ORIGINAL ARTICLE

SEROPREVALENCE OF MEASLES IgG ANTIBODIES IN CHILDREN OF SCHOOL GOING AGE

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Background: Measles is highly contagious infectious disease and considered to be leading cause of death among young children. Although vaccination process of measles is well ascertained but still its associated morbidity and mortality is high among children of developing countries. This study was designed to see the level of measles IgG in children in District Bagh of Azad Jammu & Kashmir. **Methods:** Measles IgG antibodies were screened in total of 250 school going children (4–8 years) in the District Bagh, Azad Jammu and Kashmir were enrolled. The subjects were grouped on age basis; Group A had children of 4–5 years, Group B comprised of children of 5–6 years, Group C contained children of 6–7 years and Group D had age 7–8 years. A The collected samples were transferred to the Molecular Virology Laboratories at National Institute of Health (NIH), Islamabad for detection of measles IgG antibodies. Measles antibodies were estimated by using kits for Enzyme Linked Immunosorbant Assay. **Results:** There were 10 (4%) children in Group A, 18 (7.2%) were in Group B, 42 (16.8%) were in Group C, and 180 (72%) children were in Group D. Out of 250 children 61 (24.4%) were detected as unprotected and 13 (5.2%) were at borderline and 176 (70.4%) had protective antibody level against the measles virus. **Conclusion:** Significant number of children is under potential risk to develop measles infection. No significant relation could be established between disease, age, and gender.

Keywords: Seroprevalence, Measles, IgG, antibodies, School-going, Children

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INTRODUCTION

Measles elimination was one of the critical elements in achieving the Millennium Development Goal of reducing the child mortality by two thirds by the year 2015. Being a member of WHO EMRO region, Pakistan adopted a resolution in 1997 to eliminate measles by 2010.[1] Measles ―a vaccine preventable disease, remains a major public health problem, killing 1 million individuals globally each year.[2] Though the number of reported cases has intensely reduced globally since the introduction of an approved live attenuated vaccine but despite the availability of the effected vaccine, outbreaks continue to occur not only among unvaccinated individuals but also in highly vaccinated communities.[3] Since the introduction of the measles vaccine in 1960s a significant decrease in the incidence rates of measles and its complications are reported in developed countries.[4] However, measles continues to cause substantial morbidity even in areas where the vaccine is available, generally because of incomplete immunization or low vaccination coverage.[5]

The reported antibody titres following natural infection are higher than the titres acquired after vaccination. Furthermore, individuals with sufficiently low antibody levels are vulnerable to measles infections.[6] In Pakistan, immunization schedule is provided by the health department in accordance with WHO guidelines. Measles vaccine schedule is routinely implemented in two doses at 9 and 15 months of life.[7] Measles outbreaks were, and are happening in different countries of the world but huge number of cases and deaths during a short period of time urges that there is need to take some serious steps to save the country from this monster of measles.[8] This study aimed to see the level of measles IgG in children in District Bagh of Azad Jammu & Kashmir.

METHODOLOGY

This study was conducted on school-going children, residing in the area of district Bagh, Azad Jammu & Kashmir. Population of this district was 283,380 according to 1998 census. The children included in this study were healthy with age ranging from 4 to 8 years. Blood samples by venepuncture were collected from 250 subjects, by random sampling after consent. Sample size was calculated using WHO sample size calculator. A peer-reviewed questionnaire was used to collect the information about the vaccination status of the participants.

The samples were collected from different primary and high schools of district Bagh covering government as well as private sector. The collected samples were centrifuged at the spot to separate the sera and to avoid the haemolysis of blood samples. All the collected sera samples in 1.5 ml Eppendorf tubes were

transferred by using specific temperature controlled containers (4 ºC) to Molecular Virology Laboratory at National Institute of Health (NIH), Islamabad for detection of measles IgG antibodies. Measles antibodies were estimated by using commercially available Enzyme Linked Immunosorbant Assay kits (Human Germany). Procedure was carried out according to manufacturer's guidelines.

All initial results of samples obtained from ELISA were fed in SPSS-17. Chi-square test was applied to see the relationship between positive antibody and sex and age of the participants, and $p \leq 0.05$ was taken as statistically significant.

RESULTS

Out of the 250 blood samples 176 (70.4%) were positive for measles IgG antibodies, 13 (5.2%) were at borderline and 61 (24.4%) were negative for measles IgG antibodies (Table-1).

Children were divided into four sub-groups. Group A consist of 10 (4%) children with age range 4–5 years, in Group B, 18 (7.2%) children with age 5–6 years, in Group C, 42 (16.8%) with age ranging from 6–7 years and in Group D, 180 (72%) children with age range 7–8 years were enrolled. In group A, 2 children (1 male and 1 female) were negative and 8 were positive. No child of this age group was at borderline. In group B, 7 children, (3 males and 4 females) out of 18 were negative, and 10 were positive and 1 male was at borderline. In group C, 30 children were positive, 2 were at borderline, and 10 were negative. In group D, out of 180 children 126 were positive, 11 at borderline, and 43 were negative for measles IgG antibodies (Table-2).

