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# MEASLES HEAMAGLUTINATION INHIBITION (HI) ANTIBODIES TITERS AMONG PERSONS AGE 2-21YEARS IN LAFIA, NASARAWA STATE, NORTH CENTRAL OF NIGERIA.

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**ABSTRACT** ***:*** *Background: Childhood measles infection, despite vaccination programs, continues to experience outbreaks in Nigeria. The infection which formerly affect young children, now affect even older persons in colleges. This study was therefore, carried out to identify the measles HI antibodies titers among persons age 2-21years around Lafia, in Lafia Local Government area of Nasarawa State, Nigeria. Methodology: Blood samples were collected from a total of 235 persons aged 2-21 years between the months of April and October,2012, and were tested for measles antibodies using the heamagglutination inhibition serological technique, after obtaining ethical clearance, informed consent and the records of measles vaccination of the subjects. Result: Of the 235 subjects, 112 (47.7%) were females and 123 (52.3%) were males. Overall 222 (94.5%) had antibodies to measles, out of which 106 (45.1%) were females and 116 (49.4%) were males. The heamagglutination inhibition detectable antibodies titers and percentage occurrences were as follows; 4(6.8), 8(6.0), 16(7.2), 32(34.1), 64(38.3), 128(0.8) and 512(0.4). Conclusion: This result indicates the efficacy of the Edmond strain of the live attenuated vaccine used in the State and the immune status of the children to measles infection. A study that will involve larger sample size and the entire region to identify high risk pocket areas is recommended.*
**KEYWORDS**: Measles, HI, Antibodies Titers, Nigeria.

## INTRODUCTION

One of the most common childhood fevers associated with respiratory symptoms such as nasal discharge and suffusion of the eye, which is often followed by a characteristic maculopapular rash and koplik's spot lasting 2-5 days is the viral infection known as measles (Rubeola). Despite vaccination programs, and availability of an effective vaccine, this infection continues to experience outbreaks (Jacob et al,2006) .The infection is transmitted by droplets and respiratory secretions from an infected person. Though the infection may be uncomplicated, the disease can result in life threatening pneumonia, post infection encephalitis or sub-acute sclerosing pan-encephalitis (Burnett et,al.2005)

In advanced countries such as the United States, vaccination has greatly reduced the incidence of the disease (measles), but it remains a serious problem in developing and impoverished countries and is associated with high morbidity and mortality from accompanying pneumonia and malnutrition and thus remains highly contagious ( Burnett 2005).

## MATERIALS AND METHODS

### Study Group

An age range of 2-21years was chosen for this study, with children from Nursery schools, primary schools, secondary schools and colleges as the target group from some schools in Lafia metropolist of Lafia L.G.A.,Nasarawa State, Nigeria. A total of two hundred and thirty five (235) subject's samples were assayed in the study.

### Ethical Consideration

Ethical clearance was obtained in accordance with the code of ethics for biomedical research involving human subjects. Official consent of the School authority, parents and the subjects were also obtained.

### Exclusion and Inclusion Criteria

The subjects who indicated willingness to participate in the study, having records of measles vaccination and not above 21years of age were included in the study, while those who are less than one year and have no records of measles vaccination were excluded.

### Sample Collection

Three (3) mls of blood samples was collected from each of the 235 volunteers, and the serum from each specimen was separated into a cryo-vial and stored at $-20^0$c until analyzed.

### Source of Antigen.

The antigen used, was obtained from the measles vaccine collected from the National Program on Immunization unit (NPI) of Plateau State ministry of health. The Measles vaccine which is live attenuated (Freeze-dried) is prepared from the Edmonston strain of measles virus attenuated by twenty-two passages on human diploid cells (HDC) and is known as the Edmonston – Zagreb strain. The lyophilized vaccine is provided with diluents and the vaccine meets the requirement of WHO when tested by the method outlined in WHO (1994) requirement for vaccine production, Hsiung,2005.

### Potency of the Vaccine

Each single human dose of the vaccine contains $1000CCID_{50}$ of live virus particles when reconstituted in a volume of 0.5ml. Stability data shows that the vaccine retains the potency of $1000CCID_{50}$ per dose after 1 week at $37^o$c Hsiung, 2005

### Cultivation of the Antigen

A grown monolayer of Vero cell in a tissue culture bottle obtained from the viral Research Division of National Veterinary Research Institute, Vom, Nigeria was used for the inoculation of the vaccine antigen. After 72hrs, maximum development of the CPE was observed using an inverted microscope. The tissue culture growth was then frozen and thawed three times to reduce the virulence of the virus. The measles virus culture was then centrifuged at 3000rpm for 20 minutes using a refrigerating centrifuge to obtain suspension of the viral particles which were then dispensed in aliquots of 1mls into cryovials, and stored in the freezer, ready for use.

