Seroprevalence of mumps, varicella and rubella antibodies in children 1-16 years of age in eastern Turkey

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In this study, seroprevalence of mumps, varicella and rubella was investigated in 803 unvaccinated children in eastern Turkey whose ages ranged between 1 and 16 years. Mumps IgG, varicella IgG and rubella IgG antibody levels in all children were studied by enzyme-linked immunosorbent assay (ELISA) method. Information regarding socioeconomic characteristics, number of siblings and disease history was gathered for each participant. No significant difference in seropositivity was detected between girls and boys. Seroprevalence of mumps increased with age, with a seropositivity rate of 29.9% in children aged 1-4 years and of 88.8% in those aged 13-16 years. Seroprevalence of varicella increased with age, with a seropositivity rate of 26.8% in children aged 1-4 years and of 90.3% in those aged 13-16 years. Seroprevalence of rubella also increased with age, with a seropositivity rate of 47.3% in the children aged 1-4 years and of 89.2% in those aged 13-16 years. There was a statistically significant increase in the rate of seropositivity with advancing age through the group of 13-16 years old (p<0.05). In conclusion, in order to avoid mumps, varicella and rubella diseases and their possible complications, children should be vaccinated against these three diseases before the age of two, since seroprevalence increases with age.

Key words: seroprevalence, mumps, varicella, rubella.
The present study was aimed at determining the seroprevalence of mumps, varicella and rubella in children 1-16 years of age in eastern Turkey and at emphasizing the need to expand vaccination in order to prevent incidence and complications of mumps, varicella and rubella diseases.

Material and Methods
The study included 843 children between 1 and 16 years of age living in our region. After parental consent was taken, it was inquired whether or not the children had mumps, varicella and rubella vaccination. Those who had been vaccinated against mumps, varicella and rubella were not included in the study. The study was conducted with students from kindergartens, primary schools and high schools in the urban area, and was carried out between September and December 2003. Number of siblings and socio-economic status of the children were recorded for each child. Socioeconomic status was evaluated as poor (minimum wage: $250-500), middle ($500-1000) and good (≥$1000) depending on the monthly family income.

Blood (3 ml) was collected from each child in the study. Sera were separated from blood duly and stored at –30°C until serological analysis. Mumps IgG, varicella IgG and rubella IgG antibodies were analyzed using Captia mumps IgG, varicella IgG and rubella IgG kit (Biotech, Trinity, USA) according to ELISA (enzyme-linked immunosorbent assay) method. In order to determine mumps, varicella and rubella IgG antibodies, results were calculated as indicated by the prospectus. Accordingly, results below 0.90 were considered negative and those above 1.10 were considered positive. Values between 0.91 and 1.09 were analyzed again. Forty children had a value between 0.91 and 1.09, which were accepted as indeterminate results. These children were excluded from the study.

Statistical analysis was carried out with SPSS 10.0 for Windows. Chi-square ($\chi^2$) test was used for the statistical evaluation of the results obtained in the study.

Results
The study included 803 cases 1-16 years of age, with an average of 50 children from each age group (range 46-62). Of these 803 children, 444 (55.3%) were boys and 359 (44.7%) were girls, and there was no statistical difference between them (p>0.05). There was no statistically significant difference between the children in terms of seropositivity for mumps, rubella and varicella (71.1%, 69% and 72.7%, respectively, p>0.05) (Table I). Mumps, varicella and rubella seropositivity increased with age, and this increase was statistically significant (p<0.05) (Fig. 1). Particularly,

Table I. Seropositivity in Mumps, Varicella and Rubella

<table>
<thead>
<tr>
<th></th>
<th>Seropositive</th>
<th>Seronegative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Mumps</td>
<td>571</td>
<td>71.1*</td>
<td>232</td>
</tr>
<tr>
<td>Varicella</td>
<td>554</td>
<td>69.0</td>
<td>249</td>
</tr>
<tr>
<td>Rubella</td>
<td>584</td>
<td>72.7</td>
<td>219</td>
</tr>
</tbody>
</table>

