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A Survey on Measles and Rubella Supplementary Immunization Activities (SIAs) in Iran

Seyed Mohsen Zahraei,[1] Mohammad Mehdi Gouya,[1,*] Mahdi Mohammadi,[2] Seyed Mehdi Tabatabaei,[2] Mehdi Zanganeh,[2] Iraj Zareban,[2] Malek Kiani,[2] Hosein Ali Adineh,[2] Azam Sabouri,[1] Alireza Ansari-Moghaddam,[2] Feiz Mohammad Elhami,[2] and Alireza Khorram[2]

[1]Center for Communicable Disease Control, Ministry of Health and Medical Education, Tehran, Iran
[2]Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran

[*]*Corresponding author*: Mohammad Mehdi Gouya, Center for Communicable Disease Control, Ministry of Health and Medical Education, Tehran, Iran. Tel: +98-2181455005, Fax: +98-2181454357, E-mail: mgouya57@gmail.com

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Abstract

Background: Supplementary Immunization Activities (SIAs) have been considered as a strategic key towards elimination of measles and rubella. This study aimed at identifying the coverage of vaccination in target population children.
Methods: The study was carried out in South-East of Iran on a total of 6838 randomly selected children. Information was collected by trained interviewers using a validated questionnaire. The data was analyzed through descriptive statistics (i.e. frequencies and percentages) and 95% confidence interval.
Results: Overall, 98.7% of children were vaccinated during SIAs campaign. Vaccination cards were available for about two-thirds of the participants at the time of home visits while 95.3% of them reportedly received an immunization card. Refusal to vaccinate (31%), not informed (24.2%), children being sick (22.4%), and travel (20.2%) were the main reasons for not vaccinating children (n = 86) during the campaign. The main sites for vaccination were school (46.5%) and health centers (46.4%). Fever (44.8%) and severe pain at the injection site (36.2%) were reported as the most frequent complications by the study participants. Prevention of measles and rubella (66.6%) and health staff recommendations (31.4%) were the main vaccination incentives.
Conclusions: To sum up, Supplementary Immunization Activities (SIAs) are a good approach towards high coverage of immunization and attain measles and rubella elimination.

Keywords: Measles, Rubella, Mass Vaccination, Adverse Effects

1. Background

Measles and Rubella are highly infectious diseases, which can be transmitted via breathing, coughing, or sneezing or direct contact with infected individuals (1, 2). Prior to a comprehensive vaccination program, an annual projected number of 2.6 million deaths occurred due to measles globally (3). However, the introduction of measles vaccine has led to significant decrease in mortality and morbidity of measles in children aged 6 to 35 months in the recent years. For example, rapid immunization activities have resulted in a 75% drop in measles deaths from an estimated 544 200 in 2000 to 145 700 in 2013. Moreover, the overwhelming majority of measles and rubella cases have been reduced by using mass vaccinations campaign during the last several decades (1, 4, 5).

Accordingly, measles is called a major vaccine preventable disease (3, 6). Vaccination coverage rates for measles should be more than 90% to interrupt the virus transmission as it is highly contagious and a small number of vaccinated people may not achieve immunity (5). As a result, the world has witnessed several measles outbreaks despite routine immunization programs by two-dose or low coverage of vaccine (1, 7). For example, Georgia experienced a measles and rubella outbreak in 2004 with 5151 and 8391 cases of rubella and measles, respectively. Importantly, 88% of rubella cases and 41% of measles cases were not vaccinated in this study (7). Similarly, Japan experienced 2 measles outbreaks in 2001 and 2007, in which the main reason was low vaccination coverage of measles (8). In 2015, a large multistate measles outbreak occurred in the US that entered the country by travelers (1).