**Susceptible Erythrocyte**

The susceptible erythrocyte (Red blood cell) used was obtained from Patas Monkey in Jos Zoo of the National Museum and Monument as described by Hsiung and Fong (1982).

**Technique**

Haemagglutination inhibition test (HI) was used to measure the measles antibodies as described by Brooks *et al*, (2004) and the resulting titers from the various assays are as contained in the table of results.

**RESULT.**

Of the two hundred and thirty five (235) subjects aged 2-21 years, whose samples were assayed, 112 (47.7%) were females and 123 (52.3%) were males. Overall 222 (94.5%) had antibodies to measles, out of which 106 (45.1%) were females and 116 (49.36%) were males.

**Table 1** show the distribution of measles antibodies according to age, with age group 2-6 years, showing 18 (7.7%) samples assayed with 17 (7.2%) positive while age group 7-11years shows 41 (17.5%) samples assayed with 38 (16.2%) positive and age group 12-16 years shows 125 (53.2%) samples assayed with 120 (51.1%) positive while age group 17-21years shows 51 (21.7%) samples assayed with 47 (20.0%) positive.

**Table 2** shows the distribution of measles antibodies according to sex**,** and from the two hundred and thirty five (235) samples assayed, 112 (47.7%) were females with 106 (45.1%) positive, while 123 (52.3%) were males with 116 (49.4%) positive (P=0.521).

**Table 3** shows the percentage occurrence of the haemagglutination inhibition antibodies titers across the groups with an occurrence of undetectable antibodies titer of 5.5% with detectable titer as follows; 4 (6.8), 8 (6.0), 16 (7.2), 32 (34.1), 64 (38.3), 128 (0.8) and 512 (0.4) respectively.

**Table 4** shows the prevalence of measles antibody titer among the sampled subject, giving a prevalence of 94.5%.

**TABLE 1: DISTRIBUTION OF MEASLES HEAMAGGLUTITION-INHIBITION ANTIBODIES TITERS OF THE SUBJECTS IN NASARAWA STATE.**

| Titers | Frequency | Percent |
|---|---|---|
| 0 | 13 | 5.5 |
| 4 | 16 | 6.8 |
| 8 | 14 | 6.0 |
| 16 | 22 | 9.4 |

| | | | |
|---|---|---|---|
| 32 | 88 | 37.4 | |
| 64 | 79 | | 33.6 |
| 128 | 2 | 0.9 | |
| 512 | 1 | 0.4 | |
| Total | 235 | | 100.0 |

**TABLE 2: DISTRIBUTION OF MEASLES HAEMAGGLUTINATION – INHIBITION (HI) ANTIBODIES TITERS ACCORDING TO GENDER IN NASARAWA STATE.**

| | | | Status of Titers | | |
|---|---|---|---|---|---|
| | | | Negative | Positive | Total |
| Gender | Male | Count | 7 | 116 | 123 |
| | | % of Total | 3.0% | 49.4% | 52.3% |
| | Female | Count | 6 | 106 | 112 |
| | | % of Total | 2.6% | 45.1% | 47.7% |
| Total | | Count | 13 | 222 | 235 |
| | | % of Total | 5.5% | 94.5% | 100.0% |

P > 0.05 X= 0.450

**TABLE 3: DISTRIBUTION OF MEASLES HAEMAGGLUTINATION – INHIBITION (HI) ANTIBODIES TITERS ACCORDING TO AGE GROUP**

| | | | Status of Titers | | |
|---|---|---|---|---|---|
| | | | Negative | Positive | Total |
| Age group | 2-6 | Count | 1 | 17 | 18 |
| | | % of Total | .4% | 7.2% | 7.7% |
| | 7-11 | Count | 3 | 38 | 41 |
| | | % of Total | 1.3% | 16.2% | 17.4% |
| | 12-16 | Count | 5 | 120 | 125 |
| | | % of Total | 2.1% | 51.1% | 53.2% |
| | 17-21 | Count | 4 | 47 | 51 |
| | | % of Total | 1.7% | 20.0% | 21.7% |
| Total | | Count | 13 | 222 | 235 |
| | | % of Total | 5.5% | 94.5% | 100.0% |

