

Evaluation of the measles–rubella mass vaccination campaign in the population covered by Tehran University of Medical Sciences

R. Majdzadeh,¹ A. Moradi,¹ H. Zeraati,¹ S. Ghajarieh Sepanlou,² G. Zamani¹ and V. Zonobi³

تقييم حملة للتلقيح الجموعي ضد الحصبة والحصبة الألمانية بين السكان في دائرة خدمات جامعة طهران للعلوم الطبية

رضا مجد زاده، علي مرادي، حجت زراعتي، صدف قاجاريه سبانلو، قاسم زماني، وحيد ذنوبي

الخلاصة: يقيم الباحثون في هذه الدراسة حملة للتلقيح الجموعي ضد الحصبة والحصبة الألمانية أجريت في جمهورية إيران الإسلامية في كانون الأول/ديسمبر 2003. وتناول التقييم مدى التغطية بالتلقيح والوعي المجتمعي حول الحملة وجودة خدمات التلقيح المقدمة للسكان في دائرة الخدمات التي تقدمها جامعة طهران للعلوم الطبية. وقد انتهت الحملة بتلقيح 96.4% من العينة السكانية التي يبلغ تعدادها 390 (بفاصلة ثقة 95% تتراوح بين 94.6% و98.2%). وقد ارتفع عدد من هو على علم بالحملة من 80.59% من مجمل العينة (وعددهم 190) في البدء، إلى 96.8% أثناءها، حتى وصل إلى 100% في نهايتها. ولم يتجاوز أي فريق من فرق التلقيح التي بلغ عددها 24 فريقاً عتبة الأداء غير المقبول. هذا وقد أدى الإعلام وفرق التلقيح عملاً جيداً وحققوا ما هدفوا إليه.

ABSTRACT We evaluated the measles–rubella mass vaccination campaign in the Islamic Republic of Iran in December 2003. Vaccination coverage, community awareness of the campaign and the quality of vaccination services were assessed in the population covered by Tehran University of Medical Sciences. At the end of the campaign 96.4% (95% CI: 94.6%–98.2%) of the population sample ($n = 390$) had been vaccinated. Awareness of the campaign was 80.59% of the sample ($n = 190$) at the start, rising to 96.8% during and 100.0% at the end of the campaign. None of the 24 vaccination teams sampled were over the threshold for unacceptable performance. The mass media and vaccination teams demonstrated good performance and have achieved their goals.

Évaluation de la campagne de vaccination de masse contre la rougeole et la rubéole dans la population desservie par l'Université des Sciences médicales de Téhéran

RÉSUMÉ Nous avons évalué la campagne de vaccination de masse contre la rougeole et la rubéole menée en République islamique d'Iran en décembre 2003. La couverture vaccinale, la sensibilisation du public à cette campagne et la qualité des services de vaccination ont été évaluées dans la population desservie par l'Université des Sciences médicales de Téhéran. À la fin de la campagne, 96,4 % (IC 95 % : 94,6 % - 98,2 %) de l'échantillon de la population concernée ($n = 390$) avaient été vaccinés. Au début de la campagne, 80,59 % de l'échantillon ($n = 190$) étaient sensibilisés à cette campagne, puis 96,8 % pendant, et 100 % à la fin. Les 24 équipes de vaccination échantillonnées dépassaient toutes le seuil de performance acceptable. Les médias et les équipes de vaccination ont accompli un travail de qualité et ont atteint leurs objectifs.

¹Department of Epidemiology and Biostatistics, School of Public Health; ²Health Promotion and Social Development Research Centre; ³Department of Prevention and Disease Control, Deputy of Health, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran (Correspondence to R. Majdzadeh: rezamajd@tums.ac.ir).

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Introduction

The global goals set by the World Health Assembly in 1989 [1] and by the World Summit for Children in 1990 [2] to reduce measles morbidity by 90% and measles mortality by 95% remain unachieved. In 2001, the World Health Organization (WHO) and United Nation's Children's Fund (UNICEF) presented a 5-year global strategic plan to re-energize global efforts for measles morbidity and mortality reduction [3]. However, for interruption of virus transmission in the community more than 95% of the population must be protected, and it is difficult to reach this level of protection by routine vaccination [4].

