

Gaps and challenges in the national immunisation programme of Islamic Republic of Iran

Akbar Fotouhi¹, Susan Mahmoudi², Seyed Mohsen Zahraei³, Farid Fotouhi³ and Mohammad Mehdi Gouya⁴

¹Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran (Correspondence to Akbar Fotouhi: afotouhi@tums.ac.ir). ²Department of Vaccine Preventable Diseases, Center for Communicable Diseases Control, Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran. ³General Practitioner, Tehran, Islamic Republic of Iran. ⁴Department of Infectious Diseases, Iran University of Medical Sciences and Health Services, Tehran, Islamic Republic of Iran.

Abstract

Background: Islamic Republic of Iran has achieved high immunisation coverage for routine childhood vaccines; however, gaps remain in the scope and alignment with global immunisation priorities.

Aim: To assess the status of childhood immunisation programme in Islamic Republic of Iran and identify gaps and challenges.

Methods: We reviewed and analysed secondary data from published literature available on PubMed and Google Scholar until 3 September 2024, including official reports and WHO and UNICEF immunisation databases. We compared the results with those of selected Eastern Mediterranean Region countries and the global immunisation priorities.

Results: Immunisation coverage in Islamic Republic of Iran exceeded 99% for several childhood vaccines, supported by established programme infrastructure and domestic vaccine production. Gaps were identified in the inclusion of vaccines such as human papillomavirus, varicella and hepatitis A. The national immunisation programme aligns with several WHO vaccination strategies but with limited coverage beyond the childhood years. Challenges affecting coverage included financial constraints, fragmented data systems and vaccine hesitancy.

Conclusion: Despite remarkable achievements, systemic challenges remain in the national immunisation programme of Islamic Republic of Iran. Strengthening life-course immunisation through targeted investment, policy updates and stronger surveillance will help align the programme with the global immunisation goals.

Keywords: immunisation, childhood immunisation, life-course immunisation, vaccination, Islamic Republic of Iran

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Introduction

Immunisation is one of the most effective and cost-efficient public health interventions for preventing infectious diseases and reducing mortality and morbidity. WHO launched the Expanded Programme on Immunization (EPI) in 1974 to ensure equitable access to life-saving vaccines worldwide (1). Since its introduction, vaccination has averted an estimated 154 million deaths, including 146 million among children younger than 5 years, and accounts for approximately 40% of the observed decrease in global infant mortality (2).

Over time, the scope of immunisation has expanded beyond early childhood to include older children, adolescents and adults, with the introduction of new vaccines targeting a wider range of diseases. WHO promotes a life course vaccination approach, alongside Immunization Agenda 2030 (IA2030), to maximise the impact of vaccines across all stages of life and address evolving population health needs (3).

Islamic Republic of Iran adopted the EPI in 1984, and has since achieved vaccine coverage exceeding 95%, with notable successes in polio eradication and measles

elimination (4–6). Despite these achievements, the national immunisation programme has faced increasing challenges in recent years, including limited access to new vaccines, the impact of international sanctions, and an immunisation schedule that lags behind WHO recommendations (7,8).

This review examines the status of the national immunisation programme in Islamic Republic of Iran, identifies key gaps and challenges, and situates these findings within a regional context through comparison with selected countries in the Eastern Mediterranean Region (EMR).

Methods

This review used a narrative synthesis approach to evaluate the national immunisation programme in Islamic Republic of Iran, focusing on its status, limitations, and areas for improvement. The study relied on secondary data from peer-reviewed literature, official reports, and global immunisation databases, with a particular focus on WHO sources.

