Detection of Measles Virus IgM Antibodies among Individuals Suspected of Measles in Kaduna State, Nigeria.

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Abstract

Background of the study: *Measles is an acute and highly contagious viral illness with universal occurrence. It is caused by measles virus. Measles virus (MV) is an enveloped virus belonging to the genus morbillivirus of the family-paramyxoviridae. It is transmitted by air-borne droplets. Measles is usually characterized by prodrome fever, maculopapular rash, with one or a combination of coryza, cough, conjunctivitis and Koplik's spot.* ***Objectives:*** *This study was designed to determine the prevalence of anti-measles IgM among patients suspected of measles in Kaduna State.* ***Methods:*** *Six hundred and forty two (642) blood samples were tested for measles IgM antibody. Anti-measles Virus IgM was detected using ELISA Kits manufactured by Siemens Healthcare Diagnostics product GmbH, Germany.* ***Results:*** *Of the 642 blood samples tested 54% were positive for measles IgM in Kaduna state. Individuals under 5 years age group had the highest prevalence 47.5% followed by 6-10 years age group with 4.7% while the 21-25 years age group had the lowest prevalence of 0.3%. Igabi LGA recorded the highest prevalence of 11.4% followed by Lere LGA with 4.0%, whereas Kaura LGA had the lowest prevalence with 0.2%.* ***Conclusion:*** *The 54% prevalence of measles virus IgM in Kaduna state indicates that Measles is still a major health burden in Nigeria, affecting different age groups.*

Keywords: Morbillivirus, Measles, Measles IgM, Coryza, Koplik's spots, Diagnosis, ELISA

1. Introduction

Measles is caused by measles virus (MV) that belongs to the family paramyxoviridae, genus, morbillivirus (Furus *et al.,* 2010). Measles virus is transmitted via the respiratory route and causes systemic disease. MV enters the host by infection of alveolar macrophages and/or dendritic cells in the airways and is amplified in local lymphoid tissues (Vries *et al.,* 2012).

Systemic infection occurs with the respiratory epithelium of the nasopharynx as the primary site of infection. After the invasion and replication in the respiratory epithelium and regional lymph nodes for about 2 to 3 days, a primary viremia occurs with subsequent infection of the reticuloendothelial system (Takeda, 2008). There is a further viral replication in regional and distal reticuloendothelial sites. A second viremia is said to occur 5-7 days after the initial infection. During the second viremia, there may be infection of the respiratory tract and other organs. Measles virus is shedded from the nasopharynx starting with the prodrome until 3-4 days after rash onset (Takeda, 2008). The incubation period of measles from exposure to initial symptoms ranges 10-12 days and from exposure to rash onset ranges 7-21 days, average 14 days (Walter *et al*., 2004). Measles is characterized by a prodrome of fever, cough, coryza, and conjunctivitis. This is followed by Koplik's spots and a generalized maculopapular rash (Shin-ichi *et al.,* 2004). Despite the availability of an effective live attenuated vaccine, measles is still a severe problem with high morbidity and mortality rates primarily among children in developing countries. The major complications of measles are encephalitis, alveobronchiolitis and otitis media. Encephalitis and alveobronchiolitis are the major causes of death.

Measles is a highly infectious disease with potential for eradication but is still responsible for high mortality among children particularly in developing nations like Nigeria. Currently, Nigeria is one of the 47 countries in the world with the highest burden of measles (Giusti *et al*., 2013). The national measles vaccination coverage is 62% with a very wide variation in the country that has once achieved coverage of 80% with routine immunization (Adeboye *et al*., 2011). There have been increased activities by various health regulatory agencies in the control of measles throughout the world, including Nigeria (WHO, 2008; Shena *et al*., 2014). Before the discovery of measles vaccine in 1963, epidemic cycles occurred every two to three years. Virtually everyone experienced measles illness during childhood and greater than 90% of individuals were infected by the age of 10 years. Natural infection provides lifelong immunity (Goodson *et al.*, 2011).

