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Mass vaccination of measles and rubella (MR) in Guilan, Northern Iran: Evaluation of coverage and complications

F Mansour-Ghanaei[1*], H Rahimi[2], F Joukar[3], AH Bagherzadeh[1], A Heidarzadeh[4], A Rahbar[1], H Rokhshad[1], SM Rezvani[1], HA Balou[1], A Sarshad[5]

[1]Gastrointestinal & Liver Diseases Research Center (GLDRC), [2]Department of Psychiatry, [3]Nursing and Midwifery Faculty, [4]Department of Social Medicine, [5]Department of Infectious Diseases, Guilan University Of Medical Sciences, Rasht, Guilan, Iran

Abstract

Background: The notorious complications of measles and the contribution of maternal rubella to congenital malformation of the fetus (congenital rubella syndrome) resulted in inclusion of vaccination against measles and rubella in national preventive programs. The aim of the present study is to evaluate the coverage of mass vaccination of Measles and Rubella (MR) and to determine the prevalence of complications of these vaccines in the target population of Guilan Province, Iran.

Methods: This is a population based epidemiologic cross-sectional study. After completion of a nationwide mass vaccination of MR for the age group of 5-25 years in 2003, in private and governmental medical and health centers of Guilan Province, demographic and epidemiologic information about the vaccination coverage and complications were extracted from the data banks. Statistical analysis was performed using software EPI 2002. P value< 0.05 was considered significant.

Results: The target population considered for MR mass vaccination was estimated approximately 1,034,975 persons. 99.04% (1024998) of them were vaccinated from Dec. 2003 to Jan. 2004. Complications appeared in 765 cases (7 per 10000). 96% of the complications were of common types such as fever and headache, requiring no treatment. Gender difference in MR vaccine complications was significant as 5.6 per 10000 in males in comparison to 9.26 per 10000 in females. Similarly, the prevalence of complications was highest in the age group 10 to 14 years and least in the age group 20 to 25 years.

Conclusion: Mass vaccination for Measles and Rubella, aiming at eradicating these diseases, was highly successful in terms of wide coverage, positive feedback from the public and low complication rate in this region.

Keywords: Measles; Rubella; Complications; Iran

Introduction

Measles is one of the acute infectious diseases of childhood, manifesting itself with the prodromal symptoms of fever, conjunctivitis, nasal discharge, cough, and maculopapular rash.[1-4] The etiology of this disease is RNA virus of paramyxoviridae. Only one serotype of this is known at present, which is important because of high communicability.[1-3,5-8] This disease is endemic all over the world. It affects 44 million children worldwide annually, resulting in one million deaths per year.[9] All the people not infected or not vaccinated are vulnerable to this infection. Single injection of the live virus vaccine creates active resistance against the disease in 94-98% of cases, remaining for a long time period.[10] Recent studies suggest that in the populations where childhood vaccination coverage is above 90%, with the increase of age,

***Correspondence:** Fariborz Mansour-Ghanaei, MD, Professor of Medicine, Gastrointestinal & Liver Diseases Research Center (GLDRC), Razi Hospital, Sardar-Jangle Ave, Guilan University of Medical Sciences, Rasht, Iran. Tel: +98-131- 5535116, Fax: +98-131-5534951, e-mail: ghanaei@gums.ac.ir

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the level of preventive antibodies decreases gradually.[11-13] When the ratio of children or susceptible people in the population increases above 40%, it may cause a measles outbreak. Before beginning of measles vaccination in Iran since 1966 till 2000, 100,000 people suffered from measles every year, which was nearly equal to the annual birth rate. By development of expanded program of immunization (EPI), the incidence of measles reduced up to 99% in 1984.[14] According to the international reports, the development of measles coverage in Iran was 90% or higher after 1999.[15] The routine national measles vaccination program in Iran had been vaccination in 9 and 15 months after birth; however, some studies suggest that the recommended age for the first dose of measles vaccine should be lower than 9 months of age during measles epidemics, with a booster dose in 12-15 months of age.[16] The scattered outbreaks of measles in youths and young adults have been observed in recent years,[17] so that in 2002 nearly 12000 suspected cases of measles were reported to the directorate of communicable diseases in the center of disease control in the Ministry of Health and Medical Education, although the percentage of confirmed cases is not known.[18] Different reports of the serum levels of measles antibody in different age groups from the various parts of the country show controversial data.[19, 20] Despite enough vaccination coverage even with the higher preventive antibody levels, the outbreak of disease has been observed. It seems necessary to monitor carefully every geographical and ecological part of the country in order to be able to establish a successful program for eradication of the disease. Rubella-like measles is also an acute viral disease, presenting with erythematic and maculopapular rash and starting with common cold-like prodromal symptoms such as fever, but it has mild and short period.[1,21]

