SEROPREVALENCE AND INCIDENCE OF RUBELLA IN AND AROUND DELHI (1988-2002)

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Abstract

National Institute of Communicable Diseases (NICD) has been engaged in rubella testing for serodiagnosis of the infection and screening for immunity status. The compiled and evaluated data of the work done on rubella testing for the past fifteen years has been presented here to show the trend and changing scenario of the disease in Delhi. Blood samples were from 7424 patients referred to NICD. Delhi for serodiagnosis of congenital Rubella syndrome (CRS) in malformed babies, in utero rubella infection in women and immunity status of pregnant women and women with bad obstetric history. They were tested for rubella IgG and/ or rubella IgM antibodies using commercially available reagents and kits. The data from the 15 years of testing was then compiled and evaluated. From the available data it was seen that immunity status against rubella in childbearing age group of women increased steadily from 49% in 1988 to 87% in 2002. Reported cases of CRS at NICD are also on the decline over the time period. There is periodic indication of high incidence of rubella in the year 1988; 1991 and 1998 as the reported cases of acute rubella infection in childbearing age group is high during these years.

Key words: Rubella virus, congenital rubella syndrome, serosurveillance, immunity status, in utero infection

Primary maternal rubella virus infection during the first trimester of pregnancy carries a high risk for the development of the congenital rubella syndrome (CRS) with characteristic malformations of the heart, eye and ear.1-7 Although rubella vaccination has reduced the incidence of rubella virus substantially; WHO estimates that worldwide more than 100,000 children are born with CRS each year, most of them in developing countries.8

A major section of women are immune by the time they reach childbearing age from childhood exposure to rubella virus infection.9-12 However, periodic epidemics occur among children and spread to involve the small portion of susceptible adult women, leading to epidemics of CRS.8,13-15 Infants with CRS shed rubella virus for long periods in nasopharyngeal secretions and in urine and transmit rubella infection to close contacts.8 Findings accumulated in the present study are from 15 years of rubella testing at NICD as per WHO guidelines for surveillance of CRS and prevalence of rubella in the recent past.16

Materials and Methods

The evaluated data covers the period of 15 years (1988-2002) during which 7484 blood samples were referred from Delhi based government hospitals and maternity centers to virology laboratory of Microbiology division at NICD, for serodiagnosis of rubella virus infection and/or immunity status against rubella infection. The samples belonged to the following clinical groups.

1. Congenital malformed babies (n = 1198) in the age group of new born to one year. Some of the congenital anomalies presented in the babies were cataract, deafness, bronchopneumonia, septicemia, anencephaly, microcephaly, anaemia with CHF etc.
2. Pregnant women (n = 5022), in the age group of 17-38 years, suspected for in utero infection or screening for immunity against rubella.
3. Women with bad obstetric history with recent abortion (n = 1264), in the same age group as in second group.

The samples referred to NICD belonged to mixed population of urban and rural areas but mostly from low socioeconomic strata.

Blood samples received from all the cases were clotted and centrifuged for serum separation prior to testing. All sera samples were stored at –20°C till tested. The serum samples were tested for presence of rubella IgG and/or rubella IgM antibodies. The criteria used to select cases for IgG or IgM antibody assay for rubella virus was based on clinical history. IgG antibodies were mainly tested in group 2 and 3 to see the immunity status in the cases. In group 3, IgM antibody test was carried out to see the evidence of recent exposure to rubella, the possible causative infection for the miscarriage. IgM antibodies to rubella virus was also tested in cases suspected to be having acute rubella infection and in congenital malformed babies to diagnose acute rubella
infection/congenital rubella syndrome especially in group 1. In cases where there was history of acute infection, paired serum samples were collected at an interval of 15 days and were tested by haemagglutination inhibition (in earlier part of the study) or IgG by ELISA to see fourfold rise in antibody titers.