Table 1 Current childhood immunisation schedule in Islamic Republic of Iran

Age	Vaccines
At birth	BCG, OPV, hepatitis B
2 months	Pentavalent*, OPV, pneumococcal, rotavirus
4 months	Pentavalent, OPV, IPV, pneumococcal, rotavirus
6 months	Pentavalent, OPV, IPV, rotavirus, measles**
12 months	MMR, pneumococcal
18 months	DTP, OPV, MMR
6 years	DTP, OPV

*Pentavalent vaccine includes diphtheria, tetanus, pertussis, hepatitis B, and *Haemophilus influenzae* type b.
 ** Measles vaccine is administered at 6 months of age in high-risk provinces, according to NITAG recommendations.
 *** Following completion of childhood DTP schedule, a booster dose of diphtheria-tetanus is recommended every 10 years in adulthood.

The literature search was conducted using PubMed and Google Scholar, and covered publications available up to 3 September, 2024. Data on immunisation coverage, availability and immunisation schedules were extracted primarily from WHO databases and cross-checked against official national and international sources where available (9).

A comparative analysis assessed the immunisation programme in Islamic Republic of Iran against selected EMR countries, focusing on differences in vaccine adoption and target population coverage. The analysis was guided by WHO policy frameworks, including

Immunization Agenda 2030. As the study was based exclusively on secondary data from publicly available sources, ethics approval was not required.

Results

Overview of the national immunisation programme

The national immunisation programme was launched in 1984 as part of the EPI and has achieved several key milestones. Vaccine coverage for *Bacillus Calmette–Guérin* (BCG), oral poliovirus vaccine (OPV) and hepatitis B exceeded 95% by 2002. Measles has been eliminated, and the country has maintained a polio-free status since 2001. New vaccines, such as Hepatitis B (introduced in 1994) and measles–mumps–rubella (MMR) (introduced in 2003) have been incorporated into the national schedule, with more recent additions such as pneumococcal and rotavirus vaccines (10). Details of the vaccination schedules and coverage are presented in Tables 1 and 2.

Despite these achievements, gaps in vaccine availability and target population coverage remain. Vaccines such as human papillomavirus (HPV) and hepatitis A are not included in the national schedule, while others, including varicella and influenza vaccines, are provided primarily to high-risk groups rather than the general population.

Comparison with other EMR countries

Table 3 compares vaccine inclusion in the national immunisation programmes of Islamic Republic of Iran

Table 2 Vaccines currently available in the national immunisation programme of Islamic Republic of Iran

Vaccine	Schedule/Indication
BCG	Administered at birth
OPV	Administered at birth and at 2, 4, 6, 18 months, and 6 years
IPV	Administered at 4 and 6 months
Hepatitis B	Administered at birth and as part of pentavalent vaccine at 2, 4 and 6 months, also administered to high-risk groups
Pentavalent (DTPw–HepB–Hib)	Administered at 2, 4 and 6 months
MMR	Administered at 12 and 18 months
Pneumococcal	Administered at 2, 4, and 12 months
Rotavirus	Administered at 2, 4 and 6 months
DTP	Administered at 18 months and 6 years
Measles	Administered at 6 months in some provinces
Meningococcal (serogroups A, C, Y and W)	Administered to high-risk groups (outbreak response, military personnel and Hajj pilgrims)
Td	Administered at 15 years and every 10 years in adulthood
Varicella	Administered to high-risk groups under strict national clinical guidelines (e.g. siblings of immunocompromised patients, immunocompromised individuals in remission, or prior to initiation of immunosuppressive therapy, where appropriate).
Influenza	Administered to specified high-risk groups
HPV	Available through the private sector for individuals aged under 25 years
Rabies	for post-exposure prophylaxis following animal bites and to high-risk groups
Yellow fever	Administered to travellers to endemic countries

DT vaccine is available for children with contraindications to pertussis-containing vaccines.
 Hib vaccine may be administered separately to children with contraindications to pertussis-containing vaccines.
 MR vaccine is used for outbreak response. Some vaccines, such as HPV and certain pneumococcal vaccines, are distributed through the private sector.

