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Original Article

Measles Sero–surveillance in Soldiers prior to Nation–wide Vaccination in Iran

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Abstract

Background: Measles is a contagious respiratory viral infection that accompanied with skin rash. Vaccination against measles has reduced the prevalence of the disease but sporadic measles epidemic still occurred in young people. This study, was carried out for the response evaluation of immunity against measles in Iranian soldiers living in garrisons.

Methods: In this study based on the history of measles, contact with measles cases, measles in the family and vaccination, 360 sera samples were obtained from male soldiers living in Tehran during years of 2003-2004 using ELISA method.

Results: Whereas, 48.9% and 22.5% of cases were negative for IgG and IgM respectively, 22.5% of the samples were seronegative for both IgG and IgM isotypes. The respective antibody titers of IgG and IgM were 14.45% and 36.56%. Regarding 22.5% negative cases for IgG isotype and 36.67% of positive IgM is indicative of possible latest outbreak.

Conclusion: Single vaccination against measles during childhood was not protective and requires booster injections.
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Keywords ● Measles ● IgG ● IgM ● Isotype ● Vaccination

Introduction

Widespread measles vaccination has significantly reduced morbidity and mortality rates due to measles infection. Measles outbreak continues to be a significant public health problem. However, both measles and mumps cases have occurred in vaccinated individuals.[1-3] Investigation of measles serum antibody level is an important measure for evaluation of immunity in vaccinated population and determination of diverse factors affecting protective immunity.[4] Post–vaccination measles antibody titers decline in the absence of natural infections or booster vaccination,[5] and the age at vaccination and gender may also influence the immune response.[4] Vaccination programs have resulted in a major reduction of measles infection.

Measles is the most contagious disease of human which is effectively prevented by vaccination.[6] Although, as the results of vaccination, the number of reported cases of measles is dramatically decreased worldwide, the global mortality is still

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believed to exceed one million annually.[7] Outbreaks of measles occur not only in unvaccinated individuals, but occasionally also in highly vaccinated populations.[8] Failure in measles vaccination may be due to vaccine failure in vaccinated populations, lack of antibody response after immunization, or secondary vaccine failure, waning and/or incomplete immunity.[9,10] In this regard a correlation between HLA (human leukocyte antigen) and antibody levels has been reported after measles vaccination.[11] The study of measles antibody prevalence after vaccination in different populations showed a correlation between vaccine coverage and a possibility of measles infection.[12,13] Consequently, the determination of single vaccination against measles during childhood can produce durable immunity. The objective of the present study was to measure anti measles antibody in individuals aged less than 25 years.

Subjects and Methods

In a cross–sectional study, sera samples were obtained from 360 male soldiers aged 18-25 years and living in military garrisons in Tehran, Iran, during a period of two years starting from 2002. All soldiers were asked concerning their age, history of vaccination, having measles or living in a family with measles.

Sample collection and antibody detection

Five ml blood samples were taken from individuals under study and their sera were separated by centrifugation. They were then transported, under refrigeration, to the molecular immunology laboratory of Baqiyatallah University of Medical Sciences, Tehran, Iran and kept at -20 °C until assayed by ELISA (Dade Behring, Enzygnost, Germany) for specific IgG and IgM antibodies against measles virus. The optical density (OD) was read at 450 nm by the Multiscan system. The OD of antibody titters was obtained by subtracting the absorbance of measles antigen from that of control wells.

Statistical analysis

All data were presented as mean±SD and analysed by *Student's t*-test.

Results

The results showed that from those individuals (73.3%) who had vaccination against measles virus, 27.2%, 37.2% and 8.9% were found to be positive, negative or weak for IgM isotype, while for IgG isotype this value was 38.9%, 15.8% and 18.6%, respectively. From individuals who had no history of vaccination against measles, 21.4%, 4.2% and 11.7% were positive, negative or weak for IgM isotype, while this range for IgG class was 1.9%, 2.5%, and 17% respectively. The results of IgM sera positives (36.7%) showed that 27.2% had the history of vaccination, whereas, 7.2% of them immunized against measles. The results of IgG sera positives (41.9%) showed that 38.9% had the history of vaccination, but 1.9% of these individuals were not vaccinated.