This disease is mild and benign in children, but if a pregnant woman is infected in the first trimester, serious fetal anomaly may appear.[1,21-24] This infection may lead to fetal death, spontaneous abortion, and other congenital anomalies such as congenital heart defects, deafness, cataract and mental retardation (Congenital Rubella Syndrome; CRS). The causative organism of rubella is RNA virus from Toga virus family.[3,21] Rubella is seen in all parts of the world; it usually happens in the spring and its periodical epidemic is every 6-9 years in societies which have not been vaccinated.[21] Some studies have shown that vaccination programs which cover less than 90% of the population may cause the variation of epidemiology leading to an increase in the number and incidence of sensitive women in reproductive age. So, the logical strategy in programming rubella vaccination should include prevention of CRS and women of reproductive age should be vaccinated among the children. In a rubella eradication program, it is recommended that besides infants and children, all the adolescents, male and female should be vaccinated so that the transmission chain of disease be broken.[4] Measles vaccination program as recommended by UNICEF and WHO includes routine vaccination (keep up immunization) and complete vaccination.[4,9] Complete vaccination includes: 1. Mass vaccination of the age group performed by the house-to-house catch up, or by the passive method. In the passive method, vaccination is performed on the people attending the specific center within a short time period. Through this method of vaccination coverage must be achieved to 95% or more in the target population.[25] Implementation of mass campaign program of all the cases left previous mass campaign or routine vaccination through mopping up campaign. Implementation of mass campaign with a 3-5 year interval for the infants born during this period (Follow up campaign), to continue the eradication of disease in the area.[4,9] In 2003, Ministry of Health and Medical Education of Iran started the mass campaign vaccination to eradicate measles and congenital rubella together.[4] This program included immunization against measles and rubella (MR) in national preventive program for everyone within the age group of 5-25 years, which covered approximately 33 million people in Iran.[26]

The present study is the evaluation and determination of the coverage and probable complication rate of the measles and rubella mass campaign vaccination in Guilan, northern Iran. Guilan Province has a total population of 2425259 people[27] (three percent of the country population) within the area of 14711 square meters (one percent of the country area). Guilan is situated at the southern Caspian Sea littoral with a moderate Mediterranean climate and it is a strategic province agriculture and fishing.

Materials and Methods

This was a descriptive cross-sectional study performed by collecting demographic and epidemiologic data from the target population. This group included the total residents of Guilan Province in the age range of 5-25 years, who were vaccinated against measles

and rubella during a mass campaign. This vaccination was out from Dec. 2003 to Jan. 2004, using inactive vaccination method through the reference of people to the health centers within the whole Guilan Province. Before vaccination, a brief interview was performed by health professionals for assessing the contraindications of vaccination and the data from referred people were recorded in the health centers. Target people were requested to report any abnormal symptoms before vaccination. In the case of any complications, reports given by the government or private medical center were recorded by the medical complication committee of each district health center, and after documenting the complication and assessing the new incidence of the complication (not seen before vaccination), it was gradually transferred to the provincial committee in case of confirmation. In this committee, the complications were confirmed by trained health professionals and faculty members of Guilan University of Medical Sciences. According to the national coordination program of this mass campaign vaccination,[4] people were informed of probable complications of MR immunization, common symptoms such as fever, rigors and rarely complication such as meningitis. Health professionals also explained the same to the subjects at the time of vaccination and requested them to report in case of appearance of complication. Data collections from all over the province were gathered to a data bank in the Excel software specially created for this purpose. Statistical analysis was done with the EPI 2002 software. Chi square (χ^2) test and independent samples-t- test were used for analysis and comparison. The significance level was 0.05.

