Serosurvey of rubella in five blocks of Tamil Nadu

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**Background & objectives:** Rubella, normally a mild, self-limiting disease characterized by rash, fever and lymphadenopathy, is a vaccine preventable disease. It carries little morbidity and apparently only minor complications in children. Infection during early pregnancy may lead to congenital rubella infection. Presence of rubella specific IgG in an unvaccinated population is a long term marker of previous rubella infection, which helps to assess the immune status of that population. Though many seroprevalence studies on rubella have been reported earlier from India, no study has been conducted in recent years. We undertook this study in 2003 in five blocks identified by the Integrated Child Development Scheme (ICDS), in the five districts of Tamil Nadu to assess the immune status to rubella in two age groups (1-5 yr boys and girls and 10-16 yr adolescent girls) before vaccination and draw strategies for future vaccination programme.

**Methods:** A total of 300 blood samples were collected by vein puncture from girls and boys of 1-5 yr age and adolescent girls of 10-16 yr age. Samples were tested for the presence of rubella specific IgG antibody by ELISA.

**Results:** Of the 300 samples tested, 145 (48.3%) were negative for rubella IgG antibodies. The seronegativity was 82.2 per cent in 1-5 yr and 13.5 per cent in the 10-16 yr age groups, the difference was statistically significant (P<0.001).

**Interpretation & conclusion:** Large percentage of children, 82.2 per cent in the 1-5 yr age group and 13.5 per cent in 10-16 yr population were susceptible to rubella infection highlighting the fact that there was a risk of congenital rubella syndrome. There is a need to implement routine measles, mumps, rubella (MMR) immunization programme for under five children and mass scale one time immunization with monovalent rubella vaccine for adolescent girls.

**Key words** IgG antibody estimation - MMR vaccine - rubella serosurvey

Rubella is a common cause of maculopapular rash illness with fever. The disease has minor complications unless it is contracted in the first trimester of pregnancy, when it can infect the foetus and cause the devastating condition of congenital rubella syndrome (CRS). As per the World Health Organization (WHO) estimate worldwide more than 100,000 children are born with CRS.
Persons are generally presumed immune to rubella if they have documentation of vaccination with >1 dose of measles, mumps, rubella (MMR) vaccine or other live rubella containing vaccine administered on or after the first birthday or have laboratory evidence of immunity. In India, rubella vaccine has not yet been incorporated into the National Immunization programme. In developing countries, rubella outbreaks can occur without clinical recognition, even in a community in which health is being monitored. The presence of rubella specific IgG in an unvaccinated population is a long term marker of previous rubella infection. The antibodies persist life long and said to protect the individual from rubella infection.

In India, many seroprevalence studies have been carried out in children and women of childbearing age in the last 3 decades. However, in recent time, no seroprevalence study has been reported. The present study was undertaken to assess the percentage immunity among the study population before commencement of vaccination. The study was conducted in two age groups, 1-5 yr male and female children, adolescent females 10-16 yr, in the five blocks of five districts of Tamil Nadu, India, as identified by Integrated Child Development Scheme (ICDS) in 2003 for immunization coverage.

Material & Methods

Study area: Tamil Nadu consists of 30 districts. Each district has been divided into a number of health blocks for catering to the health needs of the community. The present study was conducted in five blocks of five districts of Tamil Nadu as identified by the ICDS, Government of Tamil Nadu. The selected health blocks were Annagrammam block of Cuddalore, Jeyakondam block of Perambalur, Andipati block of Theni, Kilpennathur block of Tiruvannamalai, and Anaicut block of Vellore district. After selection of the health blocks, the Balwadi centers formed a sampling frame to select two Balwadi centers in each health block. Similarly, a list of Government high schools in each health block formed sampling frame to select one school in each health block. Simple random sampling technique was used to select Balwadi and school in each health block. After the selection of Balwadi/school, participants were selected randomly from the attendance registers maintained.

The study areas were rural communities with native Tamil people residing in the area since birth. They predominantly belonged to lower and middle socio-economic status. The local economy was mainly based on agriculture. Before the collection of sample, information regarding the study was explained to the adolescent girls and school teachers. In case of children, the details were explained to their parents or caretakers. Oral consent for participation in the study was obtained. All the samples were collected during a three month period (May to July 2003).

Study population: Three hundred children were enrolled for the study, sixty from each district. In 1-5 yr age group, 152 children were included, of which 70 were male and 82 were female. In 10-16 yr age group, 148 girls were included. As per the inclusion criteria healthy children of appropriate age group who expressed their willingness to participate in this study were included. Children who did not fall in the study age group, suffering from chronic disease or were unwell at the time of sample collection were excluded.