Discussion

Previous, studies have indicated that primary measles vaccine failure appears to occur in 2%–5% of vaccinated children.[3] Of course, our study is different from others because it did not measure antibody level in during childhood but measured the antibodies in male individuals at ages over 18 years. The low antibody response could be related to cytokine pattern after vaccination, as reported an immuno-suppression after measles vaccination due to cytokine production patterns.[14-17] The presence of detectable antibody levels for IgM isotype in this study is demonstrating the possibility of a small out break for the disease, cross reaction with type 1 to 4 of para-influenza virus, respiratory syncytial virus, rheumatoid factor, etc.[18] In this regard, Sauver et al have also reported a small, but significant correlation between antibody levels that were largely unaffected by race, sex, age at immunization and time since immunization.[3]

Table1. The prevalence of anti-measles antibody based on history of vaccination (HOV), having contacted to: anybody with measles disease (con), had measles disease (Dis), or being in family with the disease (Fam).

	YES				NO				MISSED			
	Vac	Con	Dis	Fam	Vac	Con	Dis	Fam	Vac	Con	Dis	Fam
HO (%)	73.3	8.3	19.4	22.0	21.4	90.3	77.5	73.0	5.3	1.4	3.1	5.0
IgM+ 36.67%	27.2	1.1	7.22	11.1	4.2	35	27.8	23.1	5.3	0.6	1.7	2.5
IgM-48.88%	37.2	3.3	8.05	7.8	11.7	44.7	39.4	38.6	0.0	0.8	1.4	2.5
IgM weak 14.45%	8.9	3.9	4.17	3.1	5. 6	10.6	10.3	11.4	0.0	0.0	0.0	0.0
IgG+ 41.94%	38.9	4.4	12.8	14.7	1.9	36.1	29.2	23.3	1.1	1.4	0.0	3.89
IgG- 22.5 %	15.8	1.7	3.9	4.4	2.5	20.8	15.6	16.9	4.2	0.0	3.1	1.1
IgG weak 35.56%	18.6	2.2	2.0	2.8	17.0	33.3	32.8	32.8	0.0	0.0	0.0	0.0

YES= vaccinated, contacted with disease, had the disease or lived in a family with the disease.
NO= had no vaccination, or did not contact with Measles, or did not have the disease or did not lived in a family who had the disease.
MISSED= missed data about vaccination, did not know if contacted with measles or lived in a family with the disease.

There observation revealed that about 25% of their populations were sero–negative for at least one component of the MMR (measles, mumps, rubella) vaccine.[3]

In support of our data, Mossong et al observed that measles antibody titers declined at a mean rate of 5.6% per annum equivalent to a half life of 12 yrs.[4] In contrary to this is observation, Johnson et al did not find any correlation between the level of antibody and the age at vaccination in 12 to 15 months infants followed for 9 to 39 months post vaccination.[14] They also demonstrated that 7% of children failed to produce detectable antibody titers, raising the possibility of correlation between low antibody levels and cytokine patterns.[14] On the other hand, Emani-Naeini and his colleagues measured IgG antibody against measles vaccine in medical students with the history of previous vaccination and reported that only 40.7% of these individuals had detectable antibody, whiles the rest were susceptible to wild measles virus.[19] The results of this study as well as Gans,[20] and Redd,[21] indicate that the current vaccination schedule should be changed to two intervals; one at childhood and the other at adult age, in order to reactivate the memorized immune response of primary vaccination.

Conclusion

The current vaccination schedule should be changed to two dose intervals; first during childhood and the other at adult age to have a better immune response to primary vaccination.

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