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Measles Immunoglobulin is Harvestable from Plasma-based Products in Owo, Southwest NigeriaMuhibi, M.A., Akinyele, G.A.², Olaniyan, M.F.³, Akinleye, C.A., Muhibi, M.O.

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Abstract

Measles is a contagious disease that is vaccine preventable. Unvaccinated individuals are at risk of being infected, with attendant sequels. Infected neonates and immunocompromised individuals do benefit from administration of anti-measles immunoglobulins. This work was done to determine the presence and proportion of IgG immunoglobulins against measles in Owo, southwest Nigeria. Ninety consenting blood donors were assessed with their sera analyzed using stringent ELISA technique that was specific for detection of anti-measles IgG antibody. Majority of the donors (88.89%) were found to have detectable levels of anti-measles antibodies, which was not influenced by age and gender ($p > 0.05$). It could be concluded that blood donors in Owo will serve as a good source of anti-measles immunoglobulin G, which can help in providing prophylaxis and treatment for at risk and infected individuals.

Keywords: Measles, immunoglobulin, prophylaxis, blood donors, vaccine.

Introduction

Measles is one of the most contagious infectious diseases, caused by the measles virus (MeV). Although, measles is considered a childhood disease, it can affect people of all ages (WHO, 2018; WHO, 2014). It is transmitted by direct contact with infectious droplets or by airborne spread when an infected person breathes, coughs, or sneezes (Ansaldi *et al*, 2009; Atkinson *et al*, 2015). Measles virus can remain infectious on surfaces and in the air for up to two hours after an infected person leaves an area. Measles affects about 20 million people a year, (Caserta

et al, 2013) primarily in the developing countries within Africa and Asia (WHO, 2014). Patients do acquire active immunity after infection, as against vaccinated people in whom immunity wanes over time (Antona *et al*, 2013; Dine *et al*, 2004).

Risk factors for measles include: being unvaccinated, traveling internationally and having a vitamin A deficiency. Measles is a highly contagious virus found throughout the world. People get measles by breathing in the measles virus that is spread when an infected person coughs, sneezes, or talks. You can get measles just by being in the same room with an infected person.

It has been prescribed that people with severely compromised immune systems who are exposed to measles should receive immunoglobulin regardless of immunologic or vaccination status because they might not be protected by MMR vaccine (WHO, 2018).

The introduction of centralized blood service to source blood from altruistic blood donors calls for generation of baseline data on anti-measles IgG antibody in this growing type of blood givers to guide future planning for improved quality service delivery. The potential advantages inherent in blood products as source of acquired immunity in respect to measles infection has not been documented either in transfusion practice in Nigeria.

Screening of blood donors for anti-measles antibodies in Nigeria is yet to be justified and study on seroprevalence of measles virus

infection are not yet documented, hence, the prevalence of measles antibody among blood donors in Owo metropolis (Nigeria) is not fully known. This study was designed to assess the sero-prevalence of anti-measles IgG antibody among blood donors in Owo and determine the possibility of acquiring immunity through plasma-based products.

Methodology

Study Area

This study was conducted on blood donors in Owo metropolitan area, Ondo State. Owo is a town in Ondo State situated in the south-western Nigeria. Latitude 7.19620 and longitude 5.586810. It is at the southern edge of the Yoruba hills, and at the intersection of roads from Akure, Kabba and Benin City (Adewumi and Anifowose, 2017).

Study Population

A total number of 90 adults, prospective donors who came to donate blood in Federal Medical Center were enrolled for this study. Their age ranged between 18-50 year, and lactating mothers, menstruating female, pregnant women were excluded. Informed consent was obtained from each donor before the collection of specimens and the research protocol was reviewed and approved by the Federal Medical Center Ethics Research Committee. The study questionnaire was administered on the participants after giving consent, while 5mls of blood was collected into plain sample tube by venipuncture, for the anti-measles IgG assay.

Processing of Specimen

Serum was separated from red cells by centrifuging the blood sample at 1,500rpm for 15 minutes. The serum was stored in the freezer prior to analysis. Measles IgG enzymes linked immunosorbent assay was done using

CALBIOTECH measles IgG ELISA kits according to the manufacturers guide. Diluted patient serum was added to wells coated with purified measles antigen which was genetically engineered. The measles-specific antibody, if presents bind to the antigen. All unbound materials were washed away and the enzyme conjugate was added to bind to the antibody-antigen complex, if present. Excess enzyme conjugate was washed off and substrate added. The plate was incubated to allow the hydrolysis of the substrate by the enzyme. The intensity of the color generated was proportional to the amount of IgG specific antibody in the sample. The Commercial positive and negative controls were processed the same way concurrently, to validate the assay. The TMB substrate was added and stop solution applied after 10 minutes incubation. The Optical Density was read at 450nm, with differential filter of 600nm, using ELISA reader within 15minutes.

