STM JOURNALS

Research & Reviews: A Journal of
Microbiology & Virology

https://journals.stmjournals.com/rrjomv

ISSN: 2230-9853 (Online)
ISSN: 2349-4360 (Print)
Volume 14, Issue 2, 2024
May–August
DOI (Journal): 10.37591/RRJoMV

Review RRJoMV

Universal Immunization Program in India

Lakshay Bhutani[1,*]

Abstract

The Universal Immunization Program (UIP) in India, initiated by the Government of India in 1985 and incorporated into the Child Survival and Safe Motherhood Program in 1992, plays a crucial role in enhancing public health through systematic vaccination efforts. This program aims to save lives and strengthen immune systems by administering vaccines and antibiotics. The UIP has spurred the development of various campaigns, including mass media efforts, to promote immunization against a range of diseases such as tetanus, coronavirus, and others. Supported by the Bureau of Energy and Family Prosperity, the Management of India, and the National Technical Advisory Group on Immunization (NTAGI), the UIP provides essential vaccines to infants, children, and pregnant women. India, as a major vaccine manufacturing hub with a robust national regulatory authority, is integral to the global supply of vaccines and conducts one of the world's largest immunization programs. In recent advancements, the UIP has introduced adult vaccines against specific diseases like the Orient type of encephalitis in areas with high incidence rates, following thorough studies and consultations with NTAGI. Vaccines under UIP can be categorized into two types: inactivated and live attenuated. Inactivated vaccines use dead pathogens to stimulate immunity and require frequent booster shots, examples include polio and rabies vaccines. Live attenuated vaccines, on the other hand, use weakened forms of pathogens to induce a strong, lasting immune response, as seen in vaccines for measles, mumps, rotavirus, smallpox, and chickenpox. The development of vaccines generally involves either inactivating the virus chemically or physically or weakening it before administration. Although inactivated vaccines necessitate regular transfusions to maintain immunity, they are a critical component of the immunization strategy. Through these multifaceted efforts, the UIP continues to combat infectious diseases and safeguard public health in India.

Keywords: Universal immunization, inactivated vaccines, virus, polio, rabies vaccines

INTRODUCTION

The Universal Immunization Program (UIP) in India was a vaccination program given by the Government of India in 1985 and became a part of the Survival of Child programs in 1992. In immunization, we talk about how we can save the life of any individual through antibiotics and vaccines and help in building their proper immune system. This program helped in building many campaigns, such as mass media campaigns. The UIP consists of vaccination for many diseases or viruses such as nausea, tetanus, and coronavirus. These programs have helped us to develop vaccines for any disease that can act in a very harmful way [1]. The Bureau of Energy and Family Prosperity Management of India supports several vaccines for babies, offspring, and meaningful women through the worldwide immunization program. India is the largest manufacturing area of vaccines with a functional national regulatory authority, and the Government of India provides several vaccines to infants, children, and pregnant women with the help of a UIP in India. It is also one of the largest immunization programs in India. Likewise, an adult vaccine against the Orient type of encephalitis will be introduced in sections

***Author for Correspondence**
Lakshay Bhutani
E-mail: lakshaybhutani890@gmail.com

[1]Student, Department of Life science, Amity University, Noida, Uttar Pradesh, India

Received Date: May 19, 2024
Accepted Date: July 09, 2024
Published Date: Jul 18, 2024

Citation: Lakshay Bhutani. Universal Immunization Program in India. Research & Reviews: A Journal of Microbiology & Virology. 2024; 14(2): 24–30p.

accompanying extreme levels of the disease. Approval to present these new vaccines has resulted in abundant controlled studies and comprehensive deliberations by the Domestic Mechanics Advisory Group of India (NTAGI), the country's top experimental able body on immunization [2].

Types of Vaccines

- *Inactivated vaccines*: Inactivated vaccines use the dead germ to generate immunity in the body. They do not provide high levels of immunity and require frequent transfusions to maintain health. Ex- polio and rabies.
- *Live attenuated vaccines:* These are weakened forms of germs that are introduced into the body to form immunity. In response to these pathogens, the body forms antibodies to fight against infection. They generally develop strong, long-lasting immunity. Measles, mumps, rotavirus, smallpox, and chickenpox [3].

Vaccine Development

There are different approaches to the development of vaccines, but the most common strategies used are as follows:

1. Inactivate the virus and then insert it into a person's body.
2. Weaken the virus and then insertion.

These approaches are mostly used for the development of live attenuated and inactivated vaccines.

