SEROEPIDEMIOLOGICAL STUDY OF MUMPS IN 74 CHILDREN 5 TO 10 YEARS OLD BY COMPLEMENT FIXATION

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ABSTRACT

Mumps is an acute contagious viral disease that usually manifests as inflammation of the parotid glands. The disease may be associated with symptoms such as parotitis, orchitis and meningoencephalitis. 85% of cases occur in children under 15 years of age. The disease is rare below two years but increases with age, reaching a maximum at 5 to 9 years. Some studies in Iran showed that the highest susceptibility to the disease was in age groups of over 70, 0 to 9, and 10 to 19 years old. Therefore the elderly, children and teenagers are susceptible to the disease. In this study the susceptibility of 74 children between 5 to 10 years old to mumps was evaluated. The results showed that 5 and 6 year old children were the most susceptible group ($p<0.05$), and 10 year old children had the lowest susceptibility. However, this study showed that there was antibody in %70 of the cases. Thus similar studies with larger samples may help us to achieve a suitable strategy for prevention and eradication of this disease in our country.

Keywords: *Mumps, Seroepidemiology, Complement Fixation Test.*

INTRODUCTION

Mumps is a viral disease that usually mainfests as inflammation of the parotid glands. Although the disease may cause parotitis, pancreatitis, orchitis, meningitis and meningoencephalitis, only one organ may sometimes be affected. In some circumstances mumps infections do not exhibit any clinical symptoms.[1-4] The causative agent of the disease is a paramyxovirus. Usually mumps occurs endemically throughout the world and the disease transmits through direct contact, saliva, and urine[5,6] 85% of infections are seen in children under 15 years old and most children are re-exposed to the virus and their immunity is boosted, which may result in life-long immunity. There is no natural immunity in this disease.[7] Infant immunity is dependent to maternal antibodies.[6] Mumps is rare in children under 2 years old, but increases and reaches its maximum rate in the 5 to 9 years old group. A study in 1990 in Tehran showed that people over 70, 0 to 9 and 10 to 19 years old were the most susceptible groups.[4] Some investigations during 1973 to 1975 in the USA and 1968 to 1984 in England also confirm these findings.[8] Complement fixation test is used as a sensitive and reliable test to detect antimumps virus (SV antigen) antibodies. Therefore in this study we used this test for determination of antimumps antibody and its titration in 74 children between 5 to 10 years old.

MATERIALS AND METHODS

Materials

Hemolysin, guinea pig complement, sheep red blood cells, mumps specific antigen, mumps negative control serum and positive control serum (Razi Institute, Iran), buffer and subjects sera (details of preparation explained in reference 9), and 96 well microplates.

Complement fixation test

This test is done in two separate steps.[9] Initially, serum samples were treated with relevant antigen and complement. The antibody in the serum interacts with antigen and subsequently with the complement. In the second step, a

hemolytic (or indicator) system was used. This system consisted of red blood cells that had been sensitized with specific antibody (hemolysin).

Procedure

2-3 mL venous blood was taken from each of the children and left in room temperature to clot. Each serum sample was centrifuged for 15 minutes at 2500 rpm and placed in a 56°C water bath for 30 minutes to inactivate its complement.

Doubling dilutions of the serum, using 0.05 mL of the serum, and starting with 1/5 dilution of each serum, end point titration of the serum was obtained. The serum dilution was carried out in 96 well U shaped microplates. The serum diluent consisted of barbital buffer (pH 7.2-7.4). 0.025 mL of the antigen was added to all of the wells except the last row and the plates were incubated at 4°C overnight. On the next day plates were placed in room temperature for a few minutes and then 0.025 mL of 1/5 dilution of complement was added to all the wells except the last row, and the plates were then incubated at 37°C for 30 minutes. After incubation, 0.025 mL of sensitized red blood cells was added to all wells and the plates were again incubated at 37°C for 30 minutes. Finally the microplates were left at 4°C for 30 minutes. The last dilution of serum that did not produce any hemolysis was considered as the antibody titer.