Results

Among 1034975 Persons in the target age group, 1024998 (99.04% vaccination coverage) were vaccinated during this public vaccination. The number of female was 520229 (103 % vaccination coverage), and male 504769 (95% vaccination coverage). The total number of complications reported was 756 (7 in 10000) cases and Mean age of people suffered from these complications was 14.83±5.33 years. Gender difference of complications showed 283 (37%) in males (5.6 in 10000) and 482 cases (63%) in females (9.26 in10000). The gender difference was statistically significant. ($p<0.00001$, Yates corrected chi square).Mean age of males suffering from MR immunization complications (3.72±5.28) years was significantly different from mean age of females (15.48±5.40) years (t-test, $p<0.0001$) .Majority of complications appeared in the age group 10 to 14 years and among female subjects. The minimum complication incidence was in age group 20- 25 years and among male subjects. The number of complications in different age groups has been shown in Table 1, which is significant (Chi Square, $p<0.00001$). Figure 1 shows the complications with respect to vaccinated population in different cities of Guilan in order of relative frequencies. Figure 2 shows the ratio of vaccination coverage to the target population in the same cities. Table 2 indicates the time period from vaccination to the presentation of complication. The subjects of the study often reported simple complications such as fever and headache. These complications were subsided without medical intervention. Serious complication such as thrombocytopenia and encephalopathy was reported by only one case and seizure in 9 cases. Figures 3 and 4 show common and rare but important complications respectively in measles and rubella (MR) vaccination campaign.

Table 2: Time period from vaccination to presentation of complications

Time period	Number	Percentage
Less then 1 hour	220	28.8 %
1 – 7 hours	247	23.3%
7 – 24 hours	139	18.2 %
1 – 7 days	148	19.3 %
1 – 4 weeks	11	1.4 %

Table 1: Age group and gender difference in MR vaccination mass campaign and its complications and coverage in Guilan.

Age group	Percentage of vaccination coverage			Number of complications in each Age & Sex group			Frequency of complication per 10000		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
5- 9 yrs.	81.52	78.8	80.1	70	69	139	8.44	8.21	8.33
10- 14 yrs.	99.2	97.5	98.3	155	104	259	11.92	7.84	9.86
15- 19 yrs.	104.1	98.8	101.5	129	66	195	8.32	4.31	6.33
20- 25 yrs/	122.1	102.8	112.2	128	44	175	8.4	3.25	5.98

