

Original Article

YELLOW FEVER CHILDHOOD IMMUNIZATION COVERAGE IN JOS NORTH LOCAL GOVERNMENT AREA, NORTH CENTRAL NIGERIA: 2015 – 2017.¹Omololu A, G. Andrew¹, A. Onukak¹, D. Shwe¹, C. Akude², S. Gomerep¹, NY. Shehu¹.¹Infectious Diseases Unit, Jos University Teaching Hospital, Jos, Plateau state.²Infectious Diseases Unit, Bingham University Teaching Hospital, Jos, Plateau state.**ABSTRACT**

Background: The transmission of Yellow fever, a viral hemorrhagic fever is facilitated in countries which have close proximity to the mosquito vectors and large number of unvaccinated population. Globally, mass vaccination campaigns have significantly reduced the incidence of this disease, but recent reports from the World Health Organization (WHO), indicates an increase in the rate of transmission, especially in Sub-Saharan Africa. Between 2017 and 2018, some Nigerian states including Plateau state reported confirmed cases of yellow fever. In this study, we assessed the yellow fever immunization coverage in Jos North Local Government area (LGA) of Plateau state.

Methodology: A retrospective cross-sectional study was carried out to assess yellow fever immunization coverage in Jos North LGA over a 3-year period from January 2015 to December 2017, with data obtained from the Local Government Area office. This included both data from routine and supplemental immunization activities. The number of children immunized was then compared to the target population to assess coverage for each year.

Results: Overall, 71,734 children were immunized. This comprised of infants 9-11 months 69,344 (96.7%) and 1-5 year old infants 2390 (3.3%). The overall average immunization coverage was (21,514/92,652) 23.2% in 2015, (24,977/93,569) 26.6% in 2016, and (25,243/94,495) 26.7% in 2017, with a mean coverage of 25.5% over the 3 year period.

Conclusion: Yellow fever immunization coverage in this LGA is low. Urgent work needs to be done to increase immunization coverage across the local government, and by extension the state and country, especially in view of the recent outbreak of yellow fever in some states.

Key words: Yellow fever, Immunization, North-Central Nigeria.

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INTRODUCTION

Yellow fever virus is one of the many causes of viral hemorrhagic fever. It is a member of the flavivirus family (group B arbovirus). A mosquito-borne disease, yellow fever can manifest as a spectrum of presentations, ranging from asymptomatic illness to acute-onset viral hepatitis and hemorrhagic fever. It is transmitted by tree-hole breeding

mosquitoes (*Haemagogus* and *Aedes* species) during the tropical wet season and early dry season. Large vaccination campaigns and *A. aegypti* control programs have decreased the incidence of yellow fever worldwide. Nonetheless, yellow fever has re-emerged across Africa and South America, despite the availability of an effective live-attenuated 17D vaccine.

The populations at highest risk for the illness are those in countries that lack the funding and infrastructure to support a widespread vaccination program. World Health Organization (WHO) data suggest that the rate of yellow fever transmission is

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increasing, especially in sub-Saharan Africa. Ninety percent of reported cases occur in Africa, where *A. aegypti* is rampant. Transmission occurs in largely unvaccinated populations of sub-Saharan Africa. The countries at greatest risk lie within a band from 15° North to 10° South of the equator. This region includes 32 countries in sub-Saharan Africa.

The case-fatality rate of yellow fever in Africa approximates 20% with infants and children being at highest risk. Yellow fever is a vaccine preventable disease, and despite it being scheduled on the National Programme on Immunization (NPI) in Nigeria, the immunization coverage is said to be low, with the WHO estimating that about 23 million children are at risk in urban areas only. The Global Alliance for Vaccines and Immunization (GAVI) puts the routine immunization coverage for yellow fever in Nigeria at just 51% in 2016. As of 2007, yellow fever immunization coverage in 12 to 23 month old Nigerian children was highest in Enugu state, with a coverage of 92.7 %. The other top 5 immunization coverage regions included Osun, Kwara, Nassarawa, and Oyo states, with Oyo state having a coverage of 63% in 2014. According to the Nigeria Centre for Disease Control (NCDC), sixteen Nigerian states including Plateau state, reported suspected cases of yellow fever as at October 2017, with confirmed cases from six states. This study assessed the yellow fever immunization coverage in a local government area in North - Central Nigeria.

Methodology

Study design

Aretrospective cross-sectional study was carried out, assessing the records of yellow fever immunization in the local government over a three-year period of January 2015 to December 2017.

Study area

Jos North LGA was chosen for this study, because the two cases of yellow fever reported from Plateau state in the 2017 outbreak were from this local government. Both routine and supplemental immunization activities are carried out in this LG in accordance with the National programme on immunization. Jos North LGA is the administrative seat of government in Plateau state. It has an area of about 291km², and a population of about 573,000 as at 2016, 50.1% of which are females, while 49.9% are males¹⁴. The major occupation here as in other LGA in Plateau state, is farming, but there are also various kinds of industries, trading in different goods and services, and significant number of civil servants, due to it being the state capital. Both Christianity and Islam is practiced by people in this LGA, and the major languages include Hausa, Berom, English amongst others.