Estimation of anti-rubella IgG antibody: Blood sample (5 ml) was collected by vein puncture, transported to the virology laboratory, King Institute of Preventive Medicine, Chennai in vaccine carrier. Serum was separated by centrifugation at 140g for 10 min at 4°C. Serum samples were stored at -20°C until tested. Rubella IgG antibody was estimated by ELISA using commercially available ELISA kit (Equipar, Italy) with standard controls from 0 to 1000 International Unit (IU) during every test run, which were provided along with the kit. The test was performed and interpreted as per the manufacturer’s instructions. The optical density (OD) was measured at 450 nm using ELISA reader (Lab system, Finland). The absorbance values of the standard controls provided in the kit and test were plotted on a graph. Samples that showed IgG antibody titre > 20 IU were taken as positive, <15 IU as negative and in between 15-20 IU as equivocal. This is in accordance with international guidelines.
Statistical analysis: It was performed using SSPS program - Chi square test was applied to find out significant difference and Fisher’s exact test wherever applicable.

Results & Discussion

Overall, 48.3 per cent (145 of the 300) of the study population was seronegative. In 1-5 yr age group, seronegativity was 82.2 per cent (125 out of 152) as against 13.5 per cent (20 out of 148) in 10-16 yr (Table). 84.1 per cent (69 of the 82) seronegativity was observed in under 5 yr children as against 13.5 per cent (20 out of 148) in adolescent girls, which is statistically significant (P<0.001). The same difference was observed in all the districts (P<0.001).

Eighty per cent (56 of the 70) of male children and 84.1 per cent (69 of the 82) of female children were susceptible to rubella infection. The difference was not statistically significant.

Our findings showed a significantly higher percentage of seronegativity in the under five age group children compared to that in adolescent girls. Studies conducted in the past in India and in Bolivia in the 1-4 yr old children have shown seronegativity ranging from 31 to 82 per cent. The limitation of the present study was that children in the age group of 6-9 yr were not included, therefore, seroprevalence in this age group was not known. However, looking at the fall in susceptibility percentage between the age groups studied, it is evident that children have contracted natural rubella infection between 5 and 10 yr of age, which has gone unrecognized. A low level of susceptibility cannot be taken to mean no risk of CRS. As per the WHO guidelines even when susceptibility levels in women are below 10 per cent, CRS can occur. The findings of the present study indicated the need to plan strategies for rubella vaccination in the under five children and conduct mass scale vaccination with monovalent rubella vaccine for adolescent girls as done in the developed countries.

Looking at the gender wise distribution in the under fives, no statistically significant difference was observed. The same was observed in a study conducted in Chandigarh in 1974, and in Bolivia and Turkey. This indicated that immunization should be given to all male and female children to reduce the circulation of virus in the community.

There is great variation in the age specific seroprevalence of rubella among countries. In some countries, rubella is predominantly a disease of childhood, while in others substantial infection continues to be evident among adults. The present study showed that the seronegativity decreased with age as shown earlier in a study conducted in Delhi.

As the districts and blocks were not random samples of whole of Tamil Nadu state, the results may not be applicable for the whole state.

In conclusion, the present study showed a higher percentage of susceptible under five population compared to adolescent girls; the prevalence rate among different districts did not vary significantly. This suggested that rubella outbreaks occurred in the past around the same period and children acquired rubella infection during their childhood. This study supported the Tamil Nadu Government’s policy of incorporating MMR vaccination to under five children and conducting mass vaccination campaign for adolescent girls as done in the developed countries.

<table>
<thead>
<tr>
<th>Age group (yr)</th>
<th>Sex</th>
<th>Cuddalore</th>
<th>Perambalur</th>
<th>Theni</th>
<th>Tiruvannamalai</th>
<th>Vellore</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No. tested</td>
<td>% negative</td>
<td>No. tested</td>
<td>% negative</td>
<td>No. tested</td>
<td>% negative</td>
</tr>
<tr>
<td>1-5</td>
<td>Male</td>
<td>10</td>
<td>60</td>
<td>11</td>
<td>72.7</td>
<td>16</td>
<td>81.2</td>
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<td></td>
<td>Female</td>
<td>22</td>
<td>86.4</td>
<td>19</td>
<td>84.2</td>
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<td>78.6</td>
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<td>30</td>
<td>80.0</td>
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<tr>
<td>10-16</td>
<td>Female</td>
<td>28</td>
<td>7.1</td>
<td>30</td>
<td>16.7</td>
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<td></td>
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<td>45</td>
<td>60</td>
<td>48.3</td>
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<td>43.3</td>
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targeting female children up to 16 yr of age. This would help to reduce the susceptible population against rubella and offer a second opportunity for measles vaccine to under five children.

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References


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