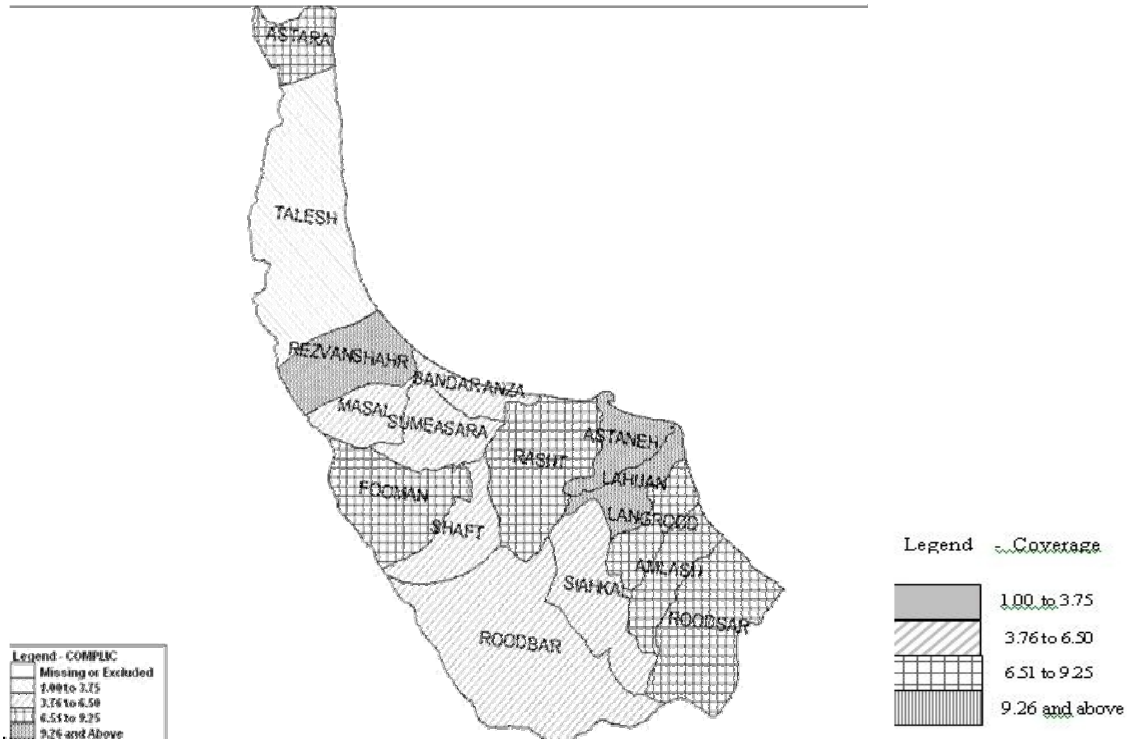

Figure 1: Complications of MR vaccine in each city of Guilan Province (per 10000 vaccination)

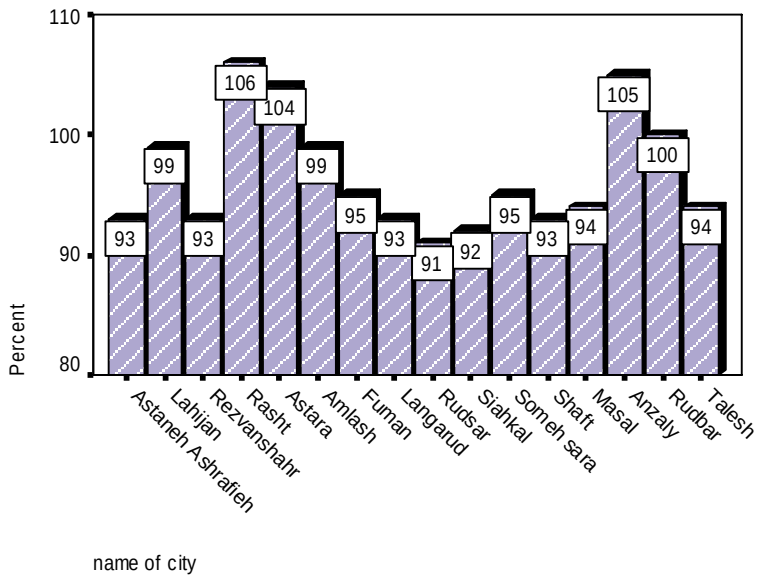

Figure 2: Diagram of MR vaccine converge in each city of Guilan (vaccine coverage=vaccinated population/target estimating population)

Discussion

As shown in the results, tables and graphs, 99.04 %(1024998 persons) of estimated population consulted for MR vaccination mass campaign. The share of females was 103% more than the estimated, while this share was 95% in male, which show the good public cooperation for the success of this program in Guilan

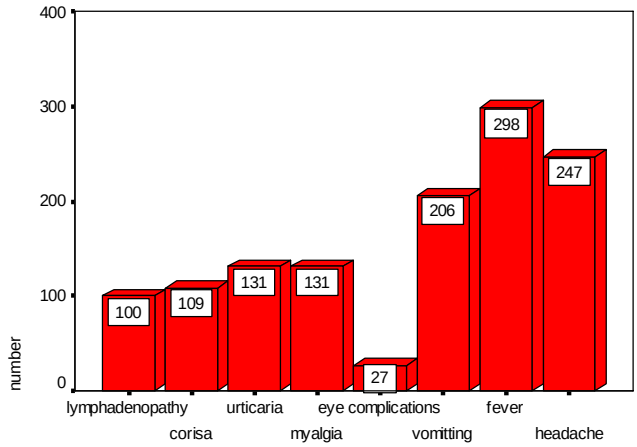

Figure 3: Distribution of MR vaccine common complications in Guilan population.