In 1980s antibody testing was done by standard haemagglutination inhibition test\(^1\) using commercial rubella HA antigen and RBCs (0.25%) of one day old chick. Antibody titer 1:8 and above was taken as positive. In later years ELISA technique was adopted using commercial kits (Novum, Herrichson, Bio Rad, G. D. Srl., Dia. Pro. Diagnostics, Equipar, Sigma etc.). To confirm the presence of antibodies the criteria as per kit insert was used for reporting. Each time the test was performed, positive and negative controls were included and complete procedure as laid down in kit insert was followed.

**Results**

A total of 7484 samples were received from 1988 to 2002 and tested for rubella IgG and/or rubella IgM antibodies according to the case presentation following the WHO guidelines. The results are shown in table-1, 2 and 3.

A total of 2208 women bearing normal pregnancy were reported and screened for immunity status (i.e., presence of IgG antibodies) in the study period. One thousand eighty three hundred thirty four (83.06%) were found to be having protective level of antibodies and were immune to rubella virus infection while 2704 (86.90%) women with bad obstetric history showed presence of IgG antibodies indicating immunity against rubella virus, during the same period of study.

Immunity status among childbearing women in 1988 onwards showed steady rise over the period. While in late 1980s it varied from 49 to 72.33%, there was steady increase in 1990s till new millennium where it was 87 to 92 % (Table 1).

Immunity status among women bearing normal pregnancy was seen to be on lower side as compared to immunity status of women with BOH (Table 1) indicating the association of some of the BOH cases with rubella infection. This is also reflected in the data (Table 1) as whenever there was increase in number of cases diagnosed to be having in utero rubella infection, immunity status increased in subsequent years markedly in BOH group.

Prevalence of reported congenital malformed babies to NICD showed declining trend from 33% in the year 1988 to 0% in the year 2002. (Table 2) and overall, 10.46% cases were having laboratory evidence of congenital rubella infection.

As can be seen in table 3 the reported acute rubella infection in child bearing age group was high in year 1988, 1991 and 1998 and correspondingly the prevalence of children with congenital anomaly reported to NICD in these respective years or subsequent years was also higher around that period (Table 3). In the study, 1593 cases with signs and symptoms of rubella infection were reported and 7.59% were positive for rubella virus infection. The correlation between

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of samples tested</th>
<th>No. showing immunity against rubella virus (%)</th>
<th>No. of samples tested</th>
<th>No. showing immunity against rubella virus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>189</td>
<td>95 (49)</td>
<td>300</td>
<td>217 (72.33)</td>
</tr>
<tr>
<td>1989</td>
<td>197</td>
<td>97 (49)</td>
<td>467</td>
<td>331 (70.88)</td>
</tr>
<tr>
<td>1990</td>
<td>100</td>
<td>68 (68)</td>
<td>192</td>
<td>175 (91.14)</td>
</tr>
<tr>
<td>1991</td>
<td>48</td>
<td>36 (75)</td>
<td>213</td>
<td>200 (93.90)</td>
</tr>
<tr>
<td>1992</td>
<td>217</td>
<td>193 (88.90)</td>
<td>257</td>
<td>236 (91.83)</td>
</tr>
<tr>
<td>1993</td>
<td>168</td>
<td>154 (91.6)</td>
<td>167</td>
<td>144 (86.22)</td>
</tr>
<tr>
<td>1994</td>
<td>180</td>
<td>170 (94.4)</td>
<td>163</td>
<td>154 (94.40)</td>
</tr>
<tr>
<td>1995</td>
<td>162</td>
<td>143 (88.0)</td>
<td>125</td>
<td>115 (92.00)</td>
</tr>
<tr>
<td>1996</td>
<td>52</td>
<td>50 (96.0)</td>
<td>84</td>
<td>79 (94.00)</td>
</tr>
<tr>
<td>1997</td>
<td>225</td>
<td>214 (90.0)</td>
<td>219</td>
<td>212 (96.80)</td>
</tr>
<tr>
<td>1998</td>
<td>193</td>
<td>167 (86.5)</td>
<td>203</td>
<td>176 (86.70)</td>
</tr>
<tr>
<td>1999</td>
<td>67</td>
<td>61 (91.0)</td>
<td>257</td>
<td>248 (96.50)</td>
</tr>
<tr>
<td>2000</td>
<td>144</td>
<td>132 (91.6)</td>
<td>117</td>
<td>108 (92.30)</td>
</tr>
<tr>
<td>2001</td>
<td>128</td>
<td>111 (87.0)</td>
<td>202</td>
<td>181 (89.60)</td>
</tr>
<tr>
<td>2002</td>
<td>238</td>
<td>211 (87.0)</td>
<td>143</td>
<td>128 (89.51)</td>
</tr>
<tr>
<td>Total</td>
<td>2208</td>
<td>1834 (83.06)</td>
<td>3109</td>
<td>2704 (86.90)</td>
</tr>
</tbody>
</table>
nonimmunized group and in utero infection was 0.815 while it was 0.725 between CRS and in utero infection cases.