The mass campaign for rubella vaccination makes congenital rubella syndrome (CRS) a preventable disease. Live attenuated rubella vaccine is now used in most of the world. Unfortunately, in many developing countries, rubella vaccination is not part of the national vaccination programme [5,6], despite warnings from WHO that low levels of rubella vaccination coverage may lead to increases in maternal infection and the burden of CRS [7]. In January 2000, WHO held a meeting in Geneva directed at prevention of CRS, particularly in developing countries [7]. The recommended strategies included piggy-backing rubella with measles vaccine (MR) or with measles and mumps vaccine (MMR), ensuring that the vaccination programme covered children of both sexes and adult women.

The Ministry of Health and Medical Education of the Islamic Republic of Iran launched a mass MR vaccination campaign throughout the country from 5 to 31 December 2003. More than 32 million inhabitants between 5 and 25 years old received the MR vaccine. The aim of this programme was to eliminate measles and to control CRS. The

mass campaign was performed by active and passive vaccination teams. Passive teams were established in service delivery points, while active teams covered crowded places of urban areas such as schools, military garrisons, jails and dormitories as well as rural areas.

A specific characteristic of the health infrastructure in the Islamic Republic of Iran is the integration of medical universities into the administrative bodies of the government health system [8]. Thus each medical university in the Islamic Republic of Iran is responsible not only for research and education but also providing health services for the people of a specified region. Tehran University of Medical Sciences (TUMS) covers the southern part of the city of Tehran, plus the districts of Islam Shahr, Shahr Ray and their nearby villages. While the target population for MR vaccination was estimated as 1 245 000 people, based on data obtained from the executive teams, 1 322 489 people were reported to be vaccinated during the campaign, giving a vaccination coverage of 106.2%. This discrepancy necessitated a survey-based evaluation of vaccination coverage to investigate the validity of the executive team's data.

In this study, an external team made an assessment of the MR mass campaign within the population covered by TUMS by means of a household survey of vaccination coverage and community awareness coverage and a survey of the quality of vaccination services.

Methods

Sample

The required sample size to estimate the vaccination coverage was 390 people between 5 and 25 years old. This sample size was calculated based on possible 90% vaccination coverage, with 95% confidence

interval, 5% precision and 2.25 design effect. For the evaluation of community awareness coverage in each stage of the campaign separately, the required sample size was 190 independent members of the target population between 12 and 25 years old and/or parents (or guardians) of children between 5 and 11 years. This sample size estimate was based on a 93% awareness of the campaign, which was expected to be slightly more than the vaccination coverage, with 6% precision and similar confidence interval and design effect as for the vaccination coverage estimate.

Study participants were selected by cluster sampling for these 2 objectives. Each cluster was the set of 10 households that included at least 1 person in the target group of the campaign. Then, if there was more than 1 eligible study participant in each selected household, 1 of the intended subjects was selected by random sampling.

Lot quality assurance sampling (LQAS) was used for assessment of the quality of vaccination services. By this method, it was possible to judge the status of the sampling

units (lots) regarding their expected level of performance. The number of samples was defined according to WHO guidelines for the LQAS method [9–12]. A total of 24 executive teams were evaluated (8 teams in each district, which comprised 3 lots for the whole of TUMS). The choice of this sample size for LQAS was based on the upper and lower thresholds of 80% and 30%. Any lot with more than 2 unqualified executive teams was considered “unacceptable”.

Data collection

Figure 1 illustrates the different time periods for data collection during the evaluation of the mass campaign.

The data relating to vaccination status (the proportion of the population vaccinated) and community awareness (the proportion of the population who were aware of the mass campaign before, during and at the end of the campaign) were gathered through questionnaires in face-to-face interviews.

