Brief Report

Is There Still an Immunity Gap in High-level National Immunization Coverage, Iran?

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Abstract

As there is a significant number of Iranian immigrant and illegal refugees living in marginal areas of large cities that might induce immunization gap in these areas. The aim of this study was to provide reliable information on vaccination status of these people.

A cross sectional study was conducted on children 24–47 month old who lived in the suburb areas of five large cities of Iran in 2013. Proportional cluster sampling method was used in each city and standard questionnaire of the World Health Organization applied for the purpose of data collection. The survey counts immunizations based on immunization card plus the history of vaccination according to the mother's memory. All gathered data were analyzed using SPSS software (version 16).

Overall, 4502 children (49.2% female) aged 24–47 month participated in this survey among which 88.1% were Iranian and 11.9% were Afghan or other nationalities. Totally, 4479 (99.4%, CI 95%: 99.2%–99.6%) of the children had a vaccination card while 828 (18.5%, CI 95%; 15.8%–21.1%) could not present it to the interviewers. 96.8% of children were fully immunized, 3.2% were partially immunized and 0.1% were not immunized. There was no significant difference in terms of vaccine coverage among males and females. The prevalence of partially immunization in non-Iranian children was six fold of Iranian children (11.9% vs. 2%).

Immunization program is implemented appropriately with high coverage rates in suburb areas of the country. However, there is still an immunity gap in non-Iranian immigrants, which should be considered as a high-risk group by the health system.

Keywords: Immunization coverage, immunity gap, Iran, suburb

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Introduction

Immunization is one of the most effective health interventions known for saving lives of children and vaccination coverage is considered as an indicator of health system performance. In Iran it was started by vaccination of soldiers against smallpox in 1829 and developed by the development of local vaccine production sites in 20th century.[1] Expanded Program on Immunization (EPI) started in 1983 to cover all children in the country. The immunization coverage of all vaccines was increased to more than 95% in less than one year old children in 1992 and has been stable afterwards.[2] National immunization programs should cover all eligible children to reach the elimination/eradication goals. Todays, the highest number of unvaccinated children is observed in low-income countries. Also, there are under-vaccinated children, even within countries with good national coverage mainly in poor people and in areas with low level standards of living.[3]

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There are a significant number of Iranian immigrant and illegal refugees who live in marginal areas of large cities in Iran and there is not any reliable data on the exact number of them. Passive vaccination services in these areas may cause immunization gap due to low participation of families. Since the immunization coverage in suburb areas of big cities in Iran is still unknown and also to confirm the reliability of reported statistics, the current survey aimed to evaluate the coverage of vaccination among 24–47 month old children in the suburbs of big cities of Iran.

Materials and Methods

This was a cross sectional study with the target population of the children aged 24–47 month living in the suburb of the five biggest cities of Iran (Tehran, Esfahan, Arak, Mashhad, and Zahedan). In each city, areas with the most concentration of migrants (Iranian and non-Iranian) and with low socio-economic criteria were listed based on the information provided by local health authorities. The survey counts an immunization based on immunization card plus history of vaccination according to the mother's memory. The data collection was conducted on June 2013.

Proportional cluster sampling method was used for each city. In this phase, a list of all distinguished suburb areas of each city was prepared based on the population of the city in the last census and the number of suburb areas the estimated sample of each area was calculated. Clusters were defined as any area highlighted by local health officers owing to lower social class, population density of low health indicators and high density of migrants.

Sampling conducted on two levels. First random selection used

in clusters and then systematic sampling applied in each cluster for selection of participants. The number of clusters in each city was different according to the information provided by local health authorities. Therefore, the number of clusters in Arak and Isfahan was 12 and 26 clusters, respectively. According to the total sample size of that city, size of each cluster in studied cities was equal. Cities, which have higher people, included a higher sample in the survey. Regarding the type of sampling method (which was a cluster sampling) we considered a design effect of 1.5 and defined the final sample size as 4278 (rounded up to 4500) eligible children.

The required data were collected using a prepared questionnaire by house to house interviewing method. The questionnaire is a standard instrument basically designed according to the questionnaire offered by WHO for the estimation of vaccination coverage. The questionnaires were completed based on the vaccination card, the grandmother or the child caregiver if the vaccination card was not available at the time of interviewing. The protocol of this study was approved by the consent of the ethics committee of Arak University of Medical Sciences and Health Affairs. Before administration of the questionnaire, informed consent was obtained from all participants.

