Prevalence of HI antibody titer against rubella virus to determine the effect of mass vaccination in Tehran

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Abstract

Background: Rubella is an infectious viral disease, has a worldwide distribution and is normally a mild childhood disease. Infection during early pregnancy may cause fetal death or congenital rubella syndrome. The highest risk of CRS is found in countries with high susceptibility rates among women of childbearing age. In many developed and some developing countries, large-scale rubella vaccination during the past decade has drastically reduced or practically eliminated rubella and CRS. Mass vaccination campaigns and Expanded Program of Immunization (EPI) have increased vaccine coverage in the world with a substantial impact on the reduction of rubella infections, such as CRS.

Objective: The present study was performed to evaluate the immune status against rubella before and after the mass campaign vaccination on 22 December 2003.

Study Design: A total of 320 samples were collected from the healthy subjects before and after the vaccination and 80 paired sera were collected and tested for the presence of rubella antibody using HI test.

Results and Conclusions: Based on the results, 98.1% of the population has gained anti-rubella antibody, compared with 92.2% before the vaccination. The data revealed that 98.75% of the paired subjects had rubella antibody after mass vaccination which is statistically significant.

Keywords: Rubella; Mass vaccination; Antibody titer; Haemagglutination inhibition (HI)

1. Introduction

The major clinical relevance of rubella is congenital rubella syndrome (CRS). Most women of childbearing age are immune to rubella, as defined by the presence of antibodies, because they either have been vaccinated or had the illness during their childhood (Chantler et al., 2001). According to WHO, countries wishing to prevent rubella infections should immunize adolescent girls and/or women of childbearing age. The most rapid impact would be achieved by mass campaigns preferably for young women and men (Robertson et al., 1997). The aim of the latest mass vaccination in Iran (22 December 2003) was to eliminate wide spread circulation of rubella virus. To measure the effectiveness of this mass vaccination, a cross-sectional study was conducted.

2. Materials and methods

2.1. Study design

Three different sets of serum samples were studied: (a) 320 sera were collected from the vaccinated and unvaccinated people before the mass vaccination with bivalent MR vaccine; (b) 320 sera were taken from the vaccinated population 4 weeks after vaccination; (c) paired sera were collected from 80 healthy volunteers just before the administration of the mass vaccination program and 4 weeks later.

2.2. HI test

Hemagglutination inhibition test was considered as a reference method for evaluating immunity. Sera with known HI titers were used in each run as a control. The highest dilution...
Distribution of HI antibody titer among the target paired subjects (group c) before and after the vaccination

<table>
<thead>
<tr>
<th>Antibody titer</th>
<th>Pre-vaccination (%)</th>
<th>Post-vaccination (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1/8</td>
<td>8.75</td>
<td>1.25</td>
</tr>
<tr>
<td>1/8</td>
<td>0</td>
<td>1.25</td>
</tr>
<tr>
<td>1/16</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>1/32</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>1/64</td>
<td>18.75</td>
<td>6.25</td>
</tr>
<tr>
<td>1/128</td>
<td>31.25</td>
<td>18.75</td>
</tr>
<tr>
<td>1/256</td>
<td>22.5</td>
<td>23.75</td>
</tr>
<tr>
<td>1/512</td>
<td>13.75</td>
<td>27.5</td>
</tr>
<tr>
<td>1/1024</td>
<td>1.25</td>
<td>17.5</td>
</tr>
</tbody>
</table>

of each serum, which inhibited completely hemagglutination, was taken as the HI serum titer.

2.3. Statistical analysis

The statistical analysis was performed with SPSS version 10.00. Pearson $\chi^2$ and/or Spearman’s non-parametric tests were used for data analysis, whenever required.

3. Results

3.1. Prevalence of HI antibody titer in the study population before and after the vaccination

We observed a high prevalence (98.1%) of rubella antibody after the vaccination in group (b), while 92.2% were seropositive in the group (a) before the vaccination. Significant differences were observed in the pre- and post-vaccinated groups using Pearson $\chi^2$ test ($p < 0.001$).

3.2. Characterization of the group (c) and prevalence of antibody levels in the paired subjects

Antibody levels against rubella were studied in paired sera collected just before the vaccination and 4 weeks later. Spearman’s non-parametric test employed to study the correlation between the antibody titters before and after the vaccination, and it was considered statistically significant in group (c) as is shown in Table 1.

Based on the obtained results 91.25% of the subjects were seropositive before the vaccination, while 98.7% of this population became seropositive after the mass vaccination in Iran (22 December 2003).

4. Discussion

Rubella immunization schedules in the eastern Mediterranean region vary in different countries. In some neighboring countries to Iran rubella vaccine has been scheduled for the girls aged 12–13 years, whereas in some other countries, it is given to the target group of 12–15 months old (CDC, 1996).

Immunization of both sexes reduces the number of infections and the circulating virus in the community. In order to eliminate CRS, it requires almost every susceptible person to be effectively immunized.

The data revealed that 98.75% of the subjects had rubella antibody after vaccination and the achieved correlation coefficient was ($r = 0.735$) with $p < 0.001$ using Spearman’s non-parametric test.

References