- The process involves inactivating viruses using a chemical reagent, such as formalin, which reduces their ability to reproduce, and exposure to different physical reagents can cause the viruses to become inactive. These viruses were preserved in reagents and inserted to form vaccines. The biggest limitation of this process is that it requires frequent transfusions [4].
- Another method is to weaken the virus. This can be achieved by weakening wild viruses in the laboratory using the tissue culture method. These weakened vaccines replicate in the body and cause memory B cells to reproduce antibodies against the infection. The immunity generated is long-lasting and will reduce the risk of diseases soon. Manufacturing process of inactivated vaccine show in Figure 1.

TIMELINE OF THE PROGRAMME

In Figure 2, the flowchart details the timeline of the vaccine program and illustrates the key stages and milestones. This visual representation aids in understanding the sequential steps and critical points involved in the implementation of the program.

IMMUNIZATION SCHEDULE

Table 1 provides an overview of the immunization schedule, including the vaccine names, diseases they protect against, and recommended dosages [5].

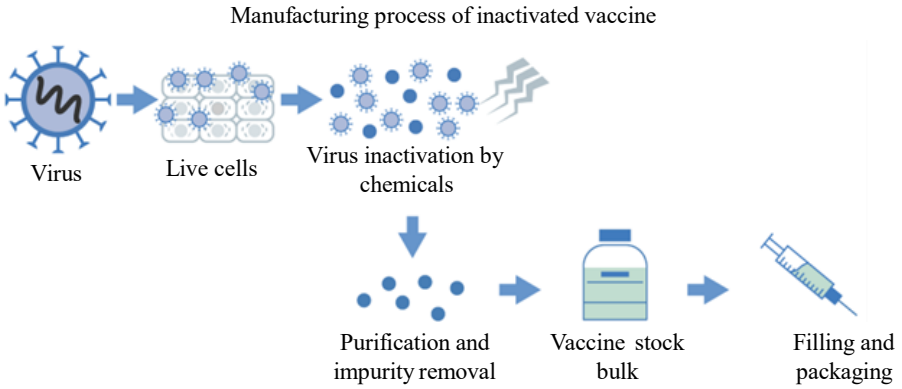

Figure 1. Flow diagrams show the manufacturing process of inactivated vaccine.

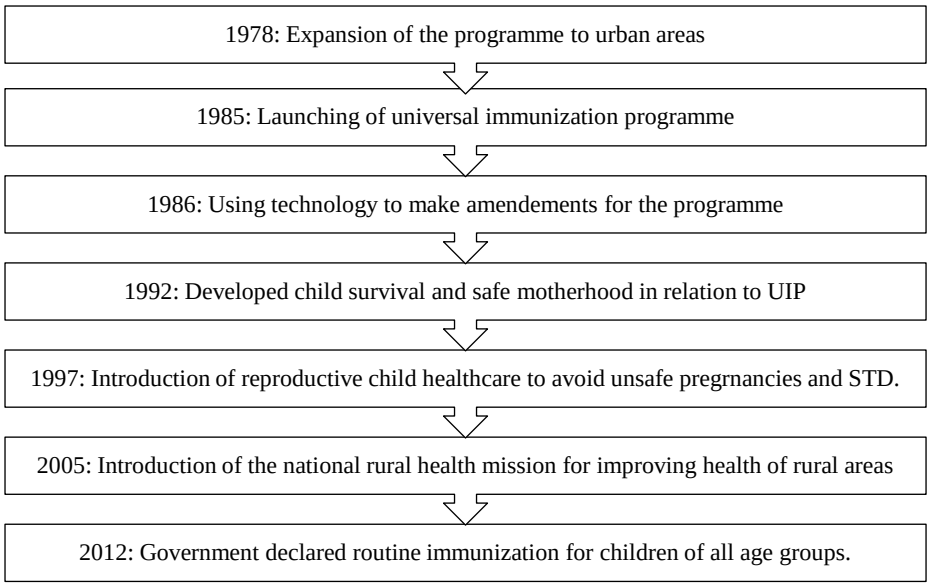

Figure 2. Flowchart of the vaccine program timeline.

Table 1. Immunization schedule.

S.N.	Vaccine	Protection	Dosage
1.	BCG vaccine	Tuberculosis	At birth up to 1 year
2.	Hepatitis-B	Hepatitis-B	At birth within 24 hours
3.	Polio vaccine	Polio	2–18 months and 4 to 6 years
4.	Rotavirus vaccine	Rotavirus infections	First at 15 weeks and last at 8 months
5.	DPT vaccine	Diphtheria, pertussis, and tetanus	3 doses at 6, 10, and 14 weeks and booster at 5–6 years
6.	MMR vaccine	Measles, mumps, and rabies	9–12 months and second at 16–24 months
7.	Influenza vaccine	Influenza virus	For everyone 6 months and older

ROUTINE IMMUNIZATION

Routine Immunization is a method by which the nation provides people with access to multiple lifesaving vaccines and various other parts that help to prevent such diseases in the future. It involves providing vaccination to children, men, women, and the elderly at periodic time intervals to eradicate the risk of diseases and reduce the error of mortality in the country.

