Immunisation coverage among refugee Afghan children in Islamic Republic of Iran

Mahin Esmaeili-Darmian[1,2], Ehsan Mousa-Farkhani[3], Ali Vafaee-Najar[1], Fatemeh Kokabi-Saghi[1] and Elaheh Hooshmand[4]

[1]Department of Management Sciences and Health Economics, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran. [2]Department of Midwifery, Bi.c., Islamic Azad University, Birjand, Iran. [3]Department of Epidemiology, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran. [4]Social Determinants of Health Research Centre, Mashhad University of Medical Sciences, Mashhad, Iran (Correspondence to Elaheh Hooshmand: houshmande@mums.ac.ir).

Abstract

Background: Although immunisation services are free in Islamic Republic of Iran, coverage among refugee Afghan children remains suboptimal.

Aim: To assess immunisation coverage among refugee Afghan children aged <2 years in suburban Mashhad, Islamic Republic of Iran.

Methods: Using a locally adapted version of the WHO standard immunisation coverage questionnaire, we collected immunisation data from 313 refugee Afghan children aged <2 years in suburban Mashhad, Islamic Republic of Iran. Immunisation status was confirmed using immunisation cards or maternal recall if cards were unavailable. We analysed the data using SPSS version 21 and conducted chi-square tests to examine associations between categorical variables, analysis of variance for continuous variables, and unadjusted linear regression to identify predictors of immunisation status. $P \leq 0.05$ was considered statistically significant.

Results: Of the children, 79.9% were fully vaccinated. Immunisation status was associated with maternal age, number of children, child's sex, religion, and duration of residence in the country. Main barriers to immunisation were fear of side-effects, low confidence in vaccines, illness, and scheduling challenges.

Conclusion: The approximately 20% immunisation gap found in this study highlights the need for tailored interventions to address the structural and behavioural barriers to immunisation among this population group, including education campaigns to counter common misconceptions about vaccines.

Keywords: immunisation, vaccination, Afghan refugees, Mashhad, Iran

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Introduction

Immunisation is one of the most cost-effective public health interventions to protect children and improve population health, serving as a key indicator of health system performance *(1,2)*. In addition to reducing child morbidity and mortality, immunisation programmes have strengthened primary care in developing countries *(2,3)*. Launched globally in 1983 and implemented in Islamic Republic of Iran in 1984, the Expanded Programme on Immunisation (EPI) has achieved coverage levels exceeding 95%, contributing to progress toward the elimination of diseases, such as polio and measles *(4)*.

The success of immunisation efforts relies on high acceptance and comprehensive coverage *(5)*. Childhood vaccines are time-sensitive and even minor gaps in coverage can threaten decades of progress *(6)*. Recent global trends indicate a concerning increase in vaccine hesitancy often driven by limited knowledge of vaccines and concerns about safety or vaccine components *(7–9)*. Studies have shown that poor awareness and misinformation are strongly linked to negative attitudes towards vaccination *(10)*.

Understanding people's knowledge, attitudes and concerns about vaccines is crucial to improving acceptance. Vaccine hesitancy is a complex global issue influenced by perceived risk-benefit ratios, religious beliefs and lack of awareness *(11–14)*. Research has demonstrated strong correlations between unfavourable attitudes, perceived immunity, religiosity, and both reluctance and delay in childhood vaccination *(15–17)*.

While immunisation coverage in Islamic Republic of Iran aligns with Immunisation Agenda 2030 goals, maintaining and improving coverage requires ongoing attention to barriers and contributing factors *(18)*. Challenges are particularly prominent in suburban areas, where large numbers of non-Iranian immigrants and undocumented refugees reside *(1)*. With coverage below 95%, these groups remain at high risk of disease outbreaks *(19)*.

Islamic Republic of Iran hosts one of the largest populations of Afghan refugees, many of whom live in marginalised areas with limited access to health services. Barriers such as language difficulties, low parental literacy, cultural differences, limited awareness

and financial constraints hinder their participation in routine immunisation *(20)*. Despite the provision of free immunisation services to all children, including refugees and undocumented migrants, large segments of these populations remain underserved *(21)*.

Previous studies have highlighted the roles of parental knowledge gaps, negative attitudes and logistic challenges in vaccine hesitancy *(22)*. However, data on Afghan refugee children in Islamic Republic of Iran remain limited. This study assessed vaccination coverage and identified associated factors among Afghan refugee children aged <2 years in suburban Mashhad, and provides evidence for targeted interventions in similar high-risk populations.