Consequently, previous studies have shown that

achieving and sustaining coverage of > 95% with two doses of vaccine is essential to ensure high mass immunity in each region and reaching the goal of elimination of measles by the world health organization (7, 9). Therefore, most countries have been providing a 'second opportunity' for measles vaccination (5) such that the national supplementary immunization activities (SIAs) have been considered as a strategic key to increase immunity levels in target populations and to eliminate measles in the entire or large regions (9). Indeed, the Measles and Rubella Initiative focuses on sustaining high vaccination coverage by two-dose routine immunization and supplementing coverage with a second opportunity through SIAs (10).

The main purpose of SIAs is to vaccinate all children, who have been missed through the routine vaccination program aged 9 months to 14 years to eliminate any measles susceptibility in the entire population with the periodic follow-up of every 2 to 4 years (2). According to the global measles strategic plan, vaccination coverage rate by SIAs should be above 90% of target large populations (5). Consequently, entire populations were vaccinated against measles in 16 European countries via SIAs during years 2000 to 2009. The Measles and Rubella vaccination coverage in these regions were reported from 48.2% to 100% through SIAs. Additionally, in 2009, 14 of 16 countries reported no measle cases or less than one case per 1000000 individuals (9).

There is some evidence that despite the widespread availability of vaccines, measles and rubella may occur due to parents' refusal to vaccinate their child, incomplete immunization schedule, and imported cases (1). Some parents consciously choose to decline or delay vaccinating their child, or to use alternative vaccination schedules. The common refusal reasons are medical complications, pain from injections, previous measles infection, concerns about safety and effectiveness of vaccines, the ingredients in the vaccines, Parent's belief that it is unimportant for children's health, religious beliefs, or socioeconomic reasons, which were significantly contributed to non-vaccination (1, 11-15). In general, in most studies, fear of vaccine side effects was reported as the leading barrier to vaccination (1, 12, 13, 15-17).

In Iran, measles decreased significantly because of routine vaccination in vulnerable groups (18, 19). Nevertheless, current percentage of coverage is not enough for elimination of disease to fulfill WHO expectations. In accordance with the milestone of WHO, some strategies have to be done, such as high coverage of vaccination with 2 doses of measles vaccine, Supplementary Immunization Activities (SIAs), surveillance of disease, checking of measles vaccination and its efficacy as well as public confidence for immunization (20).

Undoubtedly, mass measles vaccination campaigns, irrespective of past immunization history during SIAs, could provide an opportunity to achieve and vaccinate never-vaccinated children and to reach and boost immune system of children of primary vaccine failure with a second dose. On the other hand, vaccination coverage monitoring of each campaign after the exercise is a supervisory tool and essential to review completeness of vaccination activities and to ensure that all target children are vaccinated during SIAs (8). Thus, the main purpose of this study was to estimate the coverage of vaccination in eligible children (target group for measles and rubella vaccination campaign) by an independent monitoring team, and the second purpose was to identify reasons for lack of vaccination.

2. Methods

2.1. Setting

This study was carried out in the South-East of Iran, including South of Khorasan, high risk cities in Kerman and Banadar Abbas as well as Sistan and Baluchistan province, which is located at the border of Afghanistan and Pakistan. Indeed, high risk districts in 7 cities, including Zahedan, Zabol, Iranshahr, Birjand, Bam, Jiroft and Hormozgan were identified for this survey. Principally, these districts had low economic situation and were faced with illegal migration and high number of refugees.

2.2. Study Population and Sample Size

The target populations of measles and rubella vaccination in the aforementioned districts were about 1500000 children aged 9 month to 15 years old, living in three high risk provinces of Iran. It was of interest to estimate the percentage of vaccination coverage for measles and rubella with an absolute margin of error, which was smaller than 0.015. The coverage of vaccination campaign was also expected to be more about 90%. Additionally, 95% confidence interval was required to estimate vaccination coverage within 0.015. Therefore, the minimum number of subjects needed was 1536 subjects. Furthermore, with a design effect equal 2 (1536×2) at least $3072 \approx 3100$ (155 clusters each cluster included 20 participants) subjects were needed for this study. Accordingly, a multistage random sampling method was used to select a representative sample from the target population. In the first stage, sample size allocated to study universities and districts in each city was determined by probability proportional to size of populations.