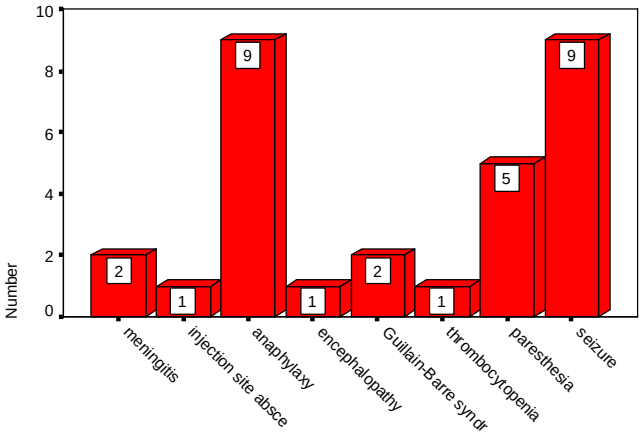

Figure 4: Distribution of important and rare MR vaccine complications in Guilan population.

province. In attention to preventive program of pregnancy, population growth was low in recent ten years and it may be a cause of fewer references of cases.

Similar study in Ardabil Province (northwest of Iran) has reported 601000 persons coverage as 99%.[26] Another study from Costa Rica regarding mass campaign vaccination for the eradication of measles, rubella and congenital rubella syndrome implemented in 2001, reports more than 95% vaccination coverage including 1635445 subjects.[28] Another report of MR vaccination coverage in 2000, from Albania has shown more than 95% in the age group 1 to 14 years.[25] Many studies have been published all over the world regarding complications of MR, MMR, hexavalent or monovalent measles or rubella vaccination and cases of local reactions such as injection abscess, fever, rashes, febrile convulsion, thrombocytopenia, Guillain-Barré syndrome and optic neuritis gave been reported[23,26,29-35] also the epidemiological evidence showing a direct relationship between increasing doses of mercury from thimerosal-containing vaccines and serious neurological disorders.[36] Vaccination related complications rate in Guilan region is very low (7 per 10000) which is comparable to the complications in other populations vaccinated for MR. This rate in Costa Rica was 6 per 10000.[28] In the present study, complication rate among female gender was significantly higher than the male gender. It may be suggested that probably female gender are immunologicaly more sensitive and female body shows more hypersensitivity reactions to vaccination. No clear information has been given by other similar studies in this regard. Complication rate in different age groups was significantly different such that prevalence of MR vaccine complications was higher in age group 10-14 years. So this may be assumed that the age is a probable risk factor for complications of MR vaccination. It seems that high number of 10-14 years olds females in this area lead to this result. Of course results of other similar studies are different in this regard.[37] Mean age of boys suffering from MR vaccine complications was significantly lower than of girls. This may be explained by the fact that larger population of young adult females at higher age group consulted for MR vaccination to prevent from congenital rubella in their off springs. In respect to time period of clinical presentation of complications, most of complications appeared between first to seventh hours of vaccination, seems to be logical in term of immunological reaction.

Our study has shown that fever and headache among the common symptoms and anaphylaxis and seizure among rare but important complications of MR vaccination have had the highest frequency, while aseptic meningitis which is a known complication of MMR[23,29,34] has shown only two per million population. Costa Rica's study did not show any aseptic meningitis. Instead skin rash, lymphadenopathy, fever; headache, arthralgia and arthritis have been reported.[28] Optic neuritis as a complication of MR vaccination as reported from Ardabil[26] has not been seen in Guilan.

We conclude that nation wide MR vaccination project for the selected age group among the young especially in young females has shown the maximum achievement. Cooperation of this population sector of present society for mass campaign vaccination was excellent. But inadequate coverage of children below

10 years, probably due to parental illiteracy, the bias in primary evaluation of the target population, warned the provincial health system for better programming of immunization in the coming years and active and persistent evaluation to detect sporadic cases of diseases among the non vaccinated population. Considering the low complication rate of mass campaign MR vaccination with a high vaccination coverage, it seems that the nationwide organized system to implement mass campaign MR vaccination and follow up its complication was adequate for the achievement of greets goal of eradication of measles and rubella.

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