Table 3. Comparison of immunisation coverage in EMR countries

Country	BCG	OPV/ IPV	Measles	Rubella	Mumps	Tetanus	Diphtheria	Hepatitis B	Hib	Pneumococcal	Rotavirus	HPV	Meningococcal	Varicella	Influenza	Hepatitis A
Afghanistan	✓	✓	✓	No	No	✓	✓	✓	No	✓	✓	No	No	No	No	No
Bahrain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Djibouti	✓	✓	✓	No	No	✓	✓	✓	No	✓	?	No	No	No	No	No
Egypt	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	No	No	✓	No	✓	No
Islamic Republic of Iran	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No
Iraq	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	✓	No	✓	No
Jordan	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	✓	No	No	No	✓	No
Kuwait	✓	✓	✓	✓	✓	✓	✓	✓	No	✓	✓	✓	✓	✓	✓	✓
Lebanon	✓	✓	✓	✓	✓	✓	✓	✓	No	✓	✓	No	✓	No	✓	No
Libya	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	No	✓	✓	No	✓	No
Morocco	✓	✓	✓	✓	No	✓	✓	✓	No	✓	✓	No	✓	No	✓	No
Oman	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	No	✓	✓	✓	✓
Pakistan	✓	✓	✓	✓	No	✓	✓	✓	No	✓	✓	No	✓	No	No	No
Occupied Palestine territory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No	✓	No	✓	No
Qatar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Saudi Arabia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Somalia	✓	✓	✓	No	No	✓	✓	No	No	No	No	No	No	No	No	No
Sudan	✓	✓	✓	No	No	✓	✓	No	No	✓	✓	No	✓	No	No	No
Syrian Arab Republic	✓	✓	✓	✓	✓	✓	✓	✓	No	No	No	No	No	No	✓	No
Tunisia	✓	✓	✓	✓	No	✓	✓	✓	No	✓	No	No	No	No	✓	✓
UAE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yemen	✓	✓	✓	✓	No	✓	✓	No	No	✓	✓	No	No	No	No	No

This table includes only vaccines formally listed as part of each country's EPI. Vaccines available exclusively through private clinics or limited to specific high-risk groups may not be fully reflected because of inconsistent reporting.

¹Recently introduced; coverage remains incomplete owing to limited access.

²Provided primarily to high-risk groups rather than the general population.

³Available mainly through the private sector and not included in the national EPI.

⁴Provided for outbreak response (e.g. dormitories or prisons), military personnel and Hajj pilgrims.

and selected EMR countries, using data from the WHO vaccination schedule database (11). The comparison includes only vaccines officially incorporated into each country's EPI, as reported to WHO. Vaccines available exclusively through private providers or limited to specific high-risk populations are not captured.

Islamic Republic of Iran has incorporated pneumococcal and rotavirus vaccines into its national programme but lags behind several countries in the Region, including Bahrain, Oman, and Saudi Arabia, in the universal provision of HPV and varicella vaccines. Meningococcal vaccination in Islamic Republic of Iran is primarily targeted to high-risk groups, whereas broader population coverage is implemented in countries such as Egypt and Saudi Arabia, reflecting their proximity to the meningitis belt.

Several countries in the Region, including the United Arab Emirates, have expanded HPV and varicella vaccination to the general population. Hepatitis A vaccination is included in the national programmes of Qatar and Saudi Arabia. Comprehensive life course vaccination strategies, covering adolescents, adults, and older populations, have been adopted by some EMR countries. While high-income and Gavi-supported low-income countries have expanded their EPI schedules, middle-income countries such as Islamic Republic of Iran face financial constraints in introducing newer and higher-cost vaccines (9).

Alignment with WHO immunisation strategies

The national immunisation programme in Islamic Republic of Iran aligns with several WHO vaccination strategies but with limited coverage beyond childhood. Childhood immunisation against BCG, OPV, hepatitis B, diphtheria–tetanus–pertussis (DTP) and MMR is well established. However, adolescent and adult vaccination remains limited, with HPV vaccines not included in the national schedule and influenza vaccination restricted largely to high-risk groups. Vaccines targeting older adults, such as pneumococcal and herpes zoster vaccines, are not routinely provided (12–14).