Secondly, for the purpose of this survey, all the health centers/units in the target districts in the mentioned university was listed based on geographical regions and then

the populations were calculated cumulatively. At this stage, clusters and head-clusters (the first selected household as the initial point to undergo monitoring for survey) was determined using the systematic random sampling method. Next, trained personnel referred to the first household in every selected cluster and moved from door to door in a clockwise direction to cover the entire twenty households in every cluster. Therefore, a representative sample of 3220 households from 161 clusters (each cluster included 20 households) were selected randomly to provide information for needed indicators at household level (Table 1).

2.3. Training and Field Work

Candidates for monitoring were selected based on required characteristics provided by global guidelines, including independency from the health system, some familiarity with vaccination campaign, familiarity with culture, beliefs and local language, acceptable and respectable in community. Therefore, all of the monitors were independent and not directly involved in the supplementary immunization activities. For example, one of the team members, as the main data collector (external evaluator), was selected amongst students, who were currently doing their Master of Science or bachelor course in the field of epidemiology, health promotion and public/environmental/occupational health. Additionally, each external evaluator was accompanied by a local person, who had no operational role in SIAs administration without conflict of interest.

Before implementation of monitoring, all of the monitors and coordinators were trained on target age group, vaccination teams and their work style, questionnaire, and method of work. To do this, a meeting was held at Zahedan university with the participation of the focal points and supervisors of involved universities. At this meeting, all aspects of the study project, including selection of data collectors, questionnaire as data collection method, management and supervision of teams was discussed and finalized. Then, each university had a similar educational explanatory meeting for the querying teams and with the participation of supervisors and focal points. Additionally, data collector teams provided a manual. Then, data was collected from selected households using a validated questionnaire.

2.4. Data Entry, Analysis and Final Report

Data was collected through a validated questionnaire and after checking and correction in the field, all questionnaires were brought to health promotion research center of Zahedan University of Medical Sciences. Accordingly, collected information through questionnaires was transferred to SPSS software by a team of trained data entry operators. Then data was analyzed and the final report was prepared using descriptive statistics (i.e. frequencies, percentages) and 95% confidence interval.

3. Results

A total number of 6838 children from 7 universities were included in the present study. Approximately half of the participants were boys. Overall, 3.7% of the study participants were less than one years old, 35.2% were 1 to 5 years old, and 61.1% were more than 5 years old (Table 2).

Table 3 shows the percentage of children, who received MR vaccine during Measles and Rubella supplementary immunization activities. In general, the total vaccination coverage was 98.7% for the studied individuals. The overwhelming majority (95.3%) of individuals reported that they had received an immunization card at the time of supplementary vaccination. However, vaccination cards were available for 68.4% of children during the evaluation time. Accordingly, interviewers could not get hold of immunization cards in 26.9% and they had to rely on self-reports of the child's family. Table 3 demonstrates why interviewers could not check immunization cards during home visits for 2127 children. More than 60% of them reported that they had received immunization cards, yet their cards were not available to be seen at the time of the study. About 22% lost their cards and 14.8% of the subjects claimed that they didn't receive immunization cards at the time of vaccination.

The most important reasons for not vaccinating children during the campaign were refusal to vaccinate, lack of information, children being sick, and travel with rates of 31%, 24.2%, 22.4%, and 20.2%, respectively. The main sites for MR vaccine inoculation were school and health centers. Approximately half of the children were vaccinated at health centers and half of them received supplementary vaccines at their schools. The most common complications reported by study participants as vaccine side effects were fever (44.8%) and severe pain at the injection site (36.2%) (Table 3).