**TABLE 4: PREVALENCE OF MEASLES HEAMAGGLUTINATION- INHIBITION ANTIBODY TITER OF THE SAMPLE SUBJECTS IN NASARAWA STATE.**

| Status | Number | (99 Percent |
|---|---|---|
| Negative | 13 | 5.5 |
| Positive | 222 | 94.5 |
| Total | 235 | 100.0 |

P value <0.05. X=85.87

## DISCUSSION

The study which was carried out in some schools (Nursery, Primary and Secondary) around Lafia Metropolist area Lafia Local Government of Nasarawa State had two hundred and thirty five (235) samples assayed for measles antibodies. From the results, measles positive antibodies titers were observed to cluster around 32 and 64 in most of the samples across the groups with a group percentage titer of 37.4% and 33.6% respectively. A second cluster was observed around 4, 8 and 16 with a group percentage titer of 6.8%, 6.0% and 9.4% respectively. A lowest titer of 4 and a highest titer of 512 was also observed with a group percentage titer of 6.8% and 0.4% respectively (Table 1). This HI antibodies clusters agrees closely with the report of Deepti *et al*, (2001). The study however gave a total of 222 (94.5%) antibody prevalence (Table 4).

From the distribution of measles HI antibodies titer according to gender (Table 2), it was observed that males had more antibodies than the females among the subjects assayed. Statistically, this was not significant at P value = 0.591. A report by Chen SSP (2009) [3], identified excess mortality following acute measles infection among females at all ages.The distribution of measles HI antibodies according to age groups (Table 3) was observed to increase simultaneously among the age groups, with the highest percentage antibodies titer among age group 12-16years.This trend could be due to chances of exposure to subclinical measles infection with age, in addition to the vaccination already received at nine (9) months of age. A report by Itoh et al (2002)[12] identified a decline in the antibody titer as the children grew, until subjects reached the age of 15 to 19years, and then increase again during their twenties. However, the trend in this study could be attributed to the outcome of the pocket outbreak in Jos and environs at about the time of this study.The positive titer of most of the samples across the groups indicates a high level of vaccination coverage and seroconversion. The relatively high titer of some of the samples across the age groups also indicate a possibility that some of the children must have suffered from clinical and or subclinical measles infection at some time (Albrecht et al, 1977).

However, the outcome of the undetectable antibodies and some low titer across the groups especially when it is noted that all these children have received measles vaccination at nine months of age indicates a possibility of some primary vaccine failure, which could be due to persistence of maternal antibodies (Wood et al, 2005)or improper storage and handling of vaccine (Meissner et al,2005) receipt of immunoglobulin, genetic factors and other

incompletely understood factors ( IRIN ,2005). or cases of non-vaccination or religious or political objections (Helfand et al,2008) and therefore emphasizes the need for surveillance and improvement of the vaccination program. It is also important to observe that not all children who received a single dose vaccine at nine (9) months of age will develop a protective response.

The study therefore raises the need for a second dose of vaccination according to WHO recommendation (IRIN ,2005). Before the age of two years or at a later years or a more appropriate period to reduce the number of primary vaccine failure and or cases of non-vaccination and to boost titers in all children and age groups. This is the practice in several developed countries including United States which have helped to achieve a substantial reduction in the incidence of measles due to the initiation of a two dose measles vaccine strategy *(*Itoh *et al,2002).*

The need for more epidemiological studies on a large scale, to identify high risk pocket areas, and to provide data needed to design and evaluate alternative methods of measles disease control and to assess immunization programs and vaccination is therefore recommended.

In conclusion, this serological study by haemagglutination inhibition technique on two hundred and thirty five (235) children samples, aged 2-21 years, showed 94.5% measles antibodies prevalence. This indicates the effectiveness of the Edmonston strain of the live attenuated measles vaccine. This finding is in agreement with previous studies by Deepti et al (2001) and Baba et al (2007) on measles antibodies prevalence. This agreement may be due to the same haemagglutination inhibition serological technique employed. Some other specific technique e.g. Enzyme link immunoassay (ELISA) and or serum Neutralization test (SNT) may be employed to measure out any difference in sensitivity of the techniques.

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