

## **Immunity against Measles among Vaccinated School-aged Children in Zahedan, Southeast of Iran**

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(Received 5 Jun 2005; accepted in revised form 11 Dec 2005)

### **Abstract**

**Background:** In Iran, despite the use of vaccine since 1976, we are still having local epidemics especially in the children aged 15-20 years old. Since 1996, the yearly epidemics of measles have been reported in these groups in Sistan-Baluchestan province, south east of Iran. The present study was conducted to determinate the level of immunity in this target population in Zahedan.

**Methods:** A total of 375 school-aged children were selected randomly from 8 schools in four areas of Zahedan city, Sistan-Baluchestan province, Iran, in 2000-1. Sera were separated in laboratory and examined for measles antibody. The titers of antibody against measles were measured using hemagglutination inhibition method. A titer of 1:4 or more was considered as positive and protective to measles.

**Results:** A total of 298 samples (76.8%) were positive at the titer 1:4 or more. Among 375 of total cases, 349 students (93%) were vaccinated twice and 26 cases (7%) were vaccinated once. Only 78.6% of the former group was immune against measles and in the latter group, the titer of antibody was under the protective level. No significant correlation was found between seropositivity and sex ( $P>0.05$ ).

**Conclusion:** It is concluded that the present vaccination program (at 9 and 15 months of age) for production of immunity against measles in this area is insufficient. A new vaccination program (at the age of 12 months and 4-6 years of age) can bring under control the measles by increasing level immunity.

**Keyword:** *Immunity, measles, school-aged children, Iran*

### **Introduction**

Measles is an important childhood disease and an acute viral infection which is characterized by a final stage of maculopapular rash erupting successively over the neck, face, body, arms and legs. It is also accompanied by high fever (1).

The disease is very contagious and recovery from measles is the rule. But serious complications of the respiratory and central nervous system may occur (2). Measles can be prevented with live, attenuated vaccine. This vac-

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cine is administered after maternally acquired immunity wane, usually at 9 months of age (1, 2). Effective vaccination at the age of 15 months and revaccination at the beginning of school age is the best method for prevention (1, 3). A prevalence of more than 90% immunization of infants has been shown to produce disease-free zone. In addition to vaccination, infection may be prevented by the use of passive immunization (immunoglobulin) (1-3). In the late 1980s and early 1990s, however, there was an increase in the incidence of measles in other countries for example in the USA, that

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was brought under control by 2 doses of measles vaccine in the children (4-7). In 1998, there were approximately 1 million deaths attributed to measles worldwide. Failure to deliver at least one dose of measles vaccine to all infants remains the primary reason for these deaths. (1,5). Measles, now has been reported in pre-school children whom mostly are too young to be vaccinated, also measles has been reported in vaccinated school-aged children, which about half of these cases have had history of prior vaccination. These cases are thought to be the result of primary vaccination failure (5,8-10). Recently, measles has been seen in school-aged children in Iran [Mokhtari, Seddigh, unpublished works]. For example, since 1996 to 2000, measles has been reported in vaccinated school-aged children in Sistan-Baluchestan. Therefore, for detection of immunity level in vaccinated school-aged children, a seroepidemiological study was carried out in this group.

### Materials and Methods

This study was a cross-sectional survey in a time period of 6 months (Oct 2000 to April 2001) in Zahedan schools (Zahedan city, Sistan-Baluchestan province, Iran). A total of 375 cases (183 females and 192 males) from 12 to 18 y of ages, were chosen randomly among students from eight second and high schools in four areas. Based on our estimate and to obtain 65% correct estimation with 5% accuracy, 350 students was to enroll in this study, but we selected 375 cases. They were the students, who fitted the selection criteria as students who had history of vaccination, based on vaccination card and Iranian nationality. Afghanian students and students, who had not received any vaccine, were not included in the survey. After recording the demographic data, 5ml of blood was drawn from each case. These samples were evaluated by hemagglutination inhibition method (HI). According to this method and the type of kit, the titers of  $\geq 1:4$

were positive and protective to measles but the titers  $<1:4$  were negative and nonprotective. Statistical significance was tested by chi-square test using SPSS software.