The IA2030 emphasises maximising vaccine impact globally across the life course. The strong primary health care system in Islamic Republic of Iran provides a foundation for this approach, although gaps remain in extending immunisation coverage beyond childhood.

The National Immunization Technical Advisory Group

The National Immunization Technical Advisory Group (NITAG) in Islamic Republic of Iran was established in 1982 to provide evidence-based guidance to the Ministry of Health on immunisation policies. The NITAG comprises 14 core members with expertise in immunisation, epidemiology and related disciplines, supported by 6 non-core members from government organisations and vaccine manufacturers. The group meets 3 to 4 times annually and is responsible for developing recommendations, reviewing immunisation

strategies, monitoring programme performance and advising on the introduction of new vaccines.

NITAG supports a national cascade training model, whereby training is initiated at the central level and delivered sequentially to provincial, district and service-level vaccinators. NITAG also contributes to the planning of supplemental immunisation activities, including biannual polio campaigns, with house-to-house efforts in high-risk southern provinces, and measles–rubella campaigns implemented during outbreaks to sustain population immunity.

Domestic vaccine production

Islamic Republic of Iran has a long-established domestic vaccine production capacity, led by the Razi Institute and the Pasteur Institute of Islamic Republic of Iran. These institutions produce vaccines including BCG, OPV, hepatitis B and MMR, while other vaccines, such as pentavalent, pneumococcal, rotavirus, and inactivated poliovirus vaccine (IPV), are imported. A presidential-level initiative has supported the involvement of startups and knowledge-based companies in vaccine manufacturing, with the aim of strengthening domestic production capacity and reducing reliance on imports.

Discussion

Despite substantial achievements, the national immunisation programme in Islamic Republic of Iran continues to face limitations and challenges. Addressing these issues is essential for improving its effectiveness and alignment with global best practices and WHO recommendations.

Limited vaccine coverage

The national immunisation programme has expanded in recent years, notably with the introduction of the rotavirus and pneumococcal vaccines. However, gaps in vaccine coverage persist, as several WHO-recommended vaccines, such as HPV, are not included in the national schedule. Vaccines such as influenza, hepatitis A, meningococcal, and varicella are largely restricted to high-risk groups, limiting population-wide protection. While recent additions progress in vaccine access, partial alignment with WHO recommendations constrains comprehensive protection against vaccine-preventable diseases across age groups.

Life course vaccination approach

WHO promotes a life course vaccination approach that emphasises immunisation throughout all stages of life (12). While childhood vaccination coverage in Islamic Republic of Iran is robust, significant gaps persist among adolescents, adults, and older populations. Notably, there is no universal HPV vaccination for adolescents, and adult coverage for influenza, pneumococcal, and shingles vaccines remains inadequate (15).

Addressing these gaps will require coordinated action within and beyond the health sector, including

collaboration with maternal health services, schools, occupational health programmes, and private entities. These initiatives would help expand vaccine access and coverage, improving public health outcomes across all age groups. Consideration of emerging vaccines, such as those targeting respiratory syncytial virus (RSV), alongside sustained leadership from NITAG in adapting global immunisation guidance, may support progress towards a more comprehensive life course approach.

Vaccine type and delivery

Vaccine selection and delivery present additional challenges within the national immunisation programme. The dual use of OPV and IPV reflects a balance between inducing intestinal immunity and ensuring safety and humoral immunity. However, new vaccines such as the new oral poliovirus vaccine type 2 (nOPV2), used in some countries to combat vaccine-derived poliovirus, are not currently included in the national programme (16).

The whole-cell pertussis (wP) vaccine used in the DTP combination is more affordable and effective but is associated with higher rates of mild adverse reactions than acellular pertussis (aP) vaccine used in many countries (17). This difference may influence vaccine acceptance in certain settings. Ongoing evaluation of vaccine type and delivery strategies is therefore needed to balance safety, effectiveness, cost and public acceptance particularly as new vaccine technologies emerge.