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*., 1999). Measles is a highly infectious immunizable and preventable disease with potential for eradication, but is still responsible for high mortality among children particularly in developing countries like Nigeria. However, to achieve eradication in Nigeria and beyond, there is need to ascertain the current situation of measles infection among our population. Therefore, this study was designed to determine the prevalence of anti-measles IgM among susceptible population in Kaduna State.

Methods

Study area: The study was conducted in Kaduna state where samples from suspected measles patients from all the Local government area were sent to a WHO measles laboratory in Yusuf Dantsoho Hospital Tudun Wada Kaduna for analysis.

Ethical consideration: Ethical approval was obtained from the Yusuf Dantsoho Hospital Management while consents were obtained from the suspected measles patients and the relatives.

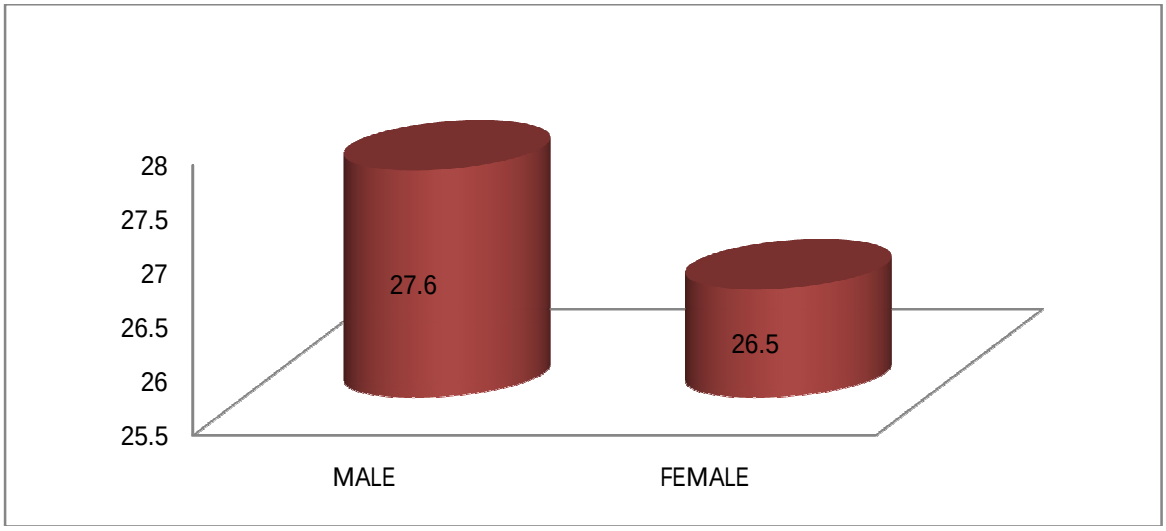
Procedure: Six hundred and forty two (642) blood samples were collected by venepuncture into EDTA bottles, and were centrifuged, the plasma were separated into plain sera containers ready for the investigation. The anti-measles Virus IgM ELISA Kits were brought to room temperature. The reference P/N, P/P and the samples were diluted 1:20 in dyed sample buffer POD. The samples were further diluted 1:1 with RF Absorbent. The diluted tubes were incubated at 25°C for 15 minutes then 150µl diluted reference P/P, 150µl reference P/N and 150µl of each sample were transferred into appropriate wells of the anti-measles Virus IgM test plates. The plates were incubated at 37°C for 60 minutes, washed 4 times with washing solution POD. Conjugate (100µl) working solution was added to each well and the plates were incubated at 37°C for 60 minutes. The plates were washed 4 times. Chromogen (100µl) working solution was added to each well and the plates were incubated at 25°C for 30 minutes in the dark. Stopping solution (100µl) was added to all wells and the absorbance was measured at wavelength 450nm and 620nm.

Result: Out of the 642 suspected measles patients tested 347 (54%) were positive for measles IgM antibody. With respect to gender, males had the highest prevalence of measles IgM antibodies 177 (27.6%) compared to females with 170 (26.5%), Figure 1.

The age distribution of measles IgM antibodies revealed that individuals within the age group ≤ 5 years had the highest occurrence of measles IgM 305 (47.5%), followed by age group 6-10 years with prevalence 30 (4.7%) whereas the least prevalence of 2 (0.3%) was observed in the age group 21-25 (Table 2).

