Jpn. J. Infect. Dis., 56, 213-215, 2003

**Short Communication**

# Age-Specific Mumps Seroprevalence of an Unvaccinated Population of Adolescents in Ankara, Turkey

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(Received August 7, 2003. Accepted November 25, 2003)

**SUMMARY**: This study aimed to detect the age-specific mumps seroprevalence of an unvaccinated population of adolescents in Ankara, Turkey and to compare the prevaccination epidemiology of mumps with those of some other countries. Four hundred and forty adolescents (227 females, 213 males) aged 9 - 16 years who were admitted to the Adolescent Unit were included in this study. For each participant, a questionnaire was completed and mumps-specific IgG antibodies were screened quantitatively by enzyme-linked fluorescent assay. Of the 440 patients screened for mumps antibodies, 48 (10.9%) were seronegative. Mumps seronegativity according to sex and age groups were 13.6, 9.9, and 10.4% in females and 18, 10.2, and 6.2% in males in the age groups of 9 - 10, 11 - 13, and 14 - 16, respectively. Mumps immunization models similar to those of European countries might be acceptable for Turkey, but since a low vaccination coverage may shift mumps infection to older ages, mumps immunization of adolescents is important until a national mumps vaccination program with a high coverage could be sustained. The routine health supervision visit at ages 11 to 12 years is an ideal time to immunize unvaccinated adolescents.

Mumps is endemic throughout the world (1). Before the live attenuated mumps vaccine was licensed for use in 1967, mumps was a disease of children and young adults, with a peak incidence between 5 and 9 years of age (1,2). Routine mumps immunization of children interrupts the circulation of the virus in the community; hence, mumps infection may shift to older ages (2). Vaccination programs have eliminated or facilitated dramatic decreases in mumps incidence in some countries (2-4). In Turkey, mumps vaccine has not been yet incorporated into the national immunization program but measles, mumps, and rubella (MMR) vaccine may be used on a physician's recommendation or at request of the parents. The aim of the present study was to determine the age-specific mumps seroprevalence of an unvaccinated population of adolescents in Turkey and to compare the prevaccination epidemiology of mumps with some other countries.

Four hundred and forty children and adolescents (227 females, 213 males) aged between 9 - 16 years who were admitted to the adolescent outpatient clinic of Hacettepe University in Ankara, Turkey were included in the study. The study was planned to be part of the measles and rubella seroprevalence study, and was conducted in July - August 2000. Information about the study was given to the adolescents and their parents, and volunteers participated in this study. For each participant a questionnaire was completed in order to provide information on sociodemographic characteristics and previous history of parotitis. Four mililiters of blood samples were obtained through venipuncture and stored at 2 - 8°C until tested. Mumps-specific IgG antibodies were screened quantitatively with the use of enzyme-linked immunosorbent assay kits (EUROIMMUN, Laboratorium für experimentelle Immunologie GmbH, Luebeck, Germany). The cut-off value recommended by EUROIMMUN is 20 relative units (RU)/ml. Values above the indicated cut-off are to be considered positive, those below as negative. Statistical analysis was performed using the SPSS 10.0 program. Testing for statistical significance for univariate analysis was performed by the chi-square tests.

Of the 440 adolescents screened for mumps antibodies, 48 (10.9%) were seronegative. Mumps seronegativity was 11% for girls and 10.8% for boys. The mumps seronegativity rates did not differ significantly between the sexes ($P = 1.0$). Mumps immunity according to the age status of the participants is shown in Table 1. Mumps seronegativity rates did not differ significantly between ages in boys ($P = 0.092$), but it could not be evaluated statistically in girls since there were not seronegative adolescents at all ages. The adolescents of both sexes were divided into three groups in relation to age (9 - 10, 11 - 13, 14 - 16 years) and data were evaluated and compared among these groups (Table 1). Mumps seronegativity rates did not differ significantly between these groups both in girls ($P = 0.764$) and in boys ($P = 0.123$) (Table 1). Also, the adolescents were divided into two groups in relation to the area that they came from; Ankara (urban area, $n = 361$) and outside Ankara (rural area, $n = 79$). The mumps seronegativity rates were 10.8 and 11.4%, respectively, in the adolescents from the urban and rural areas, and these rates did not differ significantly ($P = 1$). Out of the 392 mumps seropositive adolescents, 150 (38.3%) of them had past medical histories of parotitis, as the remainder 242 subjects (61.7%) did not have histories of parotitis.