Data analysis

Data collection was conducted on one month and then processed using SPSS software (version 16). Descriptive statistics including mean, standard deviation and percent were used for depiction of data and chi square test was used for comparing immunization coverage among groups. If a child had received all eligible doses of vaccines, but with more than one-week delay after exact date, we classified him/her as fully immunized with delay. If at least one dose of any vaccines had not been received at the interview time, we classified them as partially immunized cases. Fully immunized children were those vaccinated duly and unvaccinated children were kids without any history of vaccination.

Results

Overall, 4502 children aged 24–47 month participated in this survey among which 2213 (49.2%) were female. The mean age of children was 36.15 ± 7.2 month and the average number of children in the household was 2 ± 1.4. In terms of nationality, 88.1% of studied children were Iranian and 11.7% Afghan while 0.2% was from other nationalities.

Overall, 4479 (99.4%) of children had vaccination card and only 23 children (0.6%) did not. However, vaccination card was not on hand in 828 (18.5%, CI 95%: 15.8%–21.1%) cases at interview time, while 3651 (80.9%, CI95%: 79.6%–82.2%) showed54 a vaccination card to interviewers. Only <0.1% of studied children were not immunized and in 3.2% (CI 95%: 2.7%–3.7%) were partially immunized. Therefore, the full immunization coverage was calculated 96.8% (CI 95%; 96.3%–97.3%). However, 37.4% (CI 95%: 36%–38.8%) of children completed their vaccines with delay (more than one week delay). Coverage of all vaccines/doses was found to be more than 97.9%. The dropout rate between DTP1 and DTP3 which calculated as [(DTP1-DTP3)/DTP1]*100. It was negligible. The dropout rate between BCG and MMR1 was 0.6%, while it was increased a little bit (1.9%) between BCG and MMR2 (18 month). The highest vaccine coverage was for BCG, HepB1, OPV1, DTP1, OPV2 and HepB2 (99.8%) while MMR2 was the lowest coverage at 97.9%, CI 95%; 97.08%–98.72%) (Table 1).

Among 4502 enrolled cases, 546 children (12.1%) were non-Iranian and 524 children (96%) were Afghan. There was a significant difference between Iranian and non-Iranian children based on the immunization status ($P < 0.001$) (Figure 1).

On the basis of vaccination sector, for all doses of vaccines, more than 98% were inoculated in public health care centers, excluding at birth doses of vaccines, which 94% implemented by hospitals. The role of private sector in immunization coverage was less than 1%.

Discussion

Based on the obtained results of this study, vaccination coverage for all vaccines and doses were more than 97.9%. It was demonstrated that vaccination coverage in suburb areas of big cities in Iran is as high as other parts of the country. Based on the strong national immunization program, Iran has been successful in polio eradication and is very close to measles elimination.[4,5] Our findings are consistent with those of other studies on immunization status of children in Iran.[2] However this study was focused on suburb areas as high risk area instead of the normal population. Identical immunization coverage in male and female and high coverage rate in suburbs with a high density of foreign immigrants approves comprehensiveness of a national immunization program regardless of gender in Iran. The complete coverage of immunization in Iranian children was 98% while in non-Iranian children this rate was calculated as 87.5%. Although the rate of non-immunized children was negligible but there is immunity gap in non-Iranian kids. Regarding to the fact that 11.9% of them were partially immunized and this provides opportunity for scattered outbreaks of vaccine preventable diseases like measles and will hamper measles elimination goal in the country.[5]

Our finding is consistent with those of European Center for Disease Control report who found a significant association between immunization coverage and living in low levels of socio-economic status same as migrants and nomads.[6] One study in Pakistan had shown that DTP3 coverage in peri-urban of Karachi was significantly less than national level (45% vs. 65%) and determined the factors associated with low coverage including low socio-economic status.[7]

The dropout rate of vaccines (DTP1 to DTP3 or BCG to MMR1) was less than 1%, suggesting good performance of immunization services in terms of utility. This very low dropout rate between vaccine doses at birth to twelfth month has also been found in other studies in Iran.[8] However, 8.9% dropout for Penta1 to Penta 3 is reported from Kenya[9] and 24.7% for BCG to Measles from India.[3]

In order to estimate the immunization coverage, the current study was conducted on a random sample of suburb areas of big cities in Iran for the first time. However, near 19% of vaccination card was not observed by interview team and unfortunately it is impossible to find the accuracy of parent's reports. Although the sensitivity analysis did not show any difference in vaccination coverage between children with and without card, but the authors accept that parent's reports may be biased.