Data processing or Management

Immunization data was identified, retrieved and serialized from the Local Government Area office. The immunized population of children between 9-11 months of age, as well as those between 1-5 years of age was then compared to the estimated target population of children between the same ages in the local government, to get the proportion of the population that had been immunized against yellow fever. Total population was obtained using documented projections of population trends from the last national census. The target population for yellow fever was calculated using the formula: 0.5% of the total population for children aged 9 – 11 months, and 16% of the total population for children aged 1 – 5 years old. Immunization coverage was then calculated, using the total population immunized as the numerator, while the target population was used as the

denominator. Chi square for trends was used to assess for statistical significance in the results over the 3 year period. Inclusion criteria comprised all data on childhood yellow fever vaccination from January 2015 to December 2017, including both routine and supplemental immunizations. Data outside this time period, as well as adult

coverage was 25.5%. There is a statistically significant difference in the immunization coverage over the 3 year period, with a p value of <0.0000001.

Discussion

Plateau state reported two yellow fever cases in the 2017/2018 outbreak, both from Jos North LGA. In this study, we present the immunization coverage in this local government over a three year period. The study showed a low immunization coverage in the target population of the Local Government Area. This is consistent with the WHO estimates of the total population immunity for yellow fever in Nigeria as being low (35.4%). This is worrisome, as there is a critical herd immunity needed to prevent yellow fever transmission in a particular area. This was reflected in the 2017 outbreak in Nigeria, with suspected cases reported from at least 16 states, and confirmed cases from 6 states. Low immunization coverage as reported from this study, is likely responsible for the low population immunity against yellow fever. This is very much below the herd immunity thresholds of 60 – 80%, and could predispose to spontaneous outbreaks of the disease. Especially so, considering what is needed for effective transmission is the close proximity of vector mosquito populations to unvaccinated human populations.

Data from this study and the recent outbreak of the disease, shows that we have a large percentage of unvaccinated population. Effective response to the outbreak by WHO and NCDC, including supporting local authorities, strengthening surveillance and laboratory capacities, and a recent large scale exercise carried out in Lagos to assess readiness, as well as mass vaccination campaigns currently being carried out across the country suggest that this trend could be reversed. Emphasis though, would have to be placed on areas

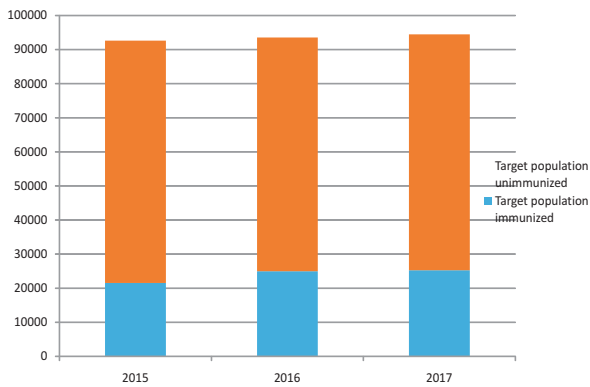


Figure 1: **Childhood immunization coverage in Jos North LGA: 2015-2017**

Results

Table 1: Childhood immunization coverage in Jos North LGA: 2015-2017

YEAR/ Categories of children	TOTAL NO. IMMUNIZED	TARGET POPULATION	TOTAL POPULATION (projections) ¹⁴	IMMUNIZATION COVERAGE [%]
2015				
9-11 months	20,514			23.2
12-23 months	929			
Total	21,514	92,652	561,529	23.2
2016				
9-11 months	24,089			
12-23 months	888			
Total	24,977	93,569	567,087	26.6
2017				
9-11 months	24,670			
12-23 months	573			
Total	25,243	94,495	572,700	26.7
OverallTotal	71,734	280,716		

Table 1 above shows the total number of children under 5 years of age that received immunizations for yellow fever for each year from 2015 to 2017. These includes data for children who were immunized in immunization clinics, and those immunized during special outreaches of the Expanded Programme on Immunization (EPI). It also shows the yellow fever immunization coverage for the local government over the same time period. The mean immunization

with low documented immunization coverage.

Common reasons that have been put forward for poor immunization coverage around the country includes shortage of vaccines and injection supplies, problems with constant electricity supply and the maintenance of the cold chain, poor government support for these programmes in terms of releasing funds, and recurrent health workers strikes. Other factors include low literacy rates among the population, especially among females, mothers not having time, cultural and religious factors that impede immunization uptake among others.

A comprehensive review of the yellow fever cases in Nigeria is needful. This would involve determination or otherwise of the status of yellow fever immunization of the affected persons using their personal immunization records or yellow cards. This would help in determining factors that affect failure of immunization.

This study has some limitation, first, assessing the uptake of other immunizations e.g measles, which is given at the same time, might have given a more robust view of immunization uptake in the LGA. Also qualitative methods of assessments like focused group discussions or key informant interviews, might have elucidated the real reasons for the low coverage. A target population of 16.5% of the total population was used for this study using the formula for the different age ranges, 9-11 months, and 1-5 years in this case. Assessing the target population for age range 1-2 years, instead of 1-5years, might have given a more accurate description as this is the age range at which yellow fever vaccination is usually given, although children under 5 years are generally targeted during extended programmes on immunization. Additionally, adult immunization coverage

was not determined, which would have given the complete immunization status of the local Government Area.

Conclusion

The 2017 outbreak was a reminder to the harsh truth that at present, we are prone to having outbreaks of yellow fever due to the low yellow fever immunization coverage, and a lot of urgent work needs to be done to forestall this. This would be especially important in this local government, and by extension the Nation. Significant work still needs to be done to raise public awareness about the disease, and its means of spread, facilitate a steady supply of vaccines, with proper storage facilities, including strict maintenance of the cold chain, and address cultural and religious factors impeding adequate uptake of immunization. Records of immunization should also be taken more seriously for adequate documentation, and further work done to assess the immunization coverage across the state, and the country at large. These would be important to increase the total population immunity against the virus, and approach levels needed for herd immunity, thereby reducing the risk of outbreaks.

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