Studies of the epidemiology and prevalence of anti-mumps antibodies in a population are of interest not only as a way of measuring the distribution, the peak age of mumps, and the proportion of the population that is immune, but also as a way of adjusting the specific strategy for mumps immunization. The prevalence of mumps cannot be assessed without serological evidence. Serological studies have been undertaken in many countries in order to assess the proportions of

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Table 1. Mumps immunity status of the participants according to age

| Age | Female ($n$ = 227) | | | Male ($n$ = 213) | | |
|---|---|---|---|---|---|---|
| | Seropositive (%) | Seronegative (%) | | Seropositive (%) | Seronegative (%) | |
| 9 | 18 ( 85.7) | 3 (14.3) | 13.6% | 10 (62.5) | 6 (37.5) | 18.0% |
| 10 | 33 ( 86,8) | 5 (13.2) | | 31 (91.2) | 3 ( 8.8) | |
| 11 | 26 ( 86.7) | 4 (13.3) | 9.9% | 27 (96.4) | 1 ( 3.6) | 10.2% |
| 12 | 30 ( 85.7) | 5 (14.3) | | 36 (85.7) | 6 (14.3) | |
| 13 | 26 (100.0) | – | | 25 (89.3) | 3 (10.7) | |
| 14 | 29 ( 90.6) | 3 ( 9.4) | 10.4% | 31 (93.9) | 2 ( 6.1) | 6.2% |
| 15 | 32 ( 86.5) | 5 (13.5) | | 19 (95.0) | 1 ( 5.0) | |
| 16 | 8 (100.0) | – | | 11 (91.7) | 1 ( 8.3) | |
| Total | 202 ( 89.0) | 25 (11.0) | | 190 (89.2) | 23 (10.8) | |

the population susceptible to mumps by age and to obtain data regarding the prevaccination (5-9) and postvaccination (4,10-15) patterns of mumps infection, and thus to define a strategy for mass immunization and to follow-up the efficacy of the immunization program.

In Turkey, mumps vaccination was introduced in the private sector in 1989 as part of the combined MMR vaccination (16), but routine mumps immunization of children has not been yet incorporated into the national immunization program since a low coverage of vaccination may interrupt circulation of the virus in the community, and since mumps infection may shift to the older ages.

This study is a survey of the prevalence of mumps in an unvaccinated population of adolescents in Ankara, the capital city of Turkey. Our study showed that 10.9% of the adolescents, aged 9 - 16 years, admitted to the Adolescent Outpatient Clinic were mumps seronegative, meaning that they were susceptible to mumps infection. Mumps seronegativity (11% in females, 10.8% in males) did not differ significantly between the sexes. Mumps seronegativity rates were 13.6, 9.9, 10.4 in females and 18.0, 10.2, 6.2% in males between the ages 9 - 10, 11 - 13, and 14 - 16 years, respectively. Akşit et al. reported that seronegativity rates were 17 and 10% in females, and 10 and 5% in males between the ages 10 - 14 years and 15 - 19 years, respectively, in the Turkish population living in İzmir (17). Also, we did not find any significant difference among the seronegativity rates of patients from urban or rural areas. A nationwide seroepidemiologic survey is warranted to determine age-specific mumps immunity in Turkey, but the results of these studies of the Turkish population in Ankara and in İzmir suggest that the mumps seronegativity rates confirm a high risk of postpubertal infection in our country.

It has been reported that only 30 - 40% of mumps infections produce typical acute parotitis; 15 - 20% of infections are asymptomatic and up to 50% of infections are associated with non-specific or primarily respiratory symptoms (2). According to the past medical history of our participants, at least 61.7% of our seropositive cases have had asymptomatic mumps infection or clinical mumps infection without demonstrable parotitis. This also shows us the importance of serologic tests for evaluating the mumps prevalance in a population.

Large serological surveys of MMR antibodies have been performed in eight different European countries as part of the European Sero-epidemiology Network (5). It has been suggested that the prevaccination epidemiology of mumps in Europe and patterns of mumps infection in different countries were similiar, thus the use similiar models of mumps transmission might be acceptable (5). With the possible exception of Italy, there appears to be a high degree of similarity in the prevaccination rates of childhood mumps infections across European countries, such that the percentage positive as derived from serological profiles from the United Kingdom and East Germany as well as the later series of case notifications from East Germany almost coincide (5).

In England, before the introduction of MMR vaccine, a survey was carried out and the percentage of serum samples negative for antibody to mumps by age were 13 and 12% between the ages 10 - 12 and 13 - 16, respectively (6). It has been reported that in the prevaccination epidemiology of mumps in the Netherlands, 90% have acquired mumps before the age of 14 years (7). In Denmark, before routine MMR vaccination was introduced, it was found that mumps antibodies were acquired at an early age, yet 10% of the young adult Danish population was still susceptible to mumps infection (8).

A comparison of the results of our study with the prevaccination epidemiology of mumps in European countries shows a high degree of similarity. A nationwide seroepidemiologic survey of Turkey is needed for the determination of prevaccination epidemiology, but for adolescents, our study would suggest that mumps transmission patterns similar to those of European countries have appeared in Turkey.

In conclusion, models similar to those of European countries for mumps immunization might be acceptable for Turkey, but since a low coverage of vaccination may shift mumps infection to older ages, mumps immunization of adolescents is important until a national mumps vaccination program with a high coverage could be sustained. The routine health supervision visit at ages 11 to 12 years is an ideal time to immunize unvaccinated adolescents.

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