Seroconversion rate following measles vaccination

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(Key words: ELISA technique, anti-measles IgG.)

Abstract

Objective To assess the seroconversion rate following measles vaccination in Sri Lankan children.

Design A descriptive study.

Setting Immunisation clinic, Lady Ridgeway Hospital, Colombo (LRHC).

Subjects 134 infants who attended the LRHC for measles vaccination.

Measurements Pre- and post-vaccination blood samples were collected and serum was tested for the presence of anti-measles IgG antibodies using the ELISA technique.

Results Of the 134 infants only 102 were brought for the post-vaccination sample. Of these 102 samples, 101 were negative for anti-measles antibodies before vaccination. Of the 101 sero-negative samples 94 became sero-positive 6 to 8 weeks after vaccination. These results indicate that the seroconversion rate is 93.06%, which is similar to the results of studies done in other countries.

Conclusion Most infants are susceptible to measles infection by the age of 9 months, and it is appropriate to vaccinate infants at this age, as is the practice at present. However, further studies are needed to assess the duration of protection with a single dose of measles vaccine.

Introduction

The measles virus is a member of the *Morbillivirus* genus in the *Paramyxoviridae* family. In developing countries measles is generally more severe than in developed countries, and affects younger children (1). Amplification of the virus in the local lymph nodes produces a primary viraemia, which results in the spread of virus to multiple lymphoid tissues and other organs including skin, kidney, gastrointestinal tract and the liver (2,3). Replication of virus in these organs leads to a secondary viraemia which coincides with the prodromal phase of measles infection (4,5). Measles infection induces both humoral and cellular immune responses. Antibodies against measles are first detectable with the appearance of the rash. Measles virus specific antibody is initially IgM and later IgG₁ and IgG₄ (6).

These antibodies can be measured by immuno-precipitation, enzyme linked immunosorbant assay (ELISA), complement fixation test (CFT), haemagglutination inhibition test (HAI), and the plaque reduction neutralisation test (PRNT).

In Sri Lanka immunisation against measles was incorporated in the expanded programme of immunisation (EPI) in 1994, and the vaccine is administered to infants at the completion of 9 months of age. With the introduction of measles vaccine, the incidence of measles has decreased in Sri Lanka, although a few outbreaks have occurred from time to time. Though the incidence of measles has gone down with the introduction of the measles vaccine to the EPI, no serological studies have been done so far to assess the seroconversion rate. The objective of the present study was to assess the seroconversion rate following measles vaccination in Sri Lankan children.

Materials and methods

134 healthy infants who attended the LRHC for the measles vaccine were selected as the study sample. The study protocol was explained to each parent or guardian, and informed consent was taken before enrolling the infants for the study.

The inclusion criteria were: infants who have completed 9 months of age, infants who have not had a long standing illness in the recent past, infants who are not on immunosuppressive therapy, infants who have not had measles or measles-like illness, and infants who have not received blood or blood products during the past 3 months.

2 ml of venous blood were drawn as the pre-vaccination sample from all infants enrolled for the study. 0.5 ml of Schwarz strain of live attenuated measles vaccine containing a virus dose of 1000 TCID₅₀ was administered subcutaneously on the upper arm of each infant on the same day. 2 ml of venous blood was drawn as the post-vaccination sample 6 to 8 weeks after vaccination. Each blood

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sample was allowed to clot and the serum was separated. Serum samples were stored at -20°C until testing was carried out. They were tested for the presence of anti-measles IgG antibodies by the ELISA technique, according to the manufacturer's (Behringwerke AG, Marburg) specifications.

Results

In spite of written reminders only 102 out of 134 infants were brought for the post-vaccination sample, a drop-out rate of 32.2%. The 32 infants who did not report were excluded from the study.

Of the 102 pre-vaccination samples that were tested, 101 were negative for anti-measles IgG antibodies. Of the 101 seronegative infants 94 became seropositive 6 to 8 weeks after vaccination. This shows a seroconversion rate of 93.06% (Table).

Table. Serologic response following measles vaccination

Infants	Number	Number (%) seroconverted
Seronegative	101	94 (93.06)
Seropositive	01	0
Total	102	94 (92.15)

Discussion

Our study shows a seroconversion rate of 93.06%. This rate is not significantly different from the expected rate of 95% ($Z=2.55\%$). The results of our study are similar to those from other countries such as India, Thailand and Russia that show seroconversion rates of 92.5%, 93.0% and 95.0% respectively (7,8,9). 7 infants did not seroconvert, giving a failure rate of 6.93%.

One important reason for primary vaccine failure is vaccination at an early age, because the presence of maternal antibodies interferes with seroconversion following measles vaccination (10). Administration of a vaccine with low potency from improper cold chain maintenance, and poor administration practice may also account for some vaccine failures (1). The infants who did not seroconvert in our study were negative for measles virus antibodies before vaccination, so that they would not have had maternal anti-measles antibodies at the time of vaccination. All infants were vaccinated at the LRHC where a proper cold chain was maintained, and well-trained staff nurses administered the vaccine.

In spite of adequate immunisation coverage, out-

breaks of measles have been reported in Sri Lanka (11). According to data given in one study, only 2 out of 69 (2.9%) clinically diagnosed patients were less than 9 months of age of (12). This low percentage of cases below 9 months justifies the national policy of administering the vaccine at the end of 9 months of age. Further studies are needed to assess whether the immunity is short-lived or sustained over a long period, as the duration of protection given by a single dose of measles vaccine is unknown. Much of what is known about the immune response to measles vaccine is from studies in children in developed countries (1). Studies in developing countries are needed to determine the role that malnutrition and concurrent illness may play in the immune response to measles vaccine.

Our study indicates that most infants are susceptible to measles infection by the age of 9 months. Hence it is appropriate to vaccinate infants against measles at 9 months of age as at present.

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Cardiovascular effects of improved glycaemic control: questions answered by the UK Prospective Diabetes Study, published in late 1997 (1)

Is there evidence for adverse effects of sulphonylureas on cardiovascular risk, as suggested by the University Group Diabetes Program, perhaps related to effects on the potassium-adenosine triphosphate channel?

There was no evidence for different effects on the incidence of myocardial infarction or case fatality between insulin and sulphonylureas, suggesting that this is not an important consideration.

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