The private sector currently plays a limited role in the national immunisation programme. Few paediatric clinics, mainly in Tehran, deliver EPI vaccines supplied by the public sector and register them in the national system, accounting for less than 1% of overall coverage. Some private providers also offer non-EPI vaccines, such as HPV and influenza, without insurance coverage. Although these services address niche demand, they remain limited in scale and only partially integrated with national monitoring systems.

Economic and administrative constraints

Financial and administrative constraints continue to hinder the inclusion of new vaccines in the national immunisation programme, despite their cost-effectiveness. Domestic vaccine production, approved by national regulatory authority but not prequalified by WHO, presents challenges related to international recognition, vaccine acceptance abroad and participation in global markets. This situation highlights the complex balance between national self-sufficiency in vaccine production and integration into global regulatory and research frameworks.

Multiple visits and injections

The national immunisation schedule requires frequent visits during the first 2 years of life – at birth, 2, 4, 6, 12, and 18 months, and again at 6 years – which may place logistic burdens on parents, especially in remote areas, and contribute to missed vaccinations. The

administration of multiple injections at individual visits, such as pentavalent, OPV, and pneumococcal vaccines at 2 months of age, may also distress children and affect compliance (18). Although the introduction of combination vaccines has reduced injection frequency, further schedule simplification with hexavalent and MMR-V vaccines may offer additional benefits, such as reducing the number of injections and visits, subject to considerations related to costs, cold-chain capacity, and immunogenicity.

Public awareness and vaccine confidence

Islamic Republic of Iran has historically maintained high immunisation coverage and public trust. However, emerging vaccine scepticism, including narratives promoted by traditional medicine advocates, reflects global trends following the COVID-19 pandemic (19). While vaccine hesitancy is not widespread, misinformation – particularly through social media – poses a growing challenge. Transparent communication on vaccine benefits and safety, supported by proactive and culturally sensitive public health education campaigns, is essential to combat misinformation and sustain confidence in immunisation programmes.

Data management and surveillance

Islamic Republic of Iran has established a robust system for monitoring immunisation coverage and vaccine-preventable diseases, providing a solid foundation for programme management (20). There are opportunities to enhance data utilisation and evaluation through increased collaboration with academic institutions and researchers. Greater integration of systematic evidence into NITAG deliberations may further support evidence-informed decision-making and improve policy recommendations.

Surveillance coverage in private healthcare facilities, particularly outpatient clinics, remains limited and represents an area for improvement. The country operates a structured vaccine adverse event following immunisation (AEFI) reporting system, established in 2004, with provincial and national review committees supporting vaccine safety monitoring.

Immunisation data infrastructure has advanced through provincial and district-level registries, the national electronic health record system used in public health centres since 2017, and the web-based vaccination supplies stock management (WVSSM) system for inventory tracking.

Despite these developments, challenges related to system integration and scalability persist. A national coverage survey conducted in 2022 assessed vaccine uptake among children aged 24–35 months, with a follow-up survey planned for 2025 to update national estimates and inform programme planning (5).

Recommendations and ways forward

Based on the findings of this review, several priority areas have been identified to strengthen the national immunisation programme in Islamic Republic of Iran. These include expanding vaccine coverage, advancing a life course vaccination approach; strengthening supply chain management, data system and human resources; improving access, equity, and public awareness; and securing sustainable financing within supportive policy frameworks. Addressing these areas may support closer alignment with global standards and improve population health outcomes across age groups.

Expanding vaccine coverage and adopting a life-course approach

To address gaps in vaccine coverage, Islamic Republic of Iran should expand its immunisation programme to include vaccines for all age groups. Decisions on the introduction of new vaccines should continue to be guided by NITAG, using WHO Evidence-to-Decision (EtD) framework, and taking into account epidemiological evidence and financial feasibility.