These vaccines are recommended to people of different age groups depending on the risk of diseases associated with them. Modern vaccines have become more efficient in preventing multiple diseases and reducing the risk of death [6]. There are multiple reasons for the importance of routine immunization.

- Immunization reduces mortality and increases life expectancy.
- It helps in reducing costs and increases financial status.
- It not only saves the present generation but also acts as a savior for the next generation.
- It also reduces the risk of other diseases that can be prevented by vaccine intervention.

IMPLEMENTATION OF ROUTINE IMMUNIZATION

Routine immunization is a major priority for all countries and helps set a target for vaccination each year. For vaccination, different immunization sessions are conducted at the small village level. Vaccines are stored at the recommended temperature to store them successfully, and many cold chain points are being created across countries; in countries such as India, immunization is a very important aspect because many infections or viruses are increasing in the environment if we have a fully immunized body we can fight against these infections. Pregnant women, elderly people, and small children have a weaker immune system; therefore, routine immunization is necessary [7, 8].

INITIATIVES

Initiatives of the UIP in India involve setting up different centers (Figure 3).

Electronic Vaccine Intelligence Network Rollout

- The government has rolled out an electronic vaccine intelligence network that digitalizes vaccine stock management, temperatures, and logistics associated with the vaccine system, and tracks the vaccines at different levels from storage in the national to sub-district areas.
- The Electronic Vaccine Intelligence Network has completed its first phase in approximately 12 states of India, namely Assam, Bihar, Madhya Pradesh, Himachal Pradesh, Gujarat, Odisha, Uttar Pradesh, and Rajasthan.
- The program enables the monitoring of vaccine stock position and storage temperature, providing a detailed report of the tracking status and an overview of countries' vaccine cold chain logistics systems.
- The program has been scaled up in the entire country, and the second phase of the electronic vaccine intelligence network program is still ongoing in the states of Andhra Pradesh, Daman and Diu, Dadar and Nagar Haveli, Goa, Karnataka, Maharashtra, and Uttarakhand [9].

National Cold Chain Management Information System

- The National Cold Chain Management System tracks the cold chain equipment and inventory, availability, and functionality of all components related to vaccine storage and stock management.
- There are two centers, the National Cold Chain Training Center (NCCTE) in Pune and the National Cold Chain and Vaccine Management Resource Center (NCCVMR) in Delhi, which have technical equipment and provide training to cold chain technicians in the repair and management of cold chain equipment.
- The program has been scaled in different parts of the country by setting up different storage facilities for Vaccine Management [10].

COMPONENTS OF UNIVERSAL IMMUNIZATION PROGRAM

The different components of the UIP in India are (Figure 4):

1. *Strategy and policy:* The National Health Policy is a program initiated by the Government of India to develop an acceptable, affordable, and sustainable standard of health by setting up an effective health system. The major role of the policy is to reduce infant and maternal mortality rates and develop national health indicators. Other than this, there are multiple policies set up by the Government of India as an indicator, including the National Vaccine Policy launched in 2011. The objective of this policy is to address the decision-making process and launch a long-term plan for the work and strengthening of the UIP in India. It also focuses on issues such as vaccine security, management, regulations, guidelines, and any inclusion or modification of immunization programs.

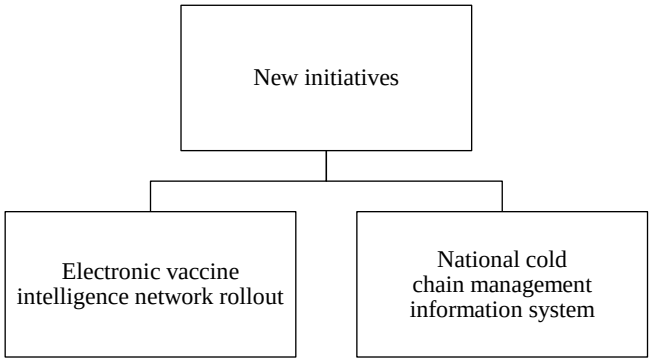

Figure 3. Flow diagram of initiatives taken for the vaccine.

