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SEROPREVALENCE OF MEALSES VIRUS INFECTION AMONG CHILDREN IN ZAMFARA STATE

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ABSTRACT
Measles is a highly contagious disease characterized by fever, malaise, coryza, conjunctivitis, cough and maculopapular rashes. Although it is a vaccine preventable disease, it however continues to be one of the present day scourges of the developing world. The study is a cross sectional involving children 10 years and below who were randomly selected by multistage cluster sampling from hospital each in local government areas from the three geopolitical zones of Zamfara state, Nigeria to determine the seroprevalence of measles specific IgM antibodies and the possible risk factors associated with the acquisition of the infection. Following informed consent a total of two hundred and twenty four (224) blood sample was collected. Study subjects were interviewed using self-structured questionnaires. Serum samples were analyzed using ELISA IgM kit (Diagnostic Automation and Cortez, Calabasas, CA, USA), in accordance with the manufacturer's guidelines. Of the 224 serum samples screened 43.3% were positive for measles virus specific IgM antibodies indicating an active infection. The results shows decrease in sero-positivity with age, with the highest prevalence recorded in age group 0-2years (49.1%) and lowest among 8-10 years (25.0%). Males had slightly higher prevalence 44.2% compared to females 42.3%, though the result was not statistically significant, (P>0.05). Previous exposure to measles and crowded environment revealed significant association (P< 0.05).However no association was observed in relation to vaccination status and contact with infected individuals (P>0.05). This study confirms the presence of measles and indicate measles endemicity in the study area. However the study shows a reduction in measles burden among vaccinated children. Its presence among unvaccinated children might be an indication of insufficient vaccination.
KEY WORDS: Measles, IgM, Antibody, Elisa, Prevalence, Zamfara.

INTRODUCTION

Measles virus is highly contagious and causes a disease characterized by high fever, cough, coryza, conjunctivitis, and appearance of generalized maculopapular rash with koplik spots appearing on the buccal mucosa 1-2 days before rash onset and may be noticeable for an additional 1-2days after rash onset. Infection confers lifelong immunity (Goodson *et al.*, 2011). Measles virus is a spherical enveloped, non-segmented virus with a single stranded, negative sense RNA genome a member of the genus *Morbillivirus* within the family *Paramyxoviridae*. Humans are the only natural host for measles virus (Griffin, 2007), although other primates such as monkey can be experimentally infected (Maldonado, 2004; Lamb and Parks 2007).

The causative agent is generally transmitted by aerosolized secretions deposited on upper respiratory tract mucosal surfaces occasionally transmitted through the conjunctivae (Mbugua *et al.*, 2003; Vries *et al.*, 2012). Exposure leads to local respiratory tract replication; infection of regional lymphoid tissues then occurs followed by viremia and systemic dissemination as revealed by the characteristic skin rash. Most children recover uneventfully from the illness, but serious complications can occur, including pneumonia and involvement of the central nervous system (Parks *et al.*, 2001).

Very significant progress in measles control has been made over the past decade. Global measles deaths reduced by 75% from 544,200 cases in 2000 to 145,700 cases in 2013 following an increase in routine measles vaccination coverage of up to 84%, with an estimated 15.6 million deaths prevented in this period (Perry *et al.*, 2015). Despite this global progress, endemic circulation persists in many developing countries in Asia and Africa (WHO, 2014) and remains the leading cause of childhood morbidity and mortality in developing countries and an outbreak threat in the majority of countries, despite the availability of safe and effective vaccine for over four decades (Odegaa *et al.*, 2010; Ntshoe *et al.*, 2013; and Fatiregun *et al.*, 2014).

In Nigeria, measles remains a major public health concern because of frequent outbreaks although vaccines have been widely used for more than four decades to prevent illness.
Clinical diagnosis of measles requires a history of fever of at least three days, with at least cough, coryza or conjunctivitis. Observation of Koplik's spot is also diagnostic of measles. Alternatively, laboratory diagnosis of measles can be done with confirmation of positive measles IgM antibodies or isolation of measles virus RNA from respiratory specimens (Njayou *et al.*, 1991). Therefore, this study was designed to determine the prevalence of anti-measles IgM among susceptible population in Zamfara State.

MATERIALS AND METHODS

The research was a descriptive cross sectional study conducted throughout the period of one year which covers both outbreak and sporadic cases within the study period. The state has fourteen (14) local governments and three senatorial zones. Using stratified sampling, the state is divided into three strata, and each stratum is representing a zone. Stratum 1 representing zone I, stratum 2 zone II and stratum 3 zone III King Fahad Women and children Hospital from zone I, General Hospital Anka from zone II and General Hospital Kauran Namoda from zone III were randomly selected. Ethical approval for the study was obtained from the ethical committee of the ministry of health while consents were obtained from the suspected measles patients and their care givers.

