The levels of measles antibodies in Nigerian children aged 0–12 months and its relationship with maternal parity

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SUMMARY

Six hundred and fifty-seven children aged between 0 and 12 months were randomly chosen and studied for measles antibody titres by the haemagglutination inhibition (HAI) test. The results showed significant variations in HAI antibody titres. Children between 0–3 months showed high measles HAI antibody titres which declined to a trough between 4 and 6 months. A rise in HAI antibody titre was observed from 10 to 12 months age. Multiparity and higher age in the mothers were noted as probable factors influencing the titres of measles HAI antibody in children. The results indicated that with increased maternal parity, measles HAI antibody titres in the children declined.

INTRODUCTION

Measles is an acute, infectious and deadly disease of man with a world-wide distribution. In Nigeria, measles is endemic; malnutrition and tuberculosis are prediposing factors and also aggravate the clinical state of measles (Noel, 1979). The regular epidemics of measles with their complications in all parts of Nigeria are in many ways worse than malaria (Morley, Woodland & Martin, 1963) and their frequency raises doubts about the value of the yearly immunization campaigns.

Different optimum ages for vaccination have been suggested based on various studies. Ogunmekan, Braken & Harshall (1981) and Sinha (1980) suggested that children should be vaccinated at the age of 6 months, while El-Karim & Salih (1981) suggested between 1 and 3 years. Janout (1978) reported possible re-infections in some vaccinated patients and Albrecht *et al.* (1977) indicated that immunizing children under the age of 1 year could allow later reinfection because maternal antibody had inhibited a proper immune response.

This study was undertaken to establish the age when maternal antibodies decline and to determine the appropriate age for vaccination against measles in the Nigerian environment. Furthermore, it was intended to explore the effect of maternal parity on the measles antibody levels in subsequent children.

The haemagglutination inhibition test (HAI) was used in this study as the most

sensitive and accurate method of measuring humoral immunity to measles (Enders-Ruckle, 1965).

MATERIALS AND METHODS

Collection of sera

Specimens of blood were collected by venepucture from 657 children under 1 year old attending the Pediatric Unit of Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria. From each blood sample, the serum was separated and stored at -20 °C with drops of 1 % sodium azide as a preservative.

The haemagglutination inhibition (HAI) test

The HAI test was carried out as described by Rosen (1961). Non-specific inhibitors were removed from the sera by absorption with 25 % kaolin and 50 % patas monkey erythrocytes as described in our previous paper (Odama et al. 1980).

RESULTS AND DISCUSSION

Any detectable level of HAI antibody to measles indicates immunity to measles (Krugman, 1977). In this study, the results indicated that age plays a significant influence on the measles antibody titre. Antibody titres were high in the age group 0–3 months, declining to a geometric mean titre (GMT) of 40·60 in the age group 4–6 months. A further decline to GMT of 35·21 was observed in the group 7–9 months (Fig. 1). However, thereafter there was a rise of HAI antibody titre to GMT of 65·10 in the age group 10–12 months. The age ranges in which a minimum average titre was found are the same as those reported by Ogunmekan, Braken & Harshall (1981) for the lowest proportion of children with detectable measles antibody.

The high HAI titre observed in the age group 0–3 months are likely to be due to the presence of maternal antibody levels which decline with age in children, with those of 7–9 months of age showing the lowest levels of measles antibody. This study seems to support 6 months as the appropriate target age for measles vaccination campaigns in this country.

Enders-Ruckle (1965) also observed declining levels of antibody in children 5–8 months of age, while Sinha (1980) indicated that infants have passive immunity up to 6 months to counteract the virus. In this study, there was an increase in measles HAI titre by 10–12 months of age, probably due to exposure of the children to wild-type virus and consequent natural infection, or it may be due to vaccination.

It was shown by Albrecht et al. (1977) that immunizing children under 1 year of age can allow infection later following poor antibody production due to existing maternal antibody circulating in the child preventing the vaccine virus initiating an immune response. Eghafona et al. (1979) suggested that later infection by wild measles virus in some previously vaccinated children was due to improper conditions for storage of vaccine leading to a loss of antigenicity and hence in immunogenicity. However, because of the seriousness of measles infections in Nigeria the target age group of 6–8 months is appropriate, and those children receiving vaccine should be tested for seroconversion.
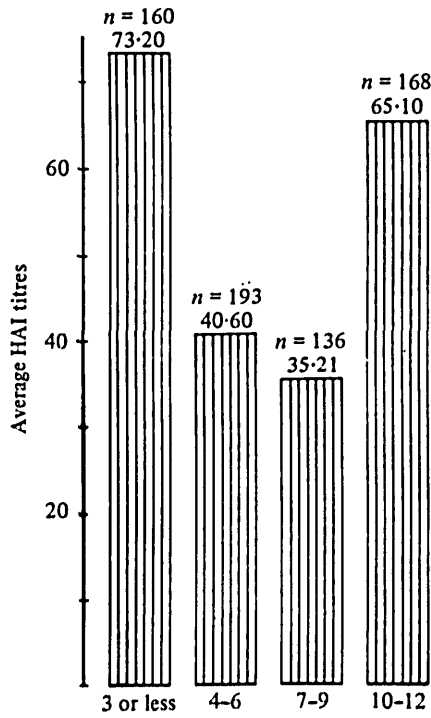
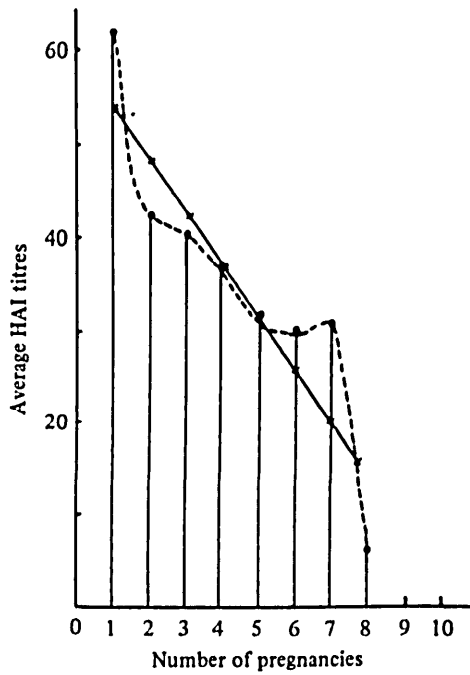Fig. 1. Distribution of average HAI titres among age groups.

Fig. 2. Relationship between average HAI titres and number of mother's pregnancies.

The relation between the number of maternal pregnancies and the average HAI titres were examined by regression analysis. This indicated that antibody levels decreased with the number of pregnancies (Fig. 2). Multiparity and a greater age in the mother have been shown to be associated with poor transfer of maternal antibody to the children (Sinha, 1980), leading to a higher incidence of measles in children under 6 months of age because of earlier maternal antibody decay.

Nigeria, as well as other developing countries of the world, is noted for high levels of maternal multiparity. Therefore the results presented in this study highlight the importance of taking into consideration maternal parity levels in any vaccination campaigns against measles.

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