In conclusion the immunization coverage is more than 95% not only at national level, but also in suburb areas as one of the high-risk areas in Iran. Therefore, the completeness of vaccination is excellent in marginal areas of large cities; although there is still an

Table 1. Immunization coverage for all vaccines in 24–47 month studies children in the suburb areas of five big cities of Iran by vaccination status and sex.

Vaccine	Vaccinated based on Vaccination Card N (%)		Vaccinated based on Mother's Memory N (%)		Unvaccinated N (%)	
At birth	**Coverage**	**CI of Coverage**	**Coverage**	**CI of Coverage**	**Coverage**	**CI of Coverage**
BCG	3611 (80.3)	82.5–77.9	879 (19.5)	21.8–17.3	9 (0.2)	0.45–0
OPV0	3600 (80.2)	82.4–77.8	880 (19.5)	21.8–17.3	14 (0.3)	0.63–0
Hep B1	3612 (80.3)	82.6–78.0	879 (19.5)	21.8–17.3	7 (0.2)	0.38–0
2nd month						
OPV1	3615 (80.3)	82.6–78.0	879 (19.5)	21.8–17.3	8 (0.2)	0.42–0
DTP1	3610 (80.2)	82.5–77.9	879 (19.5)	21.8–17.3	11 (0.2)	0.53–0
Hep B2	3607 (80.3)	82.5–77.9	878 (19.5)	21.8–17.3	11 (0.2)	0.53–0
4th month						
OPV2	3608 (80.2)	82.4–77.8	880 (19.5)	21.8–17.3	14 (0.3)	0.70–0
DTP2	3605 (80.1)	82.4–77.8	880 (19.5)	21.8–17.3	16 (0.4)	0.70–0
6th month						
OPV3	3595 (78.9)	82.2–77.6	887 (19.7)	22.0–17.4	18 (0.4)	0.76–0
DTP3	3589 (79.8)	82.1–77.5	887 (19.7)	22.0–17.4	20 (0.4)	0.83–0
Hep B3	3581 (79.7)	82.02–77.4	887 (19.7)	22.0–17.4	24 (0.5)	0.95–0
12th month						
MMR1	3576 (79.6)	81.9–77.3	880 (19.6)	21.8–17.3	37 (0.8)	1.3–0.3
18th month						
MMR2	3492 (78)	80.4–75.6	890 (19.9)	22.2–17.6	94 (2.1)	2.9–1.3
Reminder of OPV	3498 (78)	80.4–75.7	894 (20)	22.2–17.6	89 (2)	2.8–1.2
Reminder of DTP	3500 (78.1)	80.5–75.7	893 (19.9)	22.2–17.6	89 (2)	2.8–1.2

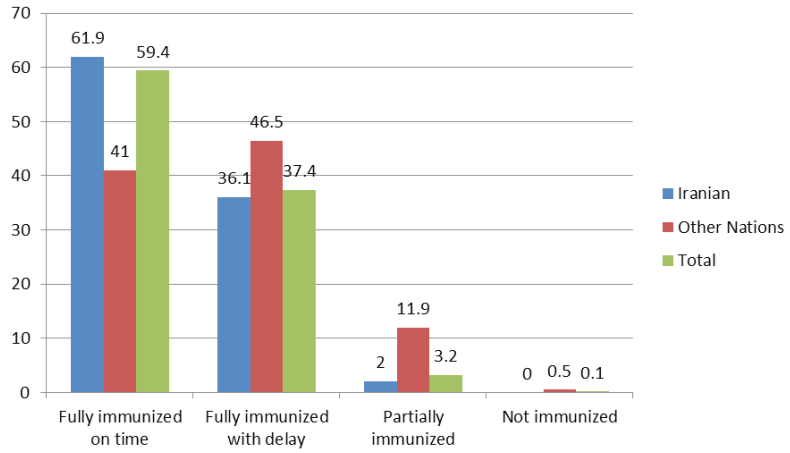

Figure 1. Distribution of vaccinated children in suburbs of big Iranian cities by immunization status and nationality.

immunity gap in non-Iranian immigrants as small population and health system should consider them as a high-risk group. In conclusion, we recommend that in countries with high routine administrative immunization coverage, immunity gaps in small pockets of population should be found by immunization provider systems.

Conflict of Interests

The authors declared no potential conflicts of interest with respect to the publication of this article.

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