Two hundred and twenty four (224) children aged less than 10 years with suspected measles were selected, sample size was arrived at using the equation by Sarmukaddam and Garad (2006). Using self-structured questionnaire, information were obtained including demographic data, history of measles infection, vaccination history and other risk factors. Venous blood sample was collected from each subject, centrifuged and the sera subsequently analyzed for specific IgM against measles virus in the department of microbiology Ahmadu Bello University Zaria using commercially available enzyme linked immunosorbent assay (Measles IgG ELISA, Diagnostic automation and Cortez, Calabasas, CA, USA), following the manufacturers guidelines. Data were summarized as percentages, charts and frequency tables and results computed and analyzed using SPSS version 21. Chi-square test was performed, and statistical significance was established at P value of ≤ 0.05.

RESULTS

Out of the 224 suspected measles patients screened (43.3%) were positive for measles IgM antibody (Figure 1). The age distribution of measles IgM antibodies revealed that individuals under 2 years had the highest IgM seroprevalence (49.1%), whereas the least of (25.0%) was observed in the age group 8-10 (Table 1). With respect to sex, males had the highest prevalence of measles IgM antibodies (44.2%) than females (42.3%), though the association was not statistically significant (P>0.05).

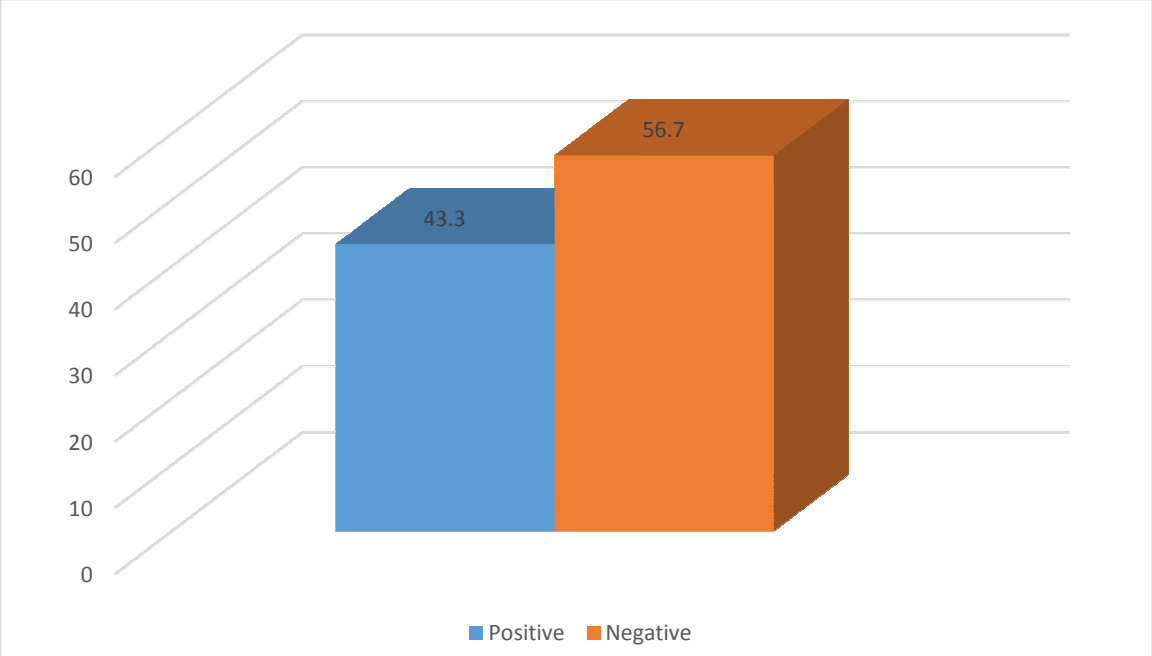

Figure 1: Seroprevalence of measles infection among children 0-10 years in Zamfara state.

Table 1: Age and Sex Distribution of Measles IgM among Children 0-10 Years with Suspected Measles in Zamfara State

Demographic factors	No. Examined	No. positive (%)	No. negative (%)	Chi-square value	p-value
Age					
0-2	108	53 (49.1)	55 (50.9)	4.955	**0.292**
2-4	61	21 (34.4)	40 (65.6)		
4-6	36	17 (47.2)	19 (52.8)		
6-8	11	4 (36.4)	7 (63.6)		
8-10	8	2 (25.0)	6 (75.0)		
Gender					
Male	120	53 (44.2)	67 (55.8)	0.078	0.779
Female	104	44 (42.3)	60 (57.7)		

P-value significant at ≤ 0.05

The result of table 2 shows the seroprevalence of measles virus IgM in relation to vaccination and previous infection history which reveals IgM seroprevalence of 46.6% and 39.8% among unvaccinated and vaccinated children respectively. There is no statistical association observed (P=0.189). Those with history of measles recorded least prevalence of (27.8%), compared to those without history (47.9%), (P=0.104).