### Results

Of the 375 students (183 females and 192 males) who were evaluated by HI method, 298 cases (76.8%) were positive ( $HI \geq 1:4$ ). This group was immune to measles (Table 1). The titers of HI in 77 cases (23.2%) were  $< 1:4$  and these children were susceptible to measles. From 375 cases, 93% (349) were vaccinated twice (at the age of 9 and 15 months). 78.6% of the vaccinated group were immune according to this method. Only 7% of the children were vaccinated once. The titers of antibody against measles in the recent group were less than protective level. By using chi-square test, there was no significant statistical difference between the males and females in the immunity level ( $P > 0.05$ ). Also there was no significant statistical difference in the age and antibody titers between the male and female students (Table 2).

**Table 1:** Summary of results in 375 school -aged students

Student	HI > 1:4		HI > 1:4	
	N	%	N	%
Famale	145	38.1	38	10.1
Male	153	40	39	11.8
Total	298	78.1	77	21.9

**Table 2:** Frequency of immunity against measles according to age and sex in 349 children who vaccinated twice

Age/Year	Male=175	Famale=174
	Frequency (%)	Frequency (%)
12	62	65
13	61	56
14	70	70
15	67	65
16	75	79
17	78	84
18	84	80

## **Discussion**

This study showed that %76.8 (298 cases) of total students (375) were immune against measles. In one study in Iranshahr district in 1994 by Moradi et al, among 411 vaccinated children (25-60 months), only 64/3% (271 cases) of the children under study had antibody against measles virus, while 95.6% of this group had been vaccinated. In this study 89.5% of children had been vaccinated against measles at 9 and 15 months of age and 6% of them were vaccinated only once (11). Our study showed that 93% of children had been vaccinated twice and only 78.6% of them had antibody and this is not enough for producing disease-free zone. Although, we did not observe any decrease in the immunity level following increase in age. It must be due to contact to measles virus during recent epidemics. Sarwghad et al reported that among 172 vaccinated school-aged children in Mashhad, only 71% had antibodies against measles and 29% were seronegative and non immune (12). In a study in Karaj, among 94 women (15-27 years) only 65% were immune against measles (Sedigh, unpublished work). In another study in Tehran, among 131 documented measles cases, 24.4% of children were vaccinated twice (Mokhtari, unpublished data). Since 1963, when the vaccine was licensed, the incidence of measles in the U.S.A and other countries had been decreased but in 1983s and early 1990s, however, there was an increase in the incidence of measles that was brought under control by increasing of immunization and institution of the routine use of two measles vaccines for all children at 15 months and 4-6 years of age (1-3). In north America and west Europe, reasons for primary vaccine failure include: exposure of vaccine to light and improper heat, storage of vaccine at  $>4^{\circ}\text{C}$ , vaccination in the presence of low level of passive antibody(primary vaccine failure), decrease in the immunity level following increase in age (secondary vaccine failure) (1,13). In order to

increase the immunity level against measles in Canada, changes in vaccination program was recommended (14). Now, in these countries, a second immunization, as MMR, is recommended routinely at 4-6 years of age (1, 14). Another study in Indian children, who had measles disease showed that, at least 50% of these measles cases had been vaccinated against measles at 9-12 months (15). Vaccination is not usually recommended for infants younger than 12 months of age, because the induction of immunity may be suppressed by residual transplacental acquired immunity (primary vaccine failure) (1, 2). But in recent years in Iran, two doses of vaccine was recommended at 9 and 15 month of age. Since the goal of WHO for elimination of measles in Eastern Mediterranean countries following American and European countries, up to 2010 has been determined and in order to make 95% of our population protected against measles, a change in vaccination program was necessary. A prevalence of more than 90% immunization of infants and immunity of 95% in population has been shown to produce disease-free zone (11). According to our results, it is concluded that the recent vaccination program for production of immunity against measles in this area was insufficient.

With regard to this fact, and yearly outbreak of measles in school-aged children in Iran, and a low level of immunity in this group, vaccination at the age of 12 months and a booster dose of measles vaccine at 4-6 year of age can bring the disease under control in the future. As a result, children who were vaccinated with measles vaccine before their first birthday should be considered unvaccinated and should receive 2 doses of measles vaccine according to the standard schedule. Fortunately, with mass vaccination in children and young adults under 25 years in last year (2003) in Iran, we think more children are immune. However, any one who is entering college or working in a medical facility or planning to travel overseas should be vaccinated against measles.

## Acknowledgments

This work was supported by financial grant of Research Department, Zahedan University of Medical Sciences, Iran, which is gratefully acknowledged.

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