

THE EFFECT OF COVID-19 PANDEMIC ON ROUTINE IMMUNIZATION: A CASE STUDY OF MEASLES OUTBREAK IN KAMBIA DISTRICT, SIERRA LEONE, OCTOBER 2021

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Abstract

Measles is one of the leading causes of death among children under five in Africa. Studies showed that COVID-19 has affected routine health services, including immunization services. We investigated to confirm the diagnosis, identify the source, mode of transmission, instituted control and prevention measures. We interviewed caregivers and community people to find the source of infection. We used case investigation form to collect demographic, clinical, travel, and contact data. We conducted active case search in communities and health facilities. We collected blood samples to test for measles antibodies and isolated case patients to prevent transmission. A total of 60 measles cases were reported, five were laboratory confirmed and 55 by epidemiological link. The median age was 4 years (range: 4 months – 23 years). Females accounted for 67% of the cases. No travel history was reported. Bamoi Luma's Measles-Rubella vaccination coverage was 28%. Only 20 patients (12%) received measles vaccination and vitamin A supplementation. Measles outbreak was confirmed with more cases in the community. Factors contributed to this outbreak included low vaccination coverage, impact of COVID-19 pandemic on routine health services, and contact with measles cases. We recommend routine measles vaccination and community sensitization on measles prevention.

Key words: Measles outbreak, COVID-19, Routine immunization, Kambia, Sierra Leone

Introduction

Measles is a febrile rash illness due to paramyxovirus (*Morbillivirus*) transmitted human-to-human via airborne droplet spread (Colavita *et al.*, 2017). Globally, during 2021, 21 large and disrupted measles outbreaks were reported by the end of the year. Worldwide, the number of reported measles cases has increased by 79% in the first two months of 2022 compared to the same period in 2021 (Belda *et al.*, 2017). Measles is the fourth leading cause of death in children less than 5 years of age in many African countries. (Raja MA., 2016). The incubation period is 7 to 18 days from exposure to onset of fever-(Ntshoe *et al.*, 2013). It is more severe and common among children with vitamin A deficiency and malnutrition. Measles may result to a severe illness due to the virus itself or its associated bacterial infections, especially pneumonia; but only a minority of cases are severe (Kurata *et al.*, 2015). Measles is among the most

transmissible airborne infections among children. Large outbreaks occur every few years in areas with low vaccine coverage and where there is an accumulation of persons who have never been infected or vaccinated (Belda *et al.*, 2017). The true incidence of measles far exceeds reported cases in many developing countries, due to reporting delays and poor reporting infrastructure (Hayman, 2018).

For measles infection include low vaccine coverage (<85 to 90%) which allows accumulation of susceptible persons at high risk for measles. Outbreaks can be explosive in areas of high population density. Other viral illnesses such as rubella may cause or contribute to similar outbreaks (Olugbade *et al.*, 2019). Recent study conducted globally by the United Nation Children Fund (UNICEF) in low and middle-income countries has shown that measles vaccination coverage was declining during COVID-19 pandemic

(UNICEF, 2021). Immunization coverage has been affected by the COVID-19 pandemic in different continents including North America, Latin America, Asia, Europe and Africa (Ota *et al.*, 2021). In a study conducted in Nigeria 2022, measles vaccination coverage was decreased from 74% to 58% during the COVID -19 pandemic (Babatunde *et al.*, 2022). In Kambia district, measles vaccination coverage declined during the COVID-19 pandemic, from 95% in 2019 (pre-pandemic) to 89% and 87% in 2020 and 2021 respectively (Ministry of Health and Sanitation, 2022). Notwithstanding the ongoing routine vaccination of measles in the country, there was a measles outbreak reported from Kambia district in October 2021. Receiving this report from Kambia District Health Management Team, an organized team that consists of Field Epidemiology Training Program (FETP) residents, surveillance officers, clinicians, and laboratory staff, were deployed to the district to investigate the outbreak. The aim of this study was to investigate the magnitude of measles outbreak, identify the source(s), mode of transmission and to institute control and preventive measures.

CASE REPORT

Study Area

Kambia district is one of the 16 districts located in the northern province of Sierra Leone. The district covers an area of 3,108 sq. km. Internationally; it borders with the Republic of Guinea. Politically, Kambia district has ten (10) chiefdoms with a population of 402,822 of which 71,300 are children under 5 years (Expanded Program for Immunization micro planning projected 2020 population) (STATISTICS SIERRA LEONE (SSL), 2017). The major tribes of the inhabitants in Kambia district are mainly Temne Fullah, Susu, Bulum, and Limba. Prevalent economic activities are petty trading, cattle rearing, rice farming and fishing. These economic activities cause a lot of

movement from one place to another increasing the risk of disease spread.