Study objectives

This study assessed vaccination coverage among Afghan refugee children aged <2 years in suburban Mashhad, Islamic Republic of Iran, and examined demographic factors associated with vaccination status, including maternal age, household size and religion. It explored behavioural and logistic barriers such as parental attitudes and scheduling challenges, in order to identify factors hindering access to immunisation services among Afghan refugee families. The findings are intended to inform targeted, evidence-based public health interventions aimed at improving vaccination coverage among vulnerable refugee populations.

Methods

This cross-sectional study was conducted in 2024 to assess vaccination coverage among Afghan refugee children aged <2 years living in suburban areas served by Mashhad University of Medical Sciences. The sample size was calculated based on an assumed 95% vaccination coverage in marginal areas, with a 95% confidence level and a design effect of 2. Considering that each cluster included 2 eligible households and assuming 500 neighbourhoods in Mashhad, the final sample size was determined to be 313 participants.

A multistage cluster sampling method was used due to the dispersion of the Afghan refugee population in suburban Mashhad, allowing for efficient and representative sampling within resource and time constraints. The city was first divided into 5 regions. From each region, 2 neighbourhoods were randomly selected, followed by the random selection of 3–4 blocks per neighbourhood. Sampling began at the first house on the right side of a mosque or school in each block and proceeded to the nearest house on the right. This systematic method ensured comprehensive coverage of the target population while maintaining randomisation.

Data were collected using a locally adapted version of WHO standard immunisation coverage questionnaire. The tool was reviewed by a panel of experts in refugee health and immunisation and pilot-tested among a small sample of mothers from the study population. Feedback from this process informed revisions aiming at improving clarity, cultural appropriateness and reliability. Construct validity was supported through expert review and piloting.

The questionnaire comprised 3 parts. The first gathered background information about the household and child, through interviews with mothers or primary caregivers. The second collected vaccination data, primarily from vaccination cards, with maternal recall used only when cards were unavailable. Potential recall bias was acknowledged and minimised by prioritising card-based data. The third part investigated reasons for incomplete or missed vaccinations.

Vaccination status was defined according to the national immunisation schedule. Children were considered fully vaccinated if they had received all scheduled doses of polio, bacille Calmette–Guérin (BCG), hepatitis B, pentavalent, diphtheria–tetanus–pertussis (DTP), and measles–mumps–rubella (MMR) vaccines by 15 months of age. Those missing at least one dose of vaccine were categorised as incompletely vaccinated.

Statistical analysis

Statistical analysis was performed using SPSS version 21. Chi-square tests were used to examine associations between categorical variables, analysis of variance (ANOVA) for continuous variables, and unadjusted linear regression to identify predictors of vaccination status. P of ≤ 0.05 was considered statistically significant.

Chi-square tests were applied to assess associations between vaccination status and demographic variables such as maternal age, number of children in the household, religion and sex. ANOVA was used to examine differences in continuous variables, such as maternal age, across vaccination groups. Unadjusted linear regression models were used to evaluate the impact of behavioural and logistic factors on incomplete vaccination, identifying significant predictors while controlling for potential confounders. Regression coefficients (β) and corresponding P values quantified the magnitude and statistical significance of each association.

The study followed the WHO vaccination coverage cluster survey reference manual, which prioritises documented evidence over maternal recall *(23)*. This approach enhanced the reliability of the findings and ensured a more accurate assessment of vaccination coverage in this vulnerable population.

Ethics approval

This research was approved by the Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.REC.1403.051).

Results

Of the 313 Afghan refugee children aged <2 years included in the study, 73.0% were girls and 27.0% were boys. Vaccination coverage was defined as the proportion of children who had received all vaccines according to the national immunisation schedule of Islamic Republic of

Iran by 15 months of age. This included all scheduled doses of polio, BCG, hepatitis B, pentavalent, DTP and MMR vaccines. Vaccination status was documented in 97.1% of cases using vaccination cards. Overall, 79.9% of the children (n = 250) were fully vaccinated, while 20.1% (n = 63) had incomplete vaccination status.

The mean maternal age was 29.04 ± 6.50 years. Half of the households (50.8%) had resided in Islamic Republic of Iran for over 10 years, and nearly two-thirds (63.5%) reported sufficient income. Chi-square tests revealed statistically significant associations between vaccination status and several demographic variables, including maternal age (P = 0.012), number of children in the household (p = 0.026), child's sex (P < 0.001), religion (P= 0.032) and duration of residence in the country (P = 0.033). However, no significant association was observed with father's age (P = 0.313) or household income (P = 0.126) (Table 1).