Results

Out of ninety (90) blood donors screened, age bracket of 21-30 years was the age group with the highest frequency (44.4%) and there was preponderance of male (68; 74.4%). A proportion of 80% of the participants were aware of the prevention being by vaccination, while 3.3% are not aware and 16.7% opted not to answer the question. Albeit, 4.4% still believe that vaccination against measles can be applied as a cure, in patients with clinical manifestation. Eighty (80) were found to be positive, giving an overall prevalence rate of 88.89%. The prevalence of anti-measles IgG in male was 91.18% and that of female was 81.82%. We noted the preponderance of anti-measles IgG positivity after the age of 20 years. This increase was linear, though not statistically significant ($p = 0.589$).

Table 1: Socio-demographic variables of blood donors and awareness about measles

Variable	Frequency	Percentage
Age Group		
≤20yrs	6	6.7
21-30yrs	40	44.4
31-40yrs	33	36.7
41-50yrs	11	12.2
Gender		
Male	68	74.4
Female	22	25.6
Marital Status		
Married	38	42.2
Widowed	2	2.2
Single	47	52.2
Divorced	3	3.3
Know about measles?		
Yes	81	90.0
No	9	10.0
Vector/Transmission mode I know		
Virus	30	33.3
Bacterial	23	25.5
Parasite	11	12.2
Hot climate	5	5.6
Cold air	7	7.8
None	9	10.0
Cow	5	5.6
Symptoms I know		
None	3	3.3
Red eye spot	9	10.0
Weight loss	53	58.9
Rashes	11	12.2
Fever	9	10.0
Tiredness	1	1.1
Loss of appetite	2	2.2
Dementia	1	1.1
Hallucination	1	1.1

Table 2: Knowledge of Measles Prevention and Treatment

Variable	Frequency	Percentage
Preventable through vaccination?		
Yes	72	80.0
No	3	3.3
I don't know	15	16.7
Treatment Type		
None	23	25.6
Drug	57	63.3
Vaccination	4	4.4
Herbs	6	6.7

Table 3: Prevalence of IgG against Measles among Blood Donors

Variable	Total	Positive (number)	Positive (%)
Age Group			
≤20yrs	6	2	33.33
21-30yrs	40	36	90.00
31-40yrs	33	31	93.94
41-50yrs	11	11	100.00
Total	90	80	88.89
Gender			
Male	68	62	91.18
Female	22	18	81.82
Total	90	80	88.89

Chi square ($p=0.58$)

Discussion

This study established the seroprevalence of anti-measles IgG antibody in 90 blood donors to be 88.89%. A research conducted previously in Nigeria found that only 17% of 4-month-old Nigerian infants were protected against measles (Hartter *et al.*, 2000), while in Mali, only 30% of 2-month-old infants had protective antibody titers (Tapia *et al.*, 2005). Reports from Libreville, Gabon, more than 30 years ago found that 90% of children consulting outpatient services were seronegative by 4 months of age (Gendrel *et al.*, 1987). The rapid rates of passive maternal antibody loss, from 96% at 2 months of age to less than 10% at 7-8 months of age in Brazzaville, Congo was equally reported (Dabis *et al.*, 1989).

However, vaccination resulted in a 75% decrease in deaths from measles between 2000 and 2013, with about 85% of children worldwide being vaccinated as of 2014 (WHO, 2014). Thus, signaling a progress made through fortification of immune system. Once a person has become infected, no specific treatment is available, although supportive care may improve outcomes. Such care may include oral rehydration solution, healthy food, and medications to control the fever. Antibiotics may be used if a secondary bacterial infection such as bacterial pneumonia occurs. Vitamin A supplementation is also recommended in the developing world (WHO, 2014).

The 88.89% immunity reported in this study

appears insufficient to confer herd immunity on the community, since 95% of the community needs to be immunized to attain such (Biesbroeck *et al.*, 2013). This is because measles is transmitted from person to person with ease.

In this study, the prevalence of IgG to measles increased after the age 20 years with the highest rates in those aged 41-50 years. This serves as a source of hope that immunocompetent adults who donate blood may be a source of potent anti-measles immunoglobulin which can be administered to highly susceptible immunocompromised individuals or be used in treatment of clinical measles cases in addition to other medications targeted at averting fever and preventing super-imposed bacterial infection. The potential beneficiaries include people who are at risk for severe illness and complications from measles, such as infants younger than 12 months of age, pregnant women without evidence of measles immunity, and people with severely compromised immune systems. Also, a healthcare provider without evidence of immunity, when exposed to measles, requires immunoglobulin under 6 days as post exposure prophylaxis, if MMR vaccine could not be administered under 72 hours, probably due to late reporting or other reasons (WHO, 2014).

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