Prevalence of measles IgM according to Local government area revealed that Igabi recorded the highest prevalence of 73 (11.4%), followed by Lere with 26 (4.0%) whereas Kaura LGA had the lowest prevalence of 1(0.2%) as shown in Table 3.

Figure 1: Gender Distribution of Measles IgM in Kaduna State



χ^2= 0.814 df= 1 p = 0.367

Table 2: Age Distribution of Measles IgM in Kaduna State, Nigeria

Age (years)	No tested	No positive	% positive
≤ 5	552	305	47.5
6-10	59	30	4.7
11-15	15	3	0.5
16-20	6	4	0.6
21-25	2	2	0.3
>25	8	3	0.5
Total	642	347	54.1

χ^2= 10.535 df= 5 p = 0.061

Table 3: Prevalence of measles virus IgM according to LGA in Kaduna state

LGA	No. Examined	No. Positive (%)
Birnin Gwari	20	11 (1.7)
Chikun	19	5 (0.8)
Giwa	21	11 (1.7)
Igabi	101	73 (11.4)
Ikara	34	19 (3.0)
Jaba	4	4 (0.6)
Jama'a	60	17 (2.6)
Kachia	26	15 (2.3)
Kaduna North	24	15 (2.3)
Kaduna South	31	23 (3.6)
Kagarko	9	5 (0.8)
Kajuru	15	9 (1.4)
Kaura	5	1 (0.2)
Kauru	18	13 (2.0)
Kuban	29	16 (2.5)
Kudan	25	18 (2.8)
Lere	45	26 (4.0)
Makarfi	53	25 (3.9)
Sabon Gari	12	8 (1.2)
Sanga	25	3 (0.5)
Soba	6	5 (0.8)
Zangon Kataf	24	7 (1.1)
Zaria	36	18 (2.8)
Total	642	347 (54)

χ^2=81.073 df=22 p=0.000

Discussion

Measles virus has caused so many deaths globally including Kaduna State Nigeria. Several studies have been carried out to determine the prevalence of measles IgM antibody. The result of our study revealed a prevalence of 347 (54%). This finding is higher than the 8.0 % obtained in Bida Niger State Nigeria as reported by Adeboye *et al*. (2011), also 30.2% and 10.2% prevalence were reported in Akwa Ibom South South and Lagos South West Nigeria according to Bassey *et al.,* (2010) and Adeoye *et al*. (2013) respectively. The reason for the observed differences may be due to variations in vaccine coverage in these domains.

A higher prevalence of 27.6% was reported among male subjects compared to 26.5% in females. However, there was no significant difference in relation to gender distribution of IgM antibodies (χ^2= 0.814: P = 0.367). In the present study, occurrences of measles were observed more 47.5% in children under 5years of age than other age groups. This report is in tandem with many other findings elsewhere in Nigeria 77.1% has been reported in Niger State and 73.3% in Akwa Ibom State. This scenario could be attributed to low vaccine coverage during childhood vaccination and/or vaccine failure.

Regarding prevalence of measles in the various Local Government Areas (L.G.A) in Kaduna State, Igabi L.G.A had the highest cases of measles. There was a statistically significant difference in the distribution of Measles according to the L.G.As (χ^2=81.073: P=0.000). This study has established the occurrence of measles in Kaduna State, despite immunization campaigns and other efforts made by the Kaduna State Government and other stakeholders to curtail the spread of the disease. Controversies over the efficacy, safety, and morality of compulsory immunization stem from the longstanding tension between protecting individual liberties and safeguarding the public's health. Various religious standpoint, vaccine objections, suspicion and mistrust of vaccines among different ethnic groups, may be responsible for the increased spread of measles in Nigeria. Also, rumors and fears that public health officials were administering childhood vaccines for sterility reason thwarted the country's efforts on immunization.

Internationally, in parts of Asia and Africa, mistrust of vaccines is often tied to "Western plot" theories, which suggest that vaccines are ploys to sterilize or infect non-Western communities.

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