Prevention of measles and rubella (66.6%) was the main reason for vaccinating children during the campaign. One-third of subjects reported that they had been encouraged by health staff to vaccinate their children. Additionally, one out of every five participant vaccinated their children to stay healthy. The distribution of participants by reported information sources regarding supplementary immunization of MR showed that the most important sources of information were vaccinators and health care

Table 1. Study Population and Sample Distribution

University	Population	% of Total	Number of Clusters	Number of Households
Zahedan	660,000	35	56	1120
Iranshahr	300,000	16	25	500
Zabol	170,000	9	14	280
Birjand	28,000	2	5	100
Bam	30,000	2	5	100
Jiroft	200,000	11	17	340
Hormozgan	47,000	25	39	780
Total	1,863,000	100	161	3220

Table 2. Frequency Distribution of Participants in Terms of Gender and Age Groups

	N	% (95% CI)
Gender		
Boys	3443	50.4 (49.2 - 51.6)
Girls	3395	49.6 (48.4 - 50.8)
Age groups		
< 1	255	3.70 (3.25 - 4.15)
1 - 5 year old	2404	35.2 (34.1 - 36.3)
> 5	4179	61.1 (59.9 - 62.3)

workers (72.3%), schools (24%), and television (22.3%) (Table 4).

4. Discussion

In the current study, the overwhelming majority of target population (98.7%) received measles and rubella vaccine. The findings were consistent with the coverage rates reported by most of the supplementary immunization activities that were conducted in other parts of the world, including Uzbekistan (99.8%) and Georgia (98.90%). However, it was different from the rate reported by Tajikistan (93.8%), Ireland (70.8%), and the WHO European regions where the MR supplementary immunization coverage rates varied from 48.2% to 100% (9). Additionally, the vaccination coverage rate in the present study was higher than Eastern and Southern Africa with about 93% based on vaccination cards, finger marks, or self-report of participants (21).

According to the global measles strategic plan, it is expected that supplementary immunization activities target large populations and achieve immunization coverage of > 90% in each region (5). Importantly, the present study revealed that the total vaccination coverage rates in all provinces of South-East of Iran were higher than the rate expected by the Global Measles Strategic Plan. Undoubtedfuly, achieving and sustaining the mentioned coverage by supplementary immunization activities could play a key role in measles and rubella elimination. Consequently, it should be continued as a significant approach to interrupt the measles and rubella virus transmissions in these regions.

The parents' decision-making on vaccinating their child seems to be a determinant in vaccination coverage (17). There are various reasons that parents may decline or delay vaccinating their child. Data suggests that medical complications, pain from injections, previous measles infection, concerns about safety and effectiveness of vaccines, the ingredients in the vaccines, parents' belief that vaccination is unimportant, religious, or socioeconomic reasons significantly contributed to lack of vaccination (1, 11-15). In the current study, the main obstacles for lack of vaccination were refusal to vaccinate (31%), lack of information (24.2%), sick child (22.4%), and travel (20.2%). However, in most studies, fear of vaccine side effects was the leading barrier to vaccination (1, 12, 13, 15-17). In a study from the United Kingdom, fever, rash, joint symptoms, and headache were reported as vaccine side effects (13). In the present study, the most common vaccine side effects expe-

Table 3. Frequency Distribution of Participants According to MR Supplementary Immunization Activities

	N	% (95% CI)
MR vaccination coverage		
Yes	6728	98.7 (98.4 - 99.0)
No	86	1.30 (1.03 - 1.57)
Possession of immunization card among participants		
Yes, it was visited	4603	68.4 (67.3 - 69.5)
Yes, but it was not visited	1812	26.9 (25.8 - 28.0)
No	315	4.70 (4.19 - 5.21)
Reasons for not checking immunization cards during home visits		
They did not receive	315	14.8 (13.3 - 16.3)
It was not available	1285	60.4 (58.3 - 62.5)
They lost their card	465	21.9 (20.4 - 23.7)
Others	62	2.90 (2.20 - 3.60)
Total	2127	100
Causes for not vaccinating children during campaign		
Doctor recommendation	1	1.0 (0.00 - 2.88)
Health staff recommendation	3	3.0 (0.00 - 6.22)
Travel	20	20.2 (12.6 - 27.8)
Guest child	3	3.0 (0.00 - 6.22)
Not informed	24	24.2 (16.1 - 32.3)
Refusal to vaccinate	31	31.0 (22.3 - 39.7)
Child sick	22	22.4 (14.5 - 30.3)
Fear of vaccine side effects	4	4.10 (0.40 - 7.80)
School	3126	46.5 (45.3 - 47.7)
Health center	3123	46.4 (45.2 - 47.6)
At Home	479	7.10 (6.49 - 7.71)
Swelling and redness at the injection site	6	5.70 (1.20 - 10.2)
Fever	47	44.8 (35.2 - 54.4)
Severe pain at the injection site	38	36.2 (27.0 - 45.4)
Skin rash	8	7.60 (2.50 - 12.7)
Weakness and lethargy	5	4.80 (0.69 - 8.91)
Total	104	100

