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PREVALENCE OF MEASLES NEUTRALIZING ANTIBODY IN CHILDREN UNDER 15YEARS IN SOUTHWESTERN NIGERIA

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The immune status of children under 15 years in the Southwestern region of Nigeria against measles virus was determined using the neutralization test with a view to assessing the herd immunity to the virus in these communities. A total of 256 serum samples collected from children were tested by the beta method of neutralization. Forty (15.6%) of these samples were found to be positive at a titre of 1:256, 35 (13.7%) at 1:128, 36(14.1%) at 1:64, 37(14.5%) at 1:32, 38 (14.8%) at 1:16, 27 (10.5%) at 1:8 and 16 (6.3%) at 1:4. Twenty-seven (10.5%) of the 256 samples had no detectable antibody to the measles virus. There was no significant relationship between the antibody titre to measles virus and the gender of the children ($p > 0.05$). Also, there was no significant difference using Chi square analysis between the neutralizing antibody titres and the age of the children ($p > 0.05$). All the children whose samples were tested were vaccinated against measles as attested to by their parents. However, the vaccination does not seem to protect all the children, for some of them had no detectable neutralizing antibody while some had low neutralizing antibody titre. In Nigeria, where only a single dose of measles vaccine is given at 9 month, measles may remain a serious threat to the children population with its attendant high morbidity and mortality.

Keywords: Prevalence, Neutralizing antibodies, Children < 15years

INTRODUCTION

Measles is one of the common childhood exanthemata, characterized initially by respiratory symptoms, cough, coryza, conjunctivitis, Koplik spots, and maculopapular rash (1). It is the greatest killer of children in history and has been responsible for severe epidemics throughout the world. It still affects about 50 million individuals and causes up to one million deaths in developing countries annually (2). The disease ranked as one of the major causes of childhood mortality with about 36 million cases occurring yearly and a mortality of about one million cases occurring each year worldwide (3). The morbidity and mortality figures were three times higher before the introduction of an effective vaccine in 1962 (4).

The introduction of the live attenuated measles vaccine in industrialized countries since the 1960's had largely contributed to the control of the disease in these countries (5). However, due to low vaccine coverage, sporadic cases and outbreaks continue to occur among school age children (6). Also, the interference of transplacentally acquired maternal antibody with measles vaccination contributes to the vaccination failure (7).

The objective of this study is to determine the level of neutralizing antibody to measles in children below 15 years of age, an indication of their level of protection against measles virus infection.

MATERIALS AND METHODS

The subjects used for this study were children below 15 years of age in Atiba,

Ibadan North, Osogbo and Olorunda local government areas of Oyo and Osun states of Nigeria, which are representative of the Southwestern region of Nigeria. They were recruited from among the children who visited the state hospitals for treatment, having sought the consent of their parents, who were also asked to fill a questionnaire on behalf of these children. The questionnaire contained information about their demographic data and vaccination records.

About 5 milliliters of venous blood was collected from the antecubital vein of each child. The blood was allowed to retract and then centrifuged at 1500 rpm, and the sera collected were stored at -20°C until tested. Each of the serum samples was tested for neutralizing antibodies to measles using the beta neutralization method of varying serum constant virus (8).

RESULTS

A total of 256 serum samples from children in Osun and Oyo States were tested. Of these, 137 (53.5%) were from children in Osun and 119 (46.5%) were from children in Oyo state. One hundred and fifty one (59%) of the samples were from males while 105 (41%) were from females. Overall, 27 (10.5%) of the samples had no detectable neutralizing antibody to measles virus while 81 (31.6%) had detectable neutralizing antibody less than a titre of 1:32. One hundred and forty eight (57.9%) samples had a titre above 1:32.