The quality of MR vaccination in each vaccination team was judged based on direct observation and interview with the director

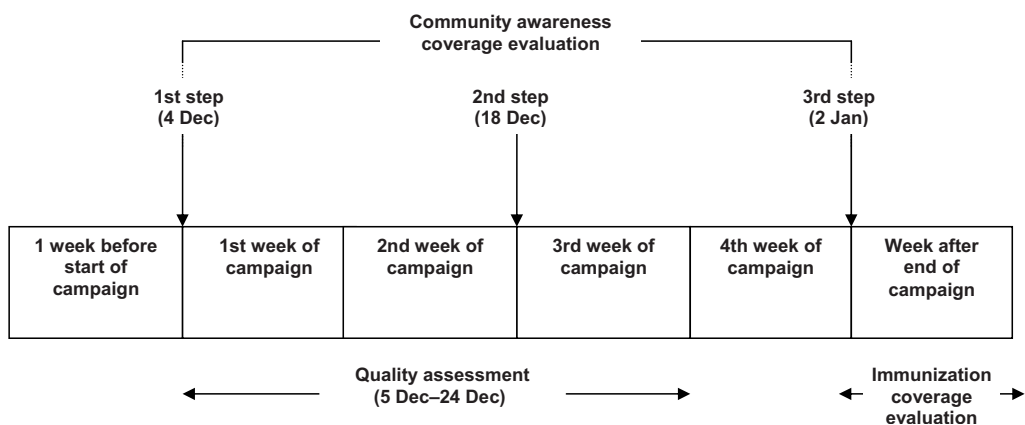


Figure 1 Data collection phases in the evaluation of the mass measles–rubella vaccination campaign by Tehran University of Medical Sciences in 2003

of the vaccination team. During observation 3 criteria were followed: (1) vaccination technique competence of providers; (2) information given to individuals who received the vaccination; (3) documentation of vaccination records. Data which had been gathered by interview were: (1) following correctly cold-chain supply instructions; and (2) adequacy of necessary equipment.

Analysis

Chi-squared and Fisher exact tests were used for determining the effect of independent variables on vaccination coverage and community awareness coverage. All analyses were done using STATA statistical software, version 8.0.

The protocol of this study was approved by the institutional ethics review board of TUMS.

Results

The findings of the study are presented in 3 parts: vaccination coverage, community awareness coverage and the quality of vaccination services.

Vaccination coverage

Of the total of 390 people interviewed, 376 [96.4% (95% CI: 94.6%–98.2%)] had received the MR vaccine. The reasons given for not being vaccinated were: pregnancy (4 people), fear of the side-effects of the vaccine (4), illness (3), and not having enough time (3). Exclusion of the 4 pregnant women from the denominator increased the coverage to 97.4%. Table 1 shows the vaccination coverage data according to the characteristics of the participants. The vaccination coverage in most subcategories of Table 1 was more than 95%, which was the predefined objective of the campaign. This proportion did not vary significantly according to the categories, except for family size, where coverage was significantly higher in larger families (98.4% for ≥ 5

Table 1 Coverage of measles–rubella vaccination in the sample of the population covered by Tehran University of Medical Sciences according to the background characteristics of study participants

Variable	Total no.	Vaccination coverage %	Significance
<i>District health centre</i>			$P = 0.05^a$
Shouth	190	95.8	
Islam Shahr	80	96.3	
Shahr Ray	120	97.5	
<i>Sex</i>			$\chi^2 = 0.21$; $P = 0.62$
Male	199	96.0	
Female	191	96.8	
<i>Age (years)</i>			$\chi^2 = 5.3$; $P = 0.37$
5–10	55	98.2	
11–15	73	98.6	
16–20	130	98.5	
21–25	125	92.8	
$\geq 26^b$	7	–	
<i>Family size</i>			$P = 0.05^a$
< 5	202	94.6	
≥ 5	188	98.4	
<i>Education of head of household</i>			$\chi^2 = 7.94$; $P = 0.09$
Illiterate	30	96.7	
Primary	101	98.0	
Secondary	97	98.0	
High school	120	95.0	
University	40	92.5	
Unclear response	2	–	
<i>Total</i>	390	96.4	

^aFisher exact test.