*Column percentage, p>0.05

Fig. 1. Seroprevalence of antibody to mumps, varicella and rubella.
the rate of having all three diseases increased with age, and this increase was statistically significant until six years of age, but not thereafter. When age groups were considered, it was seen that mumps seropositivity was 29.9% at 1-4 years, 69.8% at 5-8 years, 92.9% at 9-12 years and 88.8% at 13-16 years. Varicella seropositivity according to age groups was 26.8% at 1-4 years, 70.9% at 5-8 years, 84.6% at 9-12 years and 90.3% at 13-16 years. Rubella seropositivity according to age groups was 47.3% at 1-4 years, 66.8% at 5-8 years, 84.9% at 9-12 years and 89.2% at 13-16 years. When seroprevalence of all three diseases was evaluated in relation to socio-economic status, it was found that mumps and rubella incidence increased as socioeconomic status declined, and this increase was statistically significant. Varicella seroprevalence also increased as socio-economic status worsened, but this increase was not statistically significant (Table II). It was established that as the number of siblings increased, the seroprevalence of all three diseases rose, and the increase was statistically significant (Table III).

Discussion
Mumps, varicella and rubella are childhood diseases that can be either symptomatic or asymptomatic. Risk of having the diseases and of being exposed to the virus increases with advancing age. Results of the study showed that seropositivity rates increased both among age groups and cumulatively with age, and this increase was statistically significant (p<0.05). When all age groups were considered together, there was a similarity between the seroprevalence of mumps, varicella and rubella (71.1%, 69% and 72.7%, respectively, p>0.05).

In the previous studies, Glikmann et al.11 found that mumps seropositivity in unvaccinated children was 90%. In a seroprevalence study including children between 1 and 15 years of age, Koç et al.12 found 63.4% seropositivity for mumps. These results are similar to the mumps seroprevalence value we obtained in this study (71.1%). When seroprevalence was considered according to age groups, it was seen that seropositivity increased with age, which is also consistent with the previous studies12,13. In a study covering unvaccinated children who immigrated to the United States, varicella seropositivity was found as 64%14. Kanra et al.5, in a study carried out in nine different cities of Turkey, established that seropositivity increased with age. But they also found that seropositivity changed according to regions. They saw that the western part of Turkey had the lowest (69.7%, Edirne) and the eastern part the highest seropositivity (83.6%, Diyarbakır). The varicella seroprevalence results we obtained resembled those in the western part of Turkey since socio-economic conditions and demographical movements of our region are similar to those used in the study of Kanra et al.5.
of western Turkey. As in mumps and varicella, rubella seroprevalence also increased with age. Previous studies also established that there was an increase in rubella seroprevalence with advancing age. In a previous study, rubella seropositivity in unvaccinated children was found as 89.7% in Turkey.

It has also been reported previously that mumps, varicella and rubella seroprevalence increased as the number of siblings increased. The relation between number of siblings and seropositivity was statistically significant in our study as well (p<0.05). This finding is important, since it shows transmission of the disease among family members.

In addition to regional differences and age, seroprevalence also varied according to socio-economic status. Even though there are studies demonstrating that seroprevalence increased with improved socio-economic status, there are also studies reporting no relation between the two. In the present study, seropositivity for mumps and rubella increased as socio-economic status worsened, but there was no statistically significant relation between varicella seropositivity and socio-economic status. This finding was attributed to the higher transmission of varicella.

In conclusion, in order to avoid mumps, varicella and rubella diseases and their possible complications, children should be vaccinated against these three diseases before the age of two, since seroprevalence increases with age. As indicated in the license of the vaccines, we recommend vaccinating children at the 12th month, and rubella and mumps vaccines between the 12th-15th months. We believe it is feasible in terms of protection to vaccinate children over six years of age, after which time seroprevalence increases, and after determination of serum seropositivity, since the diseases can have an asymptomatic course in some.

REFERENCES