**Discussion**

Several studies have been conducted in the past to know the extent of problem concerning rubella immunity in child bearing age group etc.11-13 The sample size always remained questionable and other questions that remained to be answered were whether we should introduce universal rubella immunization, and whether there was any advantage of introducing antenatal screening.

In the present study, we have evaluated the information available at NICD on rubella in the last 15-years. The study was carried out in three clinically distinct groups. It has been found that immunity status of women of childbearing age was as low as 49% in 1988 and there was steady increase in the immunity status over the period and it is found to be as high as 87% in 2002 (data includes women bearing normal pregnancy). However, approximately 10 to 15 % of women reached childbearing age without developing immunity against rubella virus and were at high risk of contracting infection during pregnancy.

The increase in immunity status during the period in this study may be due to subclinical or clinical exposure to rubella virus as there is no policy for immunization against rubella virus infection. The higher rate of immunity status among women with BOH (86.90%-overall) as compared to women bearing normal pregnancy (83.06%-overall) points towards acquired immunity attained due to rubella virus exposure in childbearing age group.

In the year 1992, 1993, 1994, 1999 and 2000, the immunity status data shows a sudden rise in number of cases immune to rubella infection, which could be the consequence of high incidence of rubella in the previous years, though clinical correlation could not be established for want of adequate clinical data. As rubella infection is mild and in 90% of cases goes unnoticed, there is probability of unreported outbreaks and the years with high immunity status can be taken as indicator of unnoticed outbreak of rubella infection in Delhi in the absence of routine immunization against rubella virus.

The findings accumulated during the past 15 years suggest that a number of women in childbearing age group in this part of India still remain virgin to rubella infection and are predisposed to rubella infection during early pregnancy and thus at risk of delivering a malformed baby as a consequence of rubella virus infection. Rubella immunity of 75-80% among females of childbearing age group has been reported from different parts of India around mid seventies.9-12 This study shows comparatively higher levels of immunity against rubella as compared to immunity levels found in later parts of 1980s in studies carried out at Delhi while it is similar to what has been reported in late 1990s and new millennium. Of further interest is the fact that natural immunity status to rubella among pregnant women has increased significantly (87% in 2002) as compared to last reported in our study which was 53.75%.13

The statistical correlation found between the immunity status in childbearing age of women and incidence of rubella was highly significant in the present study. It was 0.815 between the non immunized (susceptible) population and in utero infection and 0.725 between in utero infection and in utero infection.
infection cases and prevalence of CRS. It can be inferred that increase in immunity status of child bearing age is accompanied by decrease in in utero infection cases and CRS cases as clearly shown in the figure.

The present study suggests the need for antenatal screening for rubella. In addition, a policy to immunize all children against rubella is called for to prevent congenital rubella syndrome. Serosurveillance of women of childbearing age should be continued and immunization policy needs to be developed for adolescent girls and/or women of childbearing age group before conception to control CRS. Vaccination of infants and assuring immunity against rubella in women of childbearing age can achieve the goal of reduction to complete prevention of CRS.

References


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