^bThis age group was not a target of the mass campaign.

members) than smaller ones (94.6% for < 5 members). Although the difference was not statistically significant ($P = 0.09$), the lowest vaccination coverage (92.5%) was in families where the head of household had university level of education.

Of those who were vaccinated, 373 people (99.2%) had received the MR vaccination card. Just over half the sample (204) was vaccinated by passive teams in regular

Table 2 Proportion of people surveyed in the area covered by Tehran University of Medical Sciences who were aware of the measles-rubella mass campaign, according to their background variables before, during and after the campaign in 2003

Variable	Before (4 Dec)			During (18 Dec)			After (2 Jan)	
	Total no.	% aware	Significance	Total no.	% aware	Significance	Total no.	% aware
<i>District health centre</i>			$\chi^2 = 0.71$; $P = 0.31$			$\chi^2 = 0.07$; $P = 0.94$		
Shouth	90	78.9		90	96.7		90	100.0
Islam Shahr	40	77.5		40	97.5		40	100.0
Shahr Ray	60	85.0		60	96.7		60	100.0
<i>Sex</i>			$\chi^2 = 0.37$; $P = 0.78$			$P = 0.39^a$		
Male	78	78.2		80	97.5		77	100.0
Female	112	82.1		110	96.4		113	100.0
<i>Age of person interviewed (years)</i>			$\chi^2 = 16.13$; $P < 0.0001$			$\chi^2 = 8.25$; $P = 0.01$		
< 25	60	81.7		60	98.3		61	100.0
26–50	81	93.8		92	98.9		77	100.0
> 50	48	58.3		38	89.5		52	100.0
<i>Family size</i>			$\chi^2 = 8.44$; $P = 0.003$			$P = 0.49^a$		
< 5	105	73.3		105	96.2		103	100.0
≥ 5	85	89.4		83	97.6		87	100.0
<i>Education of person interviewed</i>			$P = 0.49^a$			$\chi^2 = 5.73$; $P = 0.22$		
Illiterate	28	53.6		33	90.9		30	100.0
Primary	49	67.3		32	96.9		46	100.0
Secondary	30	90.0		37	100.0		31	100.0
High school	65	93.8		66	98.5		64	100.0
University	18	94.4		22	95.5		19	100.0
<i>Total</i>	190	80.5		190	96.8		190	100.0

^aFisher exact test.

service delivery points and 172 by active ones, which were provided exclusively for the purpose of the campaign in crowded areas.

Community awareness coverage

At the beginning of the campaign, 80.5% (95% CI: 75.4%–86.4%) of 190 people interviewed were aware of the mass campaign; this rose to 96.8% (95% CI: 94.4%–99.3%) during the campaign and 100% at the end of the campaign. Table 2 summarizes the community awareness coverage according to the characteristics of the participants from the 1st to the 3rd steps of the study. The table shows that marketing

during the campaign was successful as community awareness increased from 80.5% before the campaign to 100% at the end of the campaign in all subcategories. The difference in community awareness before the campaign was significant according to the age of the respondent ($P < 0.0001$) and family size ($P = 0.003$). The age of respondents was also significant ($P = 0.01$) in the survey in the middle of the campaign. In both surveys, i.e. before the campaign and in the middle of the campaign, older people (> 50 years old) were less aware of the mass campaign. Although educational level did not show a significant relationship with awareness of the campaign in all 3

surveys, the difference in percentage awareness before the campaign between the 2 extremes of illiterates and university educated people was notable (53.6% and 94.4% respectively).

Television was reported to be the main source of information about the mass campaign for 80% of participants (Figure 2).

Quality of vaccination services

Using the 30% threshold of quality, the overall quality of the vaccination services was judged to be acceptable in 19 executive teams (79.1%; 95% CI: 62.8%–95.3%). Therefore, the quality of MR vaccination was considered to be acceptable in all the district health centres covered by TUMS. Table 3 shows the quality of MR vaccination according to the district health centres.

The overall quality of the cold-chain supplies was acceptable in 23 executive teams out of 24 (95.8%). The competence of the human resources and available equipment for MR vaccination were judged to be acceptable in all the health centres studied.