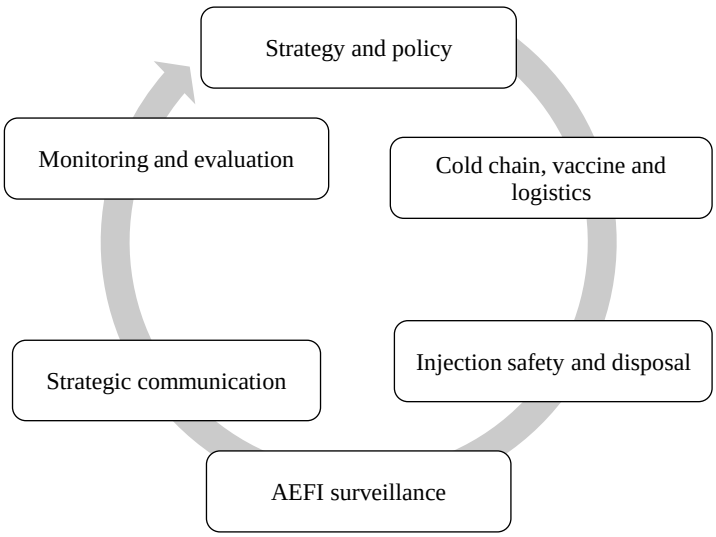

Figure 4. Components of universal immunization program.

2. *Vaccine and logistics in cold chain:* The cold chain is a system focused on the storage and transport of vaccines at a particular optimum temperature from their point of use. India has developed a vast range of features and facilities to ensure that the storage and transportation of vaccines are well monitored in each state. The vaccines were given to the government from four different medical health centers located in Karnal, Mumbai, Chennai, and Kolkata. The technicians are used to maintaining the cold chain equipment and are given specific training to handle, install, and use the equipment. The performance of the system is monitored and managed throughout the time it is produced until it is sent for the purpose. The Primary Health Centers can handle and keep the vaccine with them for a time period of one month only [11].
3. *Injection safety and disposal:* Injections are often used during the vaccination period, and lakhs of the injections are used. Unsafe use of these injections to insert the dosage can result in the spread of multiple fatal diseases, such as HIV-AIDS, Hepatitis-B, and many other harmful diseases. To ensure safe injection, the government has announced the use of safe equipment, including AD syringes, hub cutters, and waste disposal bags, to maintain the health of the individual as well as the environment. The disposal of immunization waste is done under the protocol set up by the Government of India as per the Central Pollution Control Board guidelines and procedures. States need to provide funds for proper disposal, hub cutters, and disposable bags for waste disposal.
4. *AEFI surveillance system*: AEFI stands for Adverse Event Following Immunization and is a surveillance system launched by the Government of India in 1988 as a medical incident that takes place after the immunization program and concerns the causes and effects produced by the immunization program. It monitors immunization safety, and defects related to the program and process, corrects unsafe practices of immunization, and reduces the negative impact of immunization related to the system. The committee of AEFI was revised in 2013 and has added multiple smaller committees, including Pharmacology, Pathology, Immunology, Forensic Medicine, and Epidemiology.
5. *Strategic communication*: This involves issuing media advocacy, planning, and media response to communicate with people about developing immunization programs and practices related to them. It is important to have proper immunization coverage to maintain the criticality of the situation, develop the features of different immunization programs, and make people aware of it [12].
6. *Monitoring and evaluation*: The UIP is a well-developed plan with several indicators of media coverage and monitoring stages at each level. Monitoring is performed at the three utmost levels:
   i. Regular reporting at the district level and Primary Health Centers.
   ii. Computerized reporting as a part of the Health Management System is done every month.

iii. The evaluation was based on surveys conducted over a period, including the National Family Health Survey.

IMMUNIZATION CAMPAIGNS

Multiple immunization campaigns have begun to eradicate diseases and maintain the health of the nation. Some of the major immunization campaigns were as follows.

- *JE vaccination:* JE vaccination is part of a routine immunization program and related scheme. It represents Japanese Encephalitis, which is the most adverse to laboratory people as a risk of infection. The vaccination is 90% effective against disease-causing microorganisms, and dosage is given either through muscle or injection under the skin. The campaign covers 154 districts out of 179 and covers approximately 108 million people across India. Two doses were administered under the routine immunization program in 2013 to protect children from it.
- *Polio eradication program:* The polio eradication program has achieved a remarkable status and states that in 2009, India accounted for nearly half of the global cases and gradually dropped over time. The program's success is due to continuous innovation, political support, and effective partnerships.