Table 1: Distribution of neutralizing antibody titres of children used for the study

Titre	Number	Percentage
<4	27	10.5
4	16	6.3
8	27	10.5
16	38	14.8
32	37	14.5
64	36	14.1
128	35	13.7
256	40	15.6
Total	**256**	**100**

Table 2: Age distribution of children used for the study

Age(years)	Number tested	Number positive (%)	Number negative (%)
1-5	111	97 (87.4)	14 (12.6)
6-10	119	110 (92.4)	9 (7.6)
11-15	26	22 (84.6)	4 (15.4)
Total	**256**	**229 (89.5)**	**27 (10.5)**

$X^2 = 2.36$ df = 2 $p > 0.05$

Table 3: Comparison of the sex distribution with the neutralizing antibody titre

Titre	Male	Female	Total
>4	16	11	27
4	9	7	16
8	18	9	27
16	19	19	38
32	26	11	37
64	20	16	36
128	23	12	35
256	20	20	40
Total	**151**	**105**	**256**

$X^2 = 0.0000$ df = 1 $p > 0.995$

Table 4: Comparison of the neutralizing antibody titre and the age distribution

Titre/ Age yrs)	<4	4	8	16	32	64	128	256	Total
1-5	14	11	9	12	15	18	16	16	111
S 6-10	9	5	14	22	18	14	16	21	119
11-15	4	0	4	4	4	4	3	3	26
Total	**27**	**16**	**27**	**38**	**37**	**36**	**35**	**40**	**256**

DISCUSSION

Antibodies to the haemagglutinin (H) protein are the primary antibodies measured by neutralization of virus infectivity in tissue culture (9) just as Haemaglutination Inhibition (HI) test is used to measure the antibodies to this H-protein. Neutralizing antibodies play a very important role in preventing re-infection; therefore, the neutralization test is most often used to evaluate vaccine responses and access susceptibility to measles.

The result of this study shows that there is a high prevalence of measles neutralizing antibody in children in the Southwestern Nigeria. Two hundred and twenty nine (89.5%) had detectable neutralizing antibody to measles and 27 (10.5%) had no detectable neutralizing antibody i.e. are seronegative to the neutralization test. The high titres found in the age group 1-5 years can be due to either vaccination or immunity from a previous infection since many of the children had history of measles infection in this age group. This correlated with the fact that the disease in West Africa mostly occurs in infants less than 2 years old (10).

The gender distribution did not show any significant difference between males and females ($p > 0.05$). Although, the level of the neutralizing antibody dropped as age advances (11-15 years) in this study, the level was not significantly different from the lower age groups. The drop as the age advances has been said to be an indication that immunity conferred by vaccination wanes with time, as such older children could be exposed to infection if they are not given a booster dose of the vaccine. This is because the level of immunity elicited by live measles vaccine tends to diminish over the years especially within populations with little exposure to measles virus and minimal opportunity for the antibody titre boosting in association with sub clinical re-infection (11).

In a study by Aiki-Raji (12), measles virus was isolated from an 8 year old child. This was attributed to either a waning in the immunity of the child or deficiency in the seroconversion to the vaccine earlier given. A good percentage of the parents claimed that their children have been vaccinated, however, with the report of 10.5% of these children not having detectable neutralizing antibodies, it could be deduced that there is no proper seroconversion in those children with low titres. This could have been influenced by factors such as poor nutritional status of the children, diminished potency of the vaccine used as a result of poor handling of the vaccine before its eventual administration to the children.

CONCLUSION

The result obtained in this epidemiological study of measles in Southwestern Nigeria taking Oyo and Osun states as a case study, shows that the incidence of measles among the population may be directly related to the level of immunity to the virus. It is obvious that vaccination does not protect many of the children as many with documented records of measles vaccination still had low neutralizing antibody titres. The reasons for this may include low vaccine potency, poor vaccine handling and logistics of vaccination (13). With the vaccination regime being used in Nigeria, which is given in a single dose without any booster dose, measles may remain a serious threat to the children population with its attendant high morbidity and mortality. It is of note that exclusive breastfeeding does not protect the child adequately because breast milk contains minimal antibody to measles (14). The effect of this is quite pronounced as an opportunistic period of virus infection is created since children are often vaccinated against measles at 9 months of age in developing countries. Moreover, findings demonstrate that the decay of the passive maternally acquired measles antibody occur more rapidly than expected resulting in the susceptibility to measles virus in most infants (15). Vaccination has been observed to be the most effective means of controlling measles globally (16), therefore, effective vaccination campaign should be done to combat this disease among children.

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