Study design

We used a descriptive cross-sectional study to describe the magnitude of the measles outbreak in two Chiefdoms, Magbema, and Bramaia.

Data collection

We interviewed caregivers and community members, reviewed patient registers, under-five cards, collect patient demographic information using the Case Investigation Form (including date of onset, signs and symptoms, date seen at health facilities, outcome, measles vaccination status, travel history and contacts with person with similar symptoms information). We also conducted active case search at communities for additional cases and updated the line list every day. Nine blood samples from the first suspected cases in Magbema and Bramaia chiefdoms were collected and sent to the national central public health reference laboratory (CPHRL) for IgM testing.

Measles case definition

We constructed outbreak case definitions based on the technical guidelines for integrated disease surveillance and response 2020 developed by the Ministry of Health and Sanitation.

Suspected case

Any person of Magbema and Bramaia chiefdom, Kambia district who presented with fever and maculopapular (non-vesicular) generalized rash and cough, or coryza (runny nose) or conjunctivitis (red eyes) or any person in whom a clinician suspects measles between 1st October to 30th November 2021.

Confirmed case

A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an outbreak.

Defaulter is an infant who started the routine EPI immunization series but failed to complete the schedule for whatever reason.

Data Analysis Procedures

Data were entered, cleaned and analyzed using Microsoft Excel. We calculated attack rates, vaccination status, range, and median. Results were presented in graphs, and table and summarized by person, time, and place.

Ethical consideration

This study did not require ethical consideration as it is part of the outbreak investigation and we did not present person identifiable information.

Cases findings

A total of 60 suspected measles cases and no deaths were reported in two chiefdoms in Kambia district from 1st October to 30th November 2021. Blood samples from the first nine suspected cases were tested using Enzyme-Linked Immuno Sorbent Assay (ELISA). Serological tests were conducted at the CPHRL in Freetown. There were five positives for IgM out of 9 samples. Of the cases that were not tested, 55 (91.6%) were epidemiologically linked and clinically compatible with the positive cases. The median age was 4 years, with a range of 4 months – 24 years. Forty (67%) were female while 20 (33%) were males. Among the 60 cases, 41(68.3%) cases were less than 5 years old (**Error! Reference source not found.**). The attack rate among under five children were 1.8 and 1.3 cases

per 1000 population in Magbema and Bramaia chiefdom respectively. The Overall attack rate for the under five children was 1.7 cases per 1000population in Kambia district.

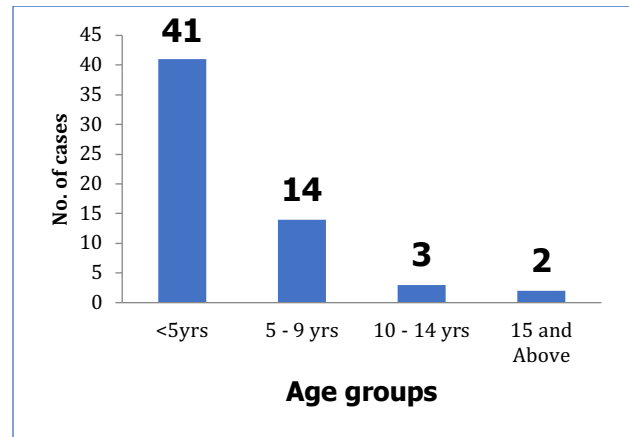


Figure 1: Age distribution of measles cases, Kambia district, 2021 (N=60)

This measles outbreak occurred in Bamio Luma (a village or section in Magbema chiefdom, Kambia district) which has large fluctuating population due to the trade fire and difficulties to achieve the target immunization coverage. The review of the two affected chiefdoms immunization administrative coverage data for the last five months before the measles outbreak indicated an overall coverage of 28% for MR1. From the total under-fives suspected cases, 27 (66%) of them had unknown vaccination status, 9 (22%) were not vaccinated, 2(5%) were not due and only3 (7%) had received single dose of measles-rubella (Figure 2). The outbreak which lasted for 24 days started on the 11th of October and ended on the 11th November 2022. The epidemiological curve shows

several peaks, suggesting a community propagated outbreak (Figure 3).

