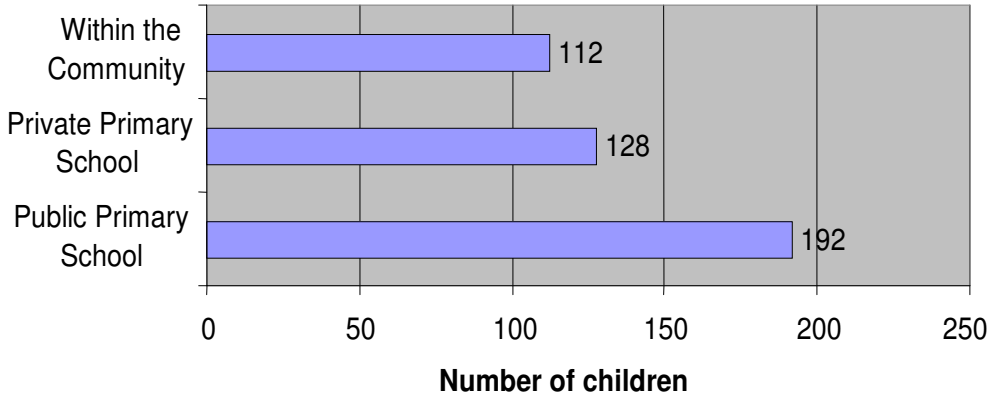

Figure 5. Number of children age 9 months to 15 years who received measles antigen during the catch-up immunization campaign following the outbreak.

workers.

DISCUSSION

The paper describes the investigation and control of a measles outbreak in Ogunmakin, Obafemi Owode LGA, Ogun State between 7th January to 15th February 2009. A confirmed measles outbreak is defined by the WHO as 3 or more IgM positive cases in a health facility or LGA, with a plausible means of transmission (Federal Ministry of Health/ World Health Organization (Nigeria), 2006). However, in the absence of 3 or more laboratory confirmed IgM positive cases, confirmation could be by epidemiological linkage. Confirmation by epidemiological linkage refers to a suspected measles case that has had a contact history with a laboratory confirmed measles case whose rash onset was within the preceding 30 days and the cases live in the same LGA or adjacent LGA with plausibility of transmission (Federal Ministry of Health/ World Health Organization (Nigeria), 2006).

In this study, only one case was positive and the other three were indeterminate by laboratory confirmation. Nevertheless, there were three epidemiologically linked cases, one is a twin brother of the positive case while the other two are cousins all living in the same family compound. This clearly provides evidence of the association with the measles virus. All the cases were also negative for rubella IgM antibodies, a differential diagnosis for a febrile rash. Therefore, based on this linkage with a laboratory confirmed measles case, the outbreak is clinically and epidemiologically confirmed. Consequently, there was a confirmed measles outbreak in Ogunmakin village.

The findings show that, the infection occurred mainly among young unimmunized children below age five. A herd immunity of 95 is required to interrupt measles transmission in a community. The Federal Ministry of Health and WHO Nigeria's algorithm for the determination of the likely cause of a measles outbreak states that low coverage of vaccination may be implicated as the cause of the outbreak if greater than 50% of the measles cases are under five and are not vaccinated (Federal Ministry of Health/ World Health Organization (Nigeria), 2006).

In this study, 96.5% of the affected children had not received measles vaccination while 79.3% had no immunization at all. The estimated measles vaccination coverage among under-fives in the village is 22.9%. This is comparable with the estimate of 22% in Adamawa State (North eastern Nigeria) that experienced a large epidemic in 2004. This implies that low immunization coverage with a resultant accumulation of susceptible non – immunized children is a plausible explanation of the cause of the outbreak. Grais and his colleagues in describing the measles epidemics in three West African countries (Niger, Nigeria and Chad) also found that low immunization coverage and being under five were risk factors of an outbreak (Granty County Health District, 2008).

The two measles deaths recorded in this outbreak were sequel to acute respiratory infection as an immediate cause. The likely contributory factors to the mortality include delayed presentation at the health facility, poor nutritional status and lack of vaccination. The measles case fatality rate (CFR) in this study was 6.9%. This is similar to the estimation from the West African Study (Grais et al., 2007) where the CFR ranged between 2.8 - 7.0%. However, Byass and colleagues found a much lower CFR of 3.3% in urban Nigeria. The reason for the rural – urban variation may be due to increased accessibility and utilization of health care services including immunization in urban areas (Byass et al., 1995).

The catch-up vaccination campaign targeting children aged 9 months to 15 years within the community and all the primary school was critical to curtailing the further spread of the outbreak. However, this would not prevent the infection in the incubatory carriers. Besides, although the children most at risk for the infection were under-fives,

the campaign was extended to children up to the age of 15 years. This is because there may a shift of the infection to older age groups if past immunization efforts had been weak implying that older unimmunized children may still be susceptible to the infection (Federal Ministry of Health/ World Health Organization (Nigeria), 2006). For example, Wichmann and his colleagues in investigating a large outbreak of measles in Germany, reported a shift in the distribution of cases to older, previously unvaccinated children within the age bracket of 10 to 14 years (Wichmann et al., 2009).

While the uptake of immunization in Ogunmakin is generally poor, about one fifth of the mothers reported that their children were fully immunized. Therefore, this cluster of women may be employed as agents of change (Immunization Advocates) to bring about a change in the communal attitude and behaviour towards the utilization of health services especially vaccination. In addition, some of the reasons expressed for the poor uptake included the lack of knowledge of the importance of immunization and the failure to remember to take the child for immunization, which are issues amenable to social re-engineering through Behavioural Change Communication (BCC) and social mobilization. Male involvement in immunization may also be important as some of the mothers stated that fathers' objection was a critical reason for failing to obtain immunization for the children.

Conclusion

The measles outbreak in Ogunmakin village is due to low routine immunization coverage resulting in an accumulation of susceptible children within the community. The supplemental immunization activities, that aim to provide a second opportunity for measles immunization, may be ineffective if the socio-cultural factors and weak health infrastructure responsible for low immunization uptake are not addressed. Moreover, the investigation of the outbreak has highlighted the importance of disease notification and its snowballing effect in the control of an epidemic prone disease like measles. We recommended that the community and all stakeholders should to be mobilized regarding the importance of immunization. Routine immunization ought to be strengthened by being made available and accessible. Health workers need to be trained on disease notification and surveillance to prevent a reoccurrence of another outbreak.

LIMITATIONS

The first limitation is the inadequacy of the blood samples collected which resulted in an insufficient yield of laboratory confirmed cases with measles specific antibodies (IgM). The collection of blood samples should have continued until there was an accumulation of the required number of laboratory confirmed IgM positive cases. Although, this contravenes the national guideline which recommends that blood samples should be collected only from the first 5 suspected cases within 30 days of the onset of the rash. Also, nasopharyngeal swabs required for viral isolation were not taken partly due to lack of preparedness to investigate the outbreak (being the first experience). Finally, this report has not being written strictly according to recommended format especially in terms of the self evaluation of the timeliness and quality of preparedness, outbreak detection, investigation and response.

AUTHORS CONTRIBUTION

Doctors Adeoye and Dairo diagnosed, investigated, reported the cases and organized the community case search. Doctors Adeoye and Dairo wrote the manuscript while Dr Adekunle reviewed the manuscript. Mrs Adedokun and Makanjuola assisted in the care of patients, community case search, reporting of the epidemic and collection of qualitative data.

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