The analysis of reasons for delayed or incomplete vaccination revealed 3 categories: lack of information, lack of motivation and logistic barriers. Fear of side effects emerged as the most frequently cited barrier (60.71%), followed by not knowing the time or place of vaccination (32.14%) and misconceptions about contraindications (7.15%). Among motivational factors, postponement (46.15%) and lack of belief in immunisation (46.15%) were equally reported, with rumours playing a minor role (7.7%). Common logistic barriers included not bringing sick children for vaccination (32.56%), improper vaccination timing (18.60%), mother's overwork (11.63%) and attending health centres without receiving the vaccine (11.63%) (Table 2).

Linear regression analysis showed that most factors significantly predicted vaccination status (P < 0.01), with the model explaining 88.3% of the variance. The strongest predictors of incomplete vaccination were: not bringing a sick child (β = −0.388), lack of belief in immunisation (β = −0.378), postponement (β = −0.349), improper timing (β = −0.284), fear of side effects (β = −0.254) and mother's overwork (β = −0.254). Rumours (P = 0.701) and lack of knowledge about timing or location (P = 0.213) were not statistically significant predictors. These findings indicate that behavioural and attitudinal factors, rather than purely information barriers, play a crucial role in determining vaccination uptake (Table 3).

Discussion

This study assessed vaccination coverage among Afghan refugee children aged <2 years living in suburban Mashhad, revealing that approximately 80% had received all age-appropriate vaccines. While relatively high, this coverage falls below previous findings from similar populations in Islamic Republic of Iran. For instance, Zahraei et al reported 90.3% coverage among non-Iranian children, and NikFarjam et al found a 95% complete immunisation rate in suburban Tehran *(19,24)*. These

Table 1 Immunisation status by demographic characteristics among refugee Afghan children aged <2 years

Variable	Category	Fully immunised n (%)	Incompletely immunised n (%)	*P* value
Mother's age (years)	< 20	16 (6.4)	3 (4.8)	0.012
	21–30	146 (58.4)	35 (55.6)	
	> 30	88 (35.2)	25 (39.7)	
Father's age (years)	21–30	83 (33.2)	23 (36.5)	0.313
	31–40	132 (52.8)	29 (46)	
	> 41	35 (14)	11 (17.5)	
Number of children in the household	1	25 (10)	13 (20.6)	0.026
	2	99 (39.6)	20 (31.7)	
	3	104 (41.6)	21 (33.3)	
	4	11 (4.4)	4 (6.3)	
	≥ 5	11 (4.4)	9 (14.3)	
Sex	Girl	95 (38)	46 (73)	0.000
	Boy	155 (62)	17 (27)	
Religion	Shia	178 (78.2)	54 (85.7)	0.032
	Sunni	72 (28.8)	9 (14.3)	
Household income	Less than enough	81 (32.4)	23 (36.5)	0.126
	Enough	169 (67.6)	40 (63.5)	
Duration of residence (years)	1–3	17 (6.8)	11 (17.5)	0.033
	4–6	58 (23.2)	9 (14.3)	
	7–10	73 (29.2)	11 (17.5)	
	> 10	102 (40.8)	32 (50.8)	

Table 2 Reported reasons for incomplete or delayed immunisation among refugee Afghan children aged <2 years

Category	Reason	Number (n)	Percentage (%)
Lack of information	Did not know time or place of vaccination	9	32.1
	Fear of side-effects	17	60.7
	Misconceptions about contraindications	2	7.2
Lack of motivation	Postpone to a later time	12	46.2
	Do not believe in immunisation	12	46.2
	Rumours	2	7.7
Barriers	Improper immunisation timing	8	18.6
	Mother's overwork	5	11.6
	Did not bring sick child	14	32.6
	Brought sick child but immunization was not given	5	11.6
	Other	9	20.93

differences may be attributed to variations in geographic locations, sample size and access to health care services.

We found statistically significant associations between vaccination status and maternal age, number of children, child's sex, religion and duration of residence in the country. These findings are consistent with those of Farzad et al and Mugali et al, who identified similar socio-demographic determinants among refugee populations in Afghanistan *(25–27)*.

The most frequently reported barriers to full vaccination were fear of side effects, lack of belief in vaccines and delays due to illness. These findings align with studies among Syrian refugees in Lebanon and Rohingya refugees in Bangladesh, where cultural beliefs, limited awareness and mistrust in health systems hindered vaccination uptake *(28,29)*.

Our findings reflect broader global trends in vaccine hesitancy. For instance, Wagner et al reported that 69% of mothers in India preferred fewer simultaneous vaccines and 39% were concerned about side effects *(12)*. In Islamic Republic of Iran, Farajzadeh et al identified illness at the time of vaccination and fear of complications as common reasons for hesitancy *(30)*.