Table 2: Seroprevalence of Measles Virus IgM with Respect to Previous History of Vaccination and Measles Infection

History of Vac/infection	No. Examined	No. positive (%)	No. negative (%)	Chi-square value	p-value
Vaccination					
Yes	88	35 (39.8)	53 (60.2)	3.333	0.189
No	133	62 (46.6)	71 (53.4)		
Not sure	3	0 (0.0)	3 (100.0)		
History of Measles					
Yes	54	15 (27.8)	39 (72.2)	8.084	0.018
No	169	81 (47.9)	88 (52.1)		
Don't know	1	1 (100.0)	0 (0.0)		

P-value significant at ≤ 0.05

Higher prevalence of 45.0% was recorded among children who had no contact history while 41.1% was obtained among those with contact history. No statistical association was observed (P=0.560). Children exposed to crowd of people had the highest measles virus IgM (47.6%) compared to those not exposed to crowd (23.1%). The statistical association was significant (P=0.045).

Table 3: Seroprevalence of Measles Virus IgM With Respect to Some Risk Factors Among Children 0-10 Years In Zamfara State.

Risk factors	No. Examined	No. positive (%)	No. negative (%)	Chi-square value	p-value
Contact history					
Yes	95	39 (41.1)	56 (58.9)	0.340	0.560
No	129	58 (45.0)	71 (55.0)		
Exposure to crowd					
Yes	185	88 (47.6)	97 (52.4)	7.869	0.005
No	39	9 (23.1)	30 (76.9)		

P-value significant at ≤ 0.05

DISCUSSION

This study reveals that measles remain an important cause of childhood morbidity and mortality especially in Nigeria. Results indicate that of the 224 children screened 97 had detectable measles specific IgM antibodies giving an overall seroprevalence of 43.3%. This contradicts findings from other parts of the country with much lower prevalence of 8.0% (Adeboye *et al.,* 2011) in Bida Niger state, and 16.5% (Chukwuemeka *et al.,* 2013) in Akwa Ibom state. However (Adetunji *et al.,* 2007) reported a higher prevalence of 55% in Lagos state. Similarly (Chukwu *et al.,* 2009 and Sheyin *et al.,* 2016) observed a prevalence of 71.1% and 54.1% in a separate studies within Kaduna state. Differences in vaccine coverage might be the reason for the observed variations in the prevalence.

Measles virus IgM was recorded in all age groups 0-10 years. Although the highest proportion of measles was found among 0 to 2 years. The number of seropositive individuals decreases with age. These findings agrees with those conducted in Calabar, Lagos, Ibadan and Akwa Ibom (Etuk *et al.,* 2003; Adetunji *et al.,* 2007; Fetuga *et al.,* 2007; Bassey *et al.,* 2010). The early presentations of measles seen among under 2 years could be due to depletion of maternal antibody, it could also be attributed to low vaccine coverage during childhood immunization. The age specific prevalence is inconsistent with the report from other parts of the world in which older children seem to be at risk of contacting the diseases with a peak age of 5-15 years as reported by (Kamel, 1993). However the fact that measles was found in older age group in the present study might be an indication that routine immunization might be insufficient to interrupt measles transmission.

Male had higher measles IgM seropositive compared to females. This finding agrees with previous studies which documented measles infection being higher in males than females (Chukwu *et al.,* 2009; Sheyin *et al.,* 2016). Other studies reported higher prevalence of females than males (Gdalevich 2002; Bassey *et al.,* 2010; Olaitan *et al.,* 2015).

Measles prevalence in this study was observed to be higher among children not vaccinated. Similar findings was also documented in previous studies among unvaccinated children (Fetuga *et al.,* 2007; Onyiruika, 2011; Duru *et al.,* 2014) with 70.5%, 47.4%, and 81.2%). Lack of vaccine at the health centers being a major reason for failure to vaccinate children. Adeboye *et al.* (2011) in Bida however attributed the lack of vaccination in their study to be largely due to negative parental disposition which was also recorded in the present study. Also some mothers give their reasons as the child being ill during vaccination.

The high prevalence reported in this study among children who contracted measles despite measles vaccination may be due to primary vaccine failure which may result from cold chain failures, poor host immune status, and wrong techniques of vaccination. Another reasonable explanation could have been inaccuracy of the history of vaccination. It is however; difficult to identify which of these factors either individually or in combination would have been implicated as cause of the observed prevalence in the vaccinated subjects.

Measles IgM seroprevalence was found to be lower in children with previous measles infection history compared to those without history. This agree with result of (Kandpal *et al.,* 2003), who reported 5% seropositivity after measles infection due to the false history of measles and the possibility parent mistaken any other eruptive fever to be measles.

Even though our study reported a lower population of seropositive with contact history compared to those without. This contradicts the findings of Shakrokh *et al.* (2012) who reported a strong association between measles prevalence and contact history. This could be due to the nature of viral transmission which apart from direct contact with infected person could be transmitted through droplet emission.

Measles virus IgM prevalence was recorded among children found to be exposed to crowded places. Overcrowding has been documented by many researchers as a predisposing factor in the acquisition of the measles infection.

CONCLUSION

The study reaffirm that measles remain one of the major cause of childhood illnesses in Nigeria despite global efforts targeted at elimination with an overall IgM seroprevalence of 43.3% among the study population. This is an indication that measles still persist in this part of the country despite the availability of safe and cost effective vaccine. It is recommended that continuous surveillance be put in place to identify and review reasons for disease burden.

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