No significance could be established between positive antibody IgG and gender (Table-3. It was noted that 19% unprotected children were those who had received double dose of live attenuated vaccine.

Table-1: Distribution of measles antibody titre in groups

Groups	Measles antibody titres					
	Positive Titre		Borderline		Negative Titre	
A	Male	Female	Male	Female	Male	Female
	4	4	0	0	1	1
B	5	5	1	0	3	4
C	23	7	2	1	7	2
D	84	44	5	4	25	18
Total	116	60	8	5	36	25

Table-2: Measles IgG antibody titre according to age

Age (year)	Number	Positive		Negative	
		Number	Percentage	Number	Percentage
4–5	10	8	80	2	20
5–6	18	11	61.1	7	38.9
6–7	42	32	76.2	10	23.8
7–8	180	138	76.7	42	23.3
Total	**250**	**189**	**75.6**	**61**	**24.4**

Table-3: Measles IgG antibody titre according to gender [n (%)]

IgG Antibody	Male	Female	*p*
Positive	124 (77.5)	65 (72.2)	0.201
Negative	36 (22.5)	25 (27.8)	
Total	**160 (100)**	**90 (100)**	

DISCUSSION

The current study shows measles protection in 75.6% children between 4–8 years of age, and non-protective levels in 24.4% children. These results are the first to document the seroprevalence of measles IgG antibodies in local Kashmiri children. Presence of protective antibody level reflects good immunity for an individual against any exposure to the wild virus. Generally by using serological methods no differentiation is possible between antibodies generated either by natural infection or vaccination. For measles natural infection provides lifelong immunity, same is expected for vaccination but protection may be limited.[6]

Absence of protective antibody level against measles demonstrates that children up to 6 years age lose their maternal IgG antibody in early years of life and became unprotected for viral infection. The results of the present study are consistent with those of several other studies. Measles immunization coverage in Pakistan was 59% in 2002 and reached up to 80% in 2009.[7] The interruption of wild virus circulation with second dose has already been proved by several surveys.[9]

In developing countries infants lose their passively acquired antibodies rapidly than infants of developed countries. The duration of passive measles immunity is dependent on the maternal source of immunity, infants of mothers who have had natural measles infection have higher level of antibodies that persist in blood for longer time as compared to the infants who are born to vaccinated mothers.[10] A significant percentage of babies born to mothers who received live attenuated measles vaccine lost maternally derived measles antibodies by 6 months of age.[11]

Since WHO began the EPI in 1974, immunization has significantly decreased child mortality.[12] In most of the developing countries live attenuated measles vaccine has been integrated in the EPI schedule. However, it was suggested that if there is a likelihood of exposure, children as young as 6 months old can be vaccinated and then revaccinated when they reach 15 months of age.[13] Two-dose schedules seem to raise the seropositivity rate among communities. To increase immunization in a population increase in vaccination coverage along with revaccination at 6 years of age are important even with the early double dose vaccination strategy.[13]

There is a close relation between numbers of susceptible individuals in the society and measles outbreaks. In community regardless of high vaccine

coverage the most important reasons of the outbreaks are the failure of primary or secondary vaccine.[14]

In developing countries designing vaccination programs is one of the central problems to achieve high rates of seroconversion by vaccination at an age when maximum number of children have neither maternal antibodies nor antibodies acquired through natural infection –the 'window period'.[12] It has been reported that the window period may be overwhelmed by adopting a two-phase vaccination program in which vaccination is initially targeted at an early age [6–9 months] and then at school going age [4–7.5 years] in order to cover the susceptible individual during vulnerable period against measles infection and the second dose will boost the specific immunity as well as maintain it for a long time.[12–14]

Our study revealed a number of unprotected children with the current vaccination regimen of measles. Increasing vaccination coverage and revaccination at 6 years of age are vital even with the primary two-dose program.[13] According to some previous studies seropositivity shown by the people aged 9–15 years is 44% in Brazil, while in Poland more than 90% are protected.[15]

Our study shows that even among the children who received double dose of vaccine the number of unprotected individuals is high. About 19% of children bear negative titre who received double dose of live vaccine. A previous study also reported that children, who received the first dose at 9 month of their age, lost their immunity due to vaccine failure at a rate of 36.36% after the first year of vaccination, while this rate becomes 45.45% after two years of vaccination.[15]

There was a considerable decline in antibody positivity in our study population. A study conducted in Egypt also shows that mean antibody titre decline with increasing age among children below the age of 8 years.[16] Some previous studies reported a decline in the titre of measles antibodies gradually. On the other hand many other surveys showed that there is a remarkable rise in titre of antibody in older age groups.[17]

Some studies revealed that among females there is significantly high level of antibody as compared to male participants.[4,16,17] We found that there is no significant difference in male and female individuals. This difference may result from variation in exposure and genetics. Some previous studies conducted in Pakistan also report that there is no significant difference between male and female seropositivity.[7,18]

CONCLUSION

Significant number of local Kashmiri children is under potential risk to develop measles infectious. No significant relation could be established between IgG titre and gender.

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