WHO identifies religious beliefs, fear of side effects and misinformation as key drivers of vaccine hesitancy globally *(31)*. In this study, refugee parents appeared to have lower health literacy and more negative attitudes towards vaccination than the general population, likely due to language barriers, low education levels and limited access to health information *(21, 32)*. Similar findings were reported by Kaji et al among migrant populations along the Thailand-Myanmar border, highlighting the global nature of these barriers among refugee communities *(34)*.

The study followed WHO recommendations for verifying vaccination status through written documentation and successfully accessed a typically hard-to-reach population (33). However, we acknowledge limitations in reaching all refugee subgroups, particularly those residing in remote areas or with frequent changes of address.

Table 3 Unadjusted linear regression model for factors associated with immunisation status among refugee Afghan children in 2024

Category	Factor	β	SD	t	value
Lack of information	Did not know time/place of immunisation	-0.029	0.058	-1.247	0.213
	Fear of side-effects	-0.254	0.039	-12.048	0.000
	Misconceptions about contraindications	-0.180	0.121	-7.881	0.000
Lack of motivation	Postponed to a later time	-0.349	0.049	-15.754	0.000
	Do not believe in immunisation	-0.378	0.046	-17.899	0.000
	Rumours	-0.009	0.128	-0.384	0.701
Barriers	Improper immunisation timing	-0.284	0.055	-13.665	0.000
	Absence of vaccinator	-0.133	0.108	-6.486	0.000
	Mother's overwork	-0.254	0.067	-12.694	0.000
	Did not bring sick child	-0.388	0.043	-18.12	0.000
	Brought sick child but not vaccinated	-0.108	0.072	-5.074	0.000
	Other	0.082	0.078	2.995	0.003

Provision of free vaccination services to refugees by Islamic Republic of Iran reflects a strong government commitment to public health (*34*). However, the persistence of an immunity gap among non-Iranian immigrants suggests that this population should remain a priority for the national health system. As recommended by Nasiri et al, implementing collaborative educational programmes, such as peer education, may help foster positive attitudes towards vaccination among refugee parents in Islamic Republic of Iran (*21*).

The finding of an approximately 20% immunisation gap highlights the need for targeted interventions. In line with WHO guidelines and evidence from successful immunisation programmes *(19)*, future efforts should address the specific barriers documented in this study. These interventions should align with global strategies aimed at improving vaccination coverage among vulnerable populations *(35)*.

Our findings highlight the need for public health strategies that address both structural and behavioural barriers to vaccination. Culturally tailored education campaigns should be prioritised to counter common misconceptions about vaccine safety and efficacy. Community-based programmes that involve trusted leaders from among refugee populations could play a vital role in building trust and promoting vaccine acceptance. Service accessibility could be improved by offering flexible clinic hours and deploying mobile health units to reach underserved or geographically isolated households. Such strategies are essential to bridge the current immunisation gap and maintain high vaccination coverage among refugee children.

This study has several limitations that should be considered when interpreting the findings. Although vaccination status was primarily verified using vaccination cards, some data were based on maternal recall, which may have introduced recall bias. Social desirability bias may also have influenced responses, particularly regarding vaccination attitudes and behaviours. The use of cluster sampling, while methodologically efficient, may not have captured the full diversity of Afghan refugee subpopulations, especially newly arrived families or those living in remote or unregistered areas. Households that were inaccessible or outside the sampling frame may have been unintentionally excluded. As a cross-sectional study, the research only offers a snapshot in time and does not allow for causal inference between identified factors and vaccination outcomes. Some potential confounding variables, such as caregiver education, detailed socioeconomic status, or access to health facilities, were not fully accounted for, which may have influenced the observed associations.

These limitations highlight the need for cautious interpretation and further research to validate the findings among broader refugee populations.

Conclusion

This study provides an exploratory analysis of vaccination coverage among Afghan refugee children aged <2 years in Mashhad, Islamic Republic of Iran. Although 80% of children received all age-appropriate vaccines, vaccination status varied significantly by maternal age, number of children, religion and other sociodemographic factors.

Vaccination was verified using reliable documentation. However, the cross-sectional design and reliance on some maternal recall limit causal interpretation. Future research should apply longitudinal designs and adjusted regression models to better assess causal relationships and improve data accuracy through integrated health records.

Our findings highlight key behavioural and structural barriers to vaccine uptake among Afghan refugee children. Culturally sensitive education campaigns, mobile outreach services and community engagement strategies should be prioritised to close the immunisation gap and improve vaccination coverage among Afghan refugee children.

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Conflict of interest: None declared.

Couverture vaccinale chez les enfants réfugiés afghans en République islamique d'Iran

Résumé

Contexte : Bien que les services de vaccination soient gratuits en République islamique d'Iran, la couverture vaccinale des enfants réfugiés afghans reste sous-optimale.