Controls

In this system the following controls were used:

Antigen hemolytic control: 0.025 mL antigen with 0.05 mL buffer and 0.05 mL sensitized-RBC (without complement).

Anti-complement control: 0.025 mL antigen with 0.025 mL complement and 0.025 mL sensitized RBC. Complement control: 0.05 mL buffer with 0.025 mL complement and 0.025 mL sensitized RBC.

RBC control: 0.075 mL buffer with 0.025 mL sensitized RBC.

Positive and negative serum controls.

RESULTS

In this study, 74 children between 5 to 10 years old (45 males and 29 females) were evaluated serologically. Antibody titers over 1/5 were considered as immune and under 1/5 as sensitive.[10] The results showed that 14 out of 17 (82.35%) five year olds, 5 out of 9 (55.5%) six year olds, 4 out of 10 (40%) seven year olds, 7 out of 16 (43.75%) eight year olds, 2 out of 5 (40%) nine year olds, and 5 out of 17 (29%) ten year old children had over 1/5 titers of antibody in their sera (Figure 1). These findings indicated that the group between 5 to 6 years old was the most susceptible group.

5 year old children were more susceptible than 6 year olds, while in 10 year old children the susceptibility was less. Although there was no significant difference in the susceptibility of 6 to 10 year old children, the 5 year old group showed significant differences with the others in antibody titer ($p<0.05$). The susceptibility of males and females was also evaluated. 22 cases of males (48.8%) and 15 cases of females (51%) were found to be susceptible according to our criteria. The difference was not significant.

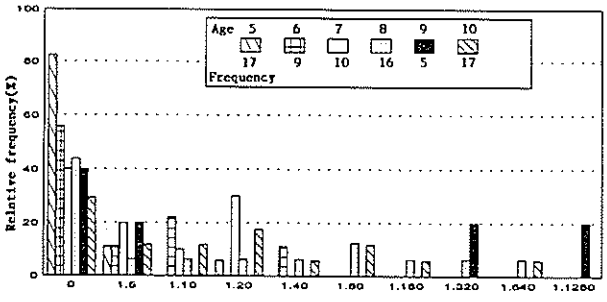

Fig. 1. Relative frequency of mumps antibody titers in different age groups.

DISCUSSION

Previous studies on mumps' immunity had revealed that the susceptibility to the disease is different by age.[11-13] According to a survey in USA susceptibility to mumps in children between 5 to 9 years old was 52%, and 90% of cases occurred in children under 14 years old.[8] A report from England indicated that 50% of 5 to 10 year old children were sensitive to mumps and immunity increased with age.[15] A study in Tehran has shown that the highest susceptibility to the disease was seen in 0 to 9 year olds.[4] The present study also showed that the 5 year old children were the most susceptible group and 10 year olds had the least susceptibility. This study indicated that the susceptibility to the disease decreased with advancing age. Our findings also showed that 50% of the population was susceptible to the disease.

According to a report from England, 89% of children under 15 years old had anti-mumps virus antibody, and there was no significant difference in antibody titer in the 15 to 50 year old group. The present study also indicated that 8 to 10 year old children had higher antibody titers and higher immunity than 5 to 7 year old children. Vaccination at a lower age may prevent disease occurrence and transmission.[14] In a survey on the vaccinated population, it has been shown that disease transmission was stopped. It was also shown that 90% of children that were vaccinated at lower ages (1.5 to 2 years old) had higher immunity.[15,16] and may acquire subclinical and non-contagious infection.[17] Thus mumps control and prevention programs must be un-

dertaken before the age of 5.

Some investigations have shown that mumps antibody persists up to 10.5 years after vaccination. Another study showed that antibody titers in natural infection are higher than that due to vaccination.[16, 18] In 1967 attenuated vaccine caused antibody production in 90% of vaccinated persons.[4] According to various reports, immunity against mumps does not differ in males and females.[2,4,14,19] Our findings also show that there is no significant difference in susceptibility to disease between the two sexes. This study indicates that 5 to 6 year old children are more sensitive to the disease.

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