NEED FOR AND IMPORTANCE OF UNIVERSAL IMMUNIZATION PROGRAMME

- Immunization reduces the risk of fatal diseases and increases longevity in both people and children. Strong immunity is an indicator of good health in humans.
- Immunization prevents a large number of autoimmune diseases in children and enhances immunity to fight infections. This increases the self-mechanism of children and adults.
- It prevents several disorders, including polio and measles, and these infections may become an epidemic shortly. To avoid and reduce the risk of infection, it is necessary to vaccinate children, especially those undergoing routine immunization.
- It is one of the most cost-effective public health maintenances and has reduced the chances of infant mortality by 5% and vaccination is being targeted to around 2.67 crore newborns and 2.9 crore pregnant women.
- The program is effective against many fatal diseases and improves the health management system in India [13].

CONCLUSION

The Universal Immunization Program (UIP) in India, initiated in 1985 and part of the Child Survival and Safe Motherhood Program in 1992, plays a vital role in enhancing public health by providing essential vaccines and antibiotics. Supported by key organizations, the UIP targets infants, children, and pregnant women to protect them against diseases such as tetanus and coronavirus. As a major vaccine producer with a strong regulatory framework, India has one of the world's largest immunization programs, adapting to new health challenges with adult vaccines for diseases such as encephalitis. Utilizing both inactivated and live attenuated vaccines, UIP is crucial for combating infectious diseases and for ensuring public health in India.

REFERENCES

1. Sachdeva A. Pneumococcal conjugate vaccine introduction in India's universal immunization program [Internet]. Indian Pediatr. 2017;54:445–6.
2. Anekwe TD, Kumar S. The effect of a vaccination program on child anthropometry: Evidence from India's Universal Immunization Program. J Public Health (Oxf). 2012;34:489–97. DOI: 10.1093/pubmed/fds032, PubMed: 22611261.
3. Pradhan SK. Time to revamp the universal immunization program in India. Indian J Public Health. 2010;54:71–4. DOI: 10.4103/0019-557X.73273, PubMed: 21119238.
4. Shrivastwa N, Gillespie BW, Lepkowski JM, Boulton ML. Vaccination timeliness in children under India's universal immunization program. Pediatr Infect Dis J. 2016;35:955–60. DOI: 10.1097/INF.0000000000001223, PubMed: 27195601.

5. Kim D, Pekgün P, Yildirim İ, Keskinocak P. Resource allocation for different types of vaccines against COVID-19: Tradeoffs and synergies between efficacy and reach. Vaccine. 2021;39:6876–82. DOI: 10.1016/j.vaccine.2021.10.025, PubMed: 34688498.
6. Có-Rives I, Chen AYA, Moore AC. Skin-based vaccination: A systematic mapping review of the types of vaccines and methods used and immunity and protection elicited in pigs. Vaccines. 2023;11:450. DOI: 10.3390/vaccines11020450, PubMed: 36851328.
7. Shen AK, Fields R, McQuestion M. The future of routine immunization in the developing world: Challenges and opportunities. Glob Health Sci Pract. 2014;2:381–94. DOI: 10.9745/GHSP-D-14-00137, PubMed: 25611473.
8. Dinleyici EC, Borrow R, Safadi MAP, van Damme P, Munoz FM. Vaccines and routine immunization strategies during the COVID-19 pandemic. Hum Vaccin Immunother. 2021;17:400–7. DOI: 10.1080/21645515.2020.1804776, PubMed: 32845739.
9. Anderson R, Perrier T, Pervaiz F, Sisouveth N, Kumar B, Phongphila S, et al. Supporting immunization programs with improved vaccine cold chain information systems. In: IEEE Global Humanitarian Technology Conference (GHTC 2014). IEEE Publications; 2014. p. 215–22. DOI: 10.1109/GHTC.2014.6970284.
10. Bremer P. Towards a reference model for the cold chain. Int J Logist Manag. 2018;29:822–38. DOI: 10.1108/IJLM-02-2017-0052.
11. Weiss WM, Winch PJ, Burnham G. Factors associated with missed vaccination during mass immunization campaigns. J Health Popul Nutr. 2009;27:358–67. DOI: 10.3329/jhpn.v27i3.3378, PubMed: 19507751.
12. Bonu S, Rani M, Baker TD. The impact of the national polio immunization campaign on levels and equity in immunization coverage: Evidence from rural North India. Soc Sci Med. 2003;57:1807–19. DOI: 10.1016/s0277-9536(03)00056-x, PubMed: 14499507.
13. Duintjer Tebbens RJ, Kalkowska DA, Wassilak SGF, Pallansch MA, Cochi SL, Thompson KM. The potential impact of expanding target age groups for polio immunization campaigns. BMC Infect Dis. 2014;14:45. DOI: 10.1186/1471-2334-14-45, PubMed: 24472313.