Objectif : Évaluer la couverture vaccinale chez les enfants réfugiés afghans âgés de moins de deux ans dans la banlieue de Mashhad (République islamique d'Iran).

Méthodes : À l'aide d'une version adaptée au contexte local du questionnaire standard de l'OMS sur la couverture vaccinale, nous avons recueilli des données sur la vaccination concernant 313 enfants réfugiés afghans âgés de

moins de deux ans dans la banlieue de Mashhad. Les carnets de vaccination, ou, en l'absence de ces documents, la déclaration de la mère, ont permis de confirmer le statut vaccinal. Nous avons analysé les données en utilisant le logiciel SPSS version 21. Des tests du chi-carré ont été réalisés pour examiner les associations entre les variables catégorielles ; une analyse de variance a été menée pour les variables continues et une régression linéaire non ajustée a été utilisée afin d'identifier les facteurs prédictifs du statut vaccinal. Une valeur *p* inférieure ou égale à 0,05 était considérée comme statistiquement significative.

Résultats : Parmi les enfants inclus dans la présente étude, 79,9 % étaient entièrement vaccinés. Le statut vaccinal était associé à l'âge de la mère, au nombre d'enfants dans le foyer, au sexe de l'enfant, à la religion et à la durée de résidence dans le pays. Les principaux obstacles à la vaccination étaient la peur des effets secondaires, le manque de confiance dans les vaccins, la maladie et les difficultés de planification.

Conclusion : Le déficit d'environ 20 % de la couverture vaccinale observé dans la présente étude souligne la nécessité de mettre en place des interventions adaptées pour lever les obstacles structurels et comportementaux à la vaccination au sein de ce groupe de population, notamment des campagnes de sensibilisation visant à corriger les idées reçues courantes sur les vaccins.

التغطية بالتحصين في أوساط الأطفال الأفغان اللاجئين في جمهورية إيران الإسلامية

مهين إسماعيلي–دارميان، إحسان موسى–فرخاني، علي فافي–نجار، فاطمة كوكابي–ساجي، إلاهي حوشمند

الخلاصة

الخلفية: على الرغم من أن خدمات التحصين مجانية في جمهورية إيران الإسلامية، فإن التغطية بها في أوساط الأطفال الأفغان اللاجئين لا تزال دون المستوى الأمثل.

الأهداف: هدفت هذه الدراسة الى تقييم التغطية بالتحصين في أوساط الأطفال الأفغان اللاجئين الذين تقل أعمارهم عن سنتين في ضواحي مدينة مشهد في جمهورية إيران الإسلامية.

طرق البحث: جمعنا بيانات التحصين من 313 طفلاً من الأطفال الأفغان اللاجئين الذين تقل أعمارهم عن سنتين في ضواحي مدينة مشهد في جمهورية إيران الإسلامية، وذلك باستخدام نسخة مكيَّفة محليًا من "استبيان منظمة الصحة العالمية المعياري للتغطية بالتحصين". وتأكدت حالة التحصين باستخدام بطاقات التحصين أو ذاكرة الأمهات في حالة عدم توفر البطاقات. وأجرينا تحليلاً للبيانات بالإصدار 21 من برمجية SPSS، وأجرينا اختبارات كاي تربيع لدراسة الارتباطات بين المتغيرات الفئوية، وتحليل التباين للمتغيرات المستمرة، والانحدار الخطي غير المعدَّل من أجل تحديد عوامل التنبؤ بحالة التحصين . وقد عُدَّت قيمة الاحتمال ≥ 0.05 ذات دلالة إحصائية.

النتائج: حصل 79.9٪ من الأطفال على جميع التطعيمات المطلوبة. وارتبطت حالة التحصين بسن الأم، وعدد الأطفال، ونوع جنس الطفل، والدين، ومدة الإقامة في البلد. وتمثلت العقبات الرئيسية أمام التحصين في الخوف من الآثار الجانبية، وضعف الثقة في اللقاحات، والخوف من المرض، والتحديات المرتبطة بمواعيد التطعيم.

الاستنتاجات: تسلط الفجوة التحصينية البالغة 20٪ تقريبًا التي اكتُشفت في هذه الدراسة الضوء على الحاجة إلى تدخلات مُصممة خصوصًا للتصدي للعقبات الهيكلية والسلوكية التي تحول دون التحصين في أوساط هذه الفئة السكانية، وتشمل تلك التدخلات تنظيم حملات تثقيفية لمواجهة المفاهيم الخاطئة الشائعة عن اللقاحات.

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