Discussion

The results of this study show that the coverage of the mass campaign for MR vaccination in the target population was 96.4%. Considering the high density of the population in the region covered by TUMS and the high population mobility in the capital city of Tehran, we can say that the health system achieved the target coverage defined at 95%.

According to the reports of the Health Deputy of TUMS on the regions covered by this university, almost 1 322 489 people were vaccinated during the mass campaign. The target population covered by this university amounted to 1 245 000 people; therefore around 77 500 people were not from the target population. There may be several

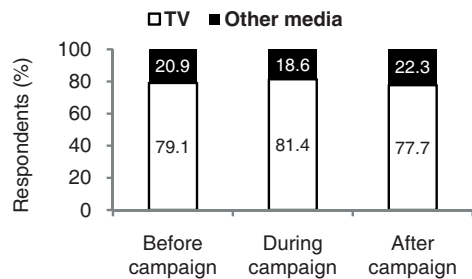


Figure 2 Reported frequency of television and other media as the main source of information about the mass vaccination campaign in the sample ($n = 190$) covered by Tehran University of Medical Sciences

reasons for this overestimation. Due to the possible imprecision in data gathering and recording of the age of the vaccinated group some people may have been vaccinated who were initially not included in the age range of the target population. Also, some people from outside the region covered by TUMS might have been vaccinated, including travellers, workers, tourists, etc. who were not originally counted in the target population. These factors caused the vaccination coverage in the reports of the Deputy of Health in TUMS to go beyond 100%.

The vaccination coverage did not vary significantly according to the background variables of the population under study except for family size, where coverage was significantly higher in larger families (98.4% for ≥ 5 members) than smaller ones (94.6% for < 5 members). Family size usually has a negative correlation with socioeconomic status and hence a negative correlation with utilization of health services in different settings. However, in a vaccination campaign the effect of socioeconomic status could be different. The lowest vaccination coverage (92.5%) was in families where the

Table 3 Quality of the measles–rubella vaccination services during the mass campaign according to the district health centre in the sample of executive teams in the area covered by Tehran University of Medical Sciences

District health centre	Total ^a	Threshold ^b	Unacceptable lots	
			No.	%
South	8	3	2	25.0
Islam Shahr	8	3	2	25.0
Shahr Ray	8	3	1	12.5
Total	24	3	5	20.9

^aTotal no. of sampled lots.

^bThreshold no. for unacceptability.

head of household had a university level of education. Although the difference was not statistically significant, it is noteworthy ($P = 0.09$). People with a higher level of education may not accept the overall benefits of free vaccination by a mass campaign in comparison to the personal risks.

The trend of community awareness coverage was favourable during the execution of the programme. According to the findings, 1 day before the beginning of the campaign, over 80% of the people under study were aware of it. This increased and at the end of the 2nd week the coverage reached more than 96%. By the end of the programme, all of the people sampled were aware of it. The difference in the awareness of people before the campaign was remarkable between the 2 extremes of educational level with 53.6% of illiterate and 94.4% of university educated people aware of the campaign. Awareness was also significantly different regarding family size and age group before the campaign, and for age during the campaign. The findings

demonstrate the important influence of television programmes in the awareness of the people about health programmes and issues. Therefore, it is appropriate to give more attention to this medium in developing health programmes, especially in health education.

The quality of the performance of the health centres covered by TUMS was acceptable. The daily vaccination records and the issuance of the vaccination card were acceptable in the overall performance of the executive teams under study. On the whole, the performance of the executive teams regarding the cold-chain supplies was acceptable and all of the health centres functioned correctly in this regard. The results also show that although the human resources for the executive teams had a heavy workload during the mass campaign, none of the study teams had any difficulty in accessing the equipment and the necessary resources for MR vaccination.

We conclude that, overall, the MR mass vaccination campaign in the area covered by TUMS can be judged to be satisfactory. It is still early to estimate the overall impact of the mass campaign on the incidence of measles [13–15], but evaluation of the campaign by means of antibody response has been carried out nationwide.

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