Priority areas include the introduction of the HPV vaccine for adolescents and expanding access to influenza vaccination for adults beyond high-risk groups. The inclusion of vaccines for older populations, such as routine shingles (Herpes zoster) and varicella vaccination, could also be evaluated based on epidemiological data. To remain aligned with global immunisation developments, the establishment of a clear national strategy for the timely evaluation and introduction of new vaccines, including those targeting RSV, is important. Advancing a comprehensive life course approach may strengthen protection against vaccine-preventable diseases and support alignment with WHO strategic goals.

Strengthening supply chain management

Ensuring reliable vaccine availability requires continued strengthening of supply chain management. The COVID-19 pandemic revealed significant vulnerabilities in vaccine procurement and distribution processes, underscoring the importance of resilient and diversified supply strategies. Engagement with international partners, including WHO, Gavi and the Coalition for Epidemic Preparedness Innovations (CEPI), may facilitate access to technical expertise, best practices and procurement mechanisms.

Diversifying vaccine procurement sources is essential to reducing reliance on single suppliers or domestic production and improving resilience to supply disruptions. This approach should be complemented by strengthened domestic vaccine production capacity, which may further support supply security and programme sustainability.

Increasing public awareness and education

Although vaccine confidence remains relatively high, sustained public engagement remains essential. Public communication strategies that promote life course vaccination using mass media, digital platforms and trusted community figures, may help reach diverse age groups, particularly adults, where coverage is lower.

Health care providers are central to shaping public attitudes towards vaccination. Ongoing training and access to up-to-date scientific information, including on newer vaccines, can strengthen providers' capacity to address concerns and support informed decision-making. Platforms for sharing best practices, such as workshops and online forums, can further align provider and public perspectives, strengthening trust and uptake.

Improving data management and surveillance systems

Continued investment in immunisation data systems may enhance programme monitoring and evaluation in Islamic Republic of Iran. Strengthening electronic immunisation registries and disease surveillance systems can support timely identification of coverage gaps and outbreaks. Increasing external evaluations by independent bodies may enhance the use of immunisation data for evidence-based policy development. Allocating additional resources to independent research could generate valuable insights to support programme improvement.

Securing sustainable funding

Achieving and sustaining expansion in line with IA2030 will require predictable and diversified funding. National budget allocations remain central to supporting vaccine procurement, cold chain systems, service delivery, and infrastructure, with continued emphasis on the cost-effectiveness of immunisation. Engagement with international partners, such as Gavi and the World Bank, alongside public-private partnerships and performance-based financing, may provide additional support. Developing a comprehensive financial plan could help ensure sustainability as programme scope evolves and support alignment with global standards.

Enhancing policy and regulatory frameworks

Strengthening immunisation policy and regulatory frameworks can facilitate progress towards a life course vaccination approach in Islamic Republic of Iran. This includes developing clear national policies that explicitly integrate all age groups, expediting vaccine approvals while maintaining safety standards, and updating school-entry and adult vaccination requirements, where appropriate. Targeted policies for high-risk settings, such as health care facilities and nursing homes, may

further improve coverage. Stakeholder consultation and evidence-based decision-making remain crucial to effective implementation.

Continued investment in the capacity of NITAG, including its secretariat, evidence-synthesis function and ongoing education for members, may support more effective policymaking, including through the use of tools such as WHO EtD framework. Participation in global networks, such as the Global NITAGs Network (GNN), and alignment with international regulatory practices, including joint reviews and reliance mechanisms, may facilitate timely access to new vaccines while maintaining safety standards.

Conclusion

The national immunisation programme in Islamic Republic of Iran has achieved strong routine coverage and eliminated important vaccine-preventable diseases. However, closer alignment with global goals, such as IA2030, will require addressing persistent challenges, including limited vaccination beyond childhood, reliance on imported vaccines, and fragmentation within data systems. Targeted investment, policy updates and strengthened surveillance may support progress towards a more comprehensive life course vaccination approach. Advancing these areas could contribute to more equitable and sustainable immunisation coverage across all population groups.

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