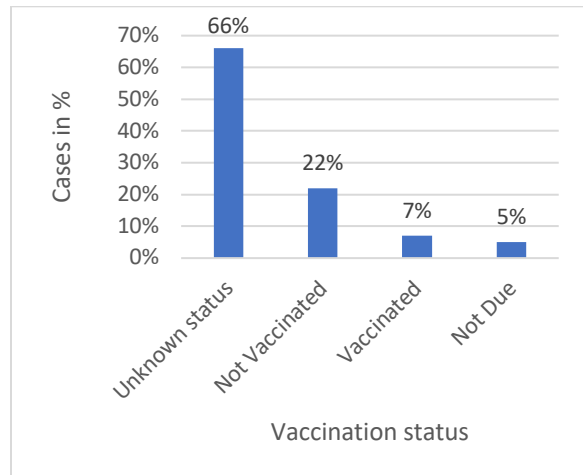


Figure 2: Proportion of vaccination status of measles under-fives cases, Kambia district, 2021 (n=41, 100%)

The index cases of this outbreak were a 6-year-old boy and a 3-year-old girl from the same family residing in Magbama Chiefdom. Their caregiver (mother) works a business centre at the Guinea park, where she spends the majority of the day with the kids. This exposes the kids to interact with park visitors including travellers from Guinea. They developed symptoms of measles on the 11th of October 2021, and were reported from Kambia district, Magbama Chiefdom, and seen at Bamoi Luma health facility on the 18th of October 2021. The number of measles cases started to increase gradually with a fluctuating trend and reached a peak on 1st and the 11th of November 2021 respectively. Default tracing was intensified at all health facilities in the district. Also, ring vaccination of under five children in hotspot communities was conducted as part of the

outbreak response. We also conducted sensitization through radios, stakeholder meetings and intensified screening at cross border points of entry.

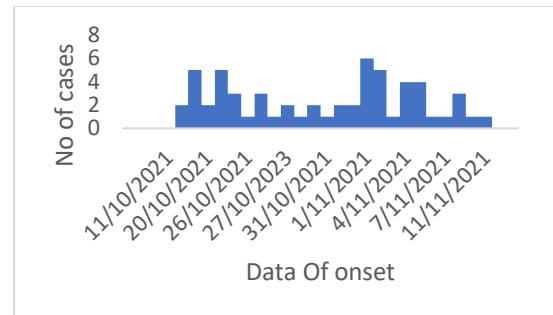


Figure 3: Measles outbreak in Kambia District, 2021

DISCUSSION

This study aimed to investigate the magnitude of measles outbreak, identify source, mode of transmission and institute control and preventive measures in Kambia district. A total of five laboratory-confirmed IgM-positive cases and 55 epidemiologically linked and clinically compatible cases with no death was found during the study period. This finding was similar with study conducted in Ethiopia, where the outbreak was confirmed by laboratory investigation (IgM positive) (Kalil *et al.*, 2020). The fact that there were no deaths could be likely attributed to prompt and effective outbreak response.

Our study also revealed that the measles outbreak affected a wider age range from two months to 24 years. This finding is unexpected because measles is known to be prevalent among under-five children and very rare in older age groups. This is also concurrent with a study conducted in Ethiopia where the median age was 3years ranging from 3months to 30 years (Ketema *et al.*, 2020). This indicate that, persistent low routine immunization

coverage over several years and the accumulation of the susceptible population in the older age group might have likely led to the current outbreak.

The high attack rate as reported in our findings could be due to accumulation of susceptible population which may have contributed to the spread of the disease in the communities in Kambia district. Due to the overall measles vaccination coverage (28%) falling below the 95% national Expanded Program on immunization target in Sierra Leone (Government of Sierra Leone, 2014), which may have been made worse by the COVID-19 pandemic, the measles outbreak is most likely to have resulted.

Prevention and control measures taken

Infection Prevention and Control materials were supplied to the health facilities. The cases were isolated and treated to prevent further spread and reduce morbidity of the disease using medications such as calamine lotion, eye ointment, vitamin A. Active case search was carried out in all affected communities in the district and regular update of the line list was done as cases increased.

CONCLUSION

Measles outbreak was confirmed in Kambia district and the majority of the cases were found in the communities, suggestive of ongoing community transmission. The low immunization coverage in Magbama and Bramaia Chiefdoms confirmed might be the causes of measles outbreak. We recommend to strengthening measles vaccination coverage in the district and sensitize the community members to enhance its uptake. Also, the district to intensify routine active cases search,

defaulter tracing and routine outreach vaccination to the targeted population.

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