rienced by study recipients were fever and severe pain at the site of injection.

Insufficient knowledge about vaccination may also contribute to low vaccination adherence (1, 22). In comparison, high level of knowledge in parents about the immunizations mechanisms could have a positive impact on parents' vaccination behavior to collaborate with vaccine stakeholders (17). For example, mothers, who had high levels of knowledge and positive attitudes towards vaccination, scheduled immunization of their children (14). Likewise, vaccination incentives in approximately two-third of the study participants was prevention of disease. In line with the current study, parents reported vaccination as a reasonable method to prevent disease in studies conducted by Carine Weiss et al. as well as Forster et al. (14, 17). As a result, providing parents with some consultations by health care providers and increasing their knowledge about the vaccination mechanism, side effects, and bene-

Table 4. The Frequency Distribution of Subjects by Vaccination Incentive and Information Sources

	N	% (95% CI)
Vaccination incentives		
Health staff recommendations	2079	31.4 (30.4 -32.4)
Prevention of disease	4412	66.6 (65.6 - 67.6)
Staying healthy	1465	22.1 (21.2 - 23.0)
Child safety	702	10.6 (9.90 - 11.3)
Information Sources for supplementary immunization of MR		
Radio	132	2.0 (1.70 - 2.30)
TV	1504	22.3 (21.4 - 23.2)
Vaccinators/ health care workers	4871	72.3 (71.4 - 73.2)
Religious/ traditional leaders	103	1.50 (1.25 - 1.75)
The local press	22	0.30 (0.20 - 0.40)
Schools	1613	24.0 (23.1 - 24.9)
Friends and neighbors	728	10.8 (10.2 - 11.4)
Banners	201	3.0 (2.65 - 3.35)
Social networks	5	0.10 (0.04 - 0.16)
SMS	20	0.30 (0.19 - 0.41)

fits of vaccination are recommended.

The findings suggest primary health care providers (72.3%), schools (24%), and television (22.3%) as the important sources of information while in developed countries, the media was a leading source of information about childhood vaccinations (16). Accordingly, results demonstrated that most children were vaccinated at health centers and schools. In comparison, a study by Roberts et al. in United Kingdom showed that vaccine injection in schools was poor despite extensive publicies (13).

The study results also illustrated that 95.3% of the study participants received an immunization card at the time of vaccination. However, immunization cards were not available for more than half of them to be visited at the time of the study. Similarly, vaccination cards were available for approximately half of the children in a study conducted by Gust et al. (15). In eastern and southern Africa, during supplementary measles vaccination activities, both vaccination cards and finger marks were used to monitor vaccination coverage. In this study, 48% of vaccinated children had finger markings once visited. Comparably, immunization cards of the eligible children were available for about two-thirds of the study participants (21).

One of the study limitations was that data was collected based on self reports. Nevertheless, the researchers strove to ensure the participants about the privacy of information in order to answer the questions correctly. The strength of the present study was the high number and representativeness of the study participants in the study.

In conclusion, the present study illustrated that it is possible to achieve high coverage for measles and rubella immunization through supplementary immunization activities (SIAs). Therefore, the routine measles and rubella vaccination program should also be further strengthened with a booster dose of SIAs to sustain high herd immunity and attain measles and rubella elimination.

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Footnote

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