

Review Article

U-WIN, e-VIN and Co-WIN: harnessing digital platforms to enhance immunisation coverage in India

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ABSTRACT

Vaccine portals have emerged as modern healthcare tools in the administration and distribution of vaccinations. Among the leading three are U-WIN, e-VIN, and CO-WIN, all of which have become essential tools in India for efficient vaccine administration, access, and improvement in public health outcomes. PubMed and Google scholar search engines were used for comprehensive reviews and studies regarding vaccination portals, their functioning, implementations, and public health impact. Vaccination portals beyond simple administration can also serve as channels for education that impart precious knowledge on vaccine safety and effectiveness. Public engagement through the same portals will allow authorities in health to build more educated populations that are easily protected from misinformation. These types of portals need to be reviewed and updated constantly to meet ongoing issues in public health. Vaccination portals represent a landmark in the public health infrastructure. Improving access to vaccines, countering misinformation, educating public, and adapting to the changes in health landscape positions them as a vital tool in global effort toward achieving high vaccination rates and protecting community health.

Keywords: U-WIN, e-VIN, Co-WIN, Universal immunisation programme, Ayushman Bharat health account, Cold chain

INTRODUCTION

The U-WIN, e-VIN, and Co-WIN platforms represent important steps in the direction of India's immunization efforts, especially under the Aegis of the UIP (Universal immunisation programme). They are constituent parts of India's vaccine strategy each playing a distinct yet complementary role in enhancing the coverage and efficiency of immunization. The Co-WIN app was introduced in 2021 to control the spread of the COVID-19 pandemic, which became one of the giant successes of India's digital health intervention. The U-WIN and e-VIN platforms were launched to increase universal immunization coverage. Platforms that have vaccination tracking, vaccine stock management, monitoring of cold chain points, and monitor adverse events following immunization. U-WIN is integrated with

the Ayushman Bharat digital mission (ABDM), in partnerships with ABHA (Ayushman Bharat health account) and other health platforms to identify and reach out to unimmunised children and pregnant women. This review assesses the effectiveness of these digital platforms to enhance the immunization coverage, sustain the vaccine supply chain, and hence the public health programs of India at large.

India has excelled significantly by implementing a superior vaccination system via prime digital platforms such as U-WIN and e-VIN, which have effectively become successful in covering vast populations, particularly pregnant women and children. In 2021, the Co-WIN application saw the launch of the immunization program with much success in vaccinating millions from COVID-19. The provision blossomed in preparation for

the U-WIN application, which aimed at uplifting the UIP to reach and track children who missed vaccinations. The life-saving vaccines through immunization are delivered free of cost to children and pregnant women against 12 vaccine preventable diseases-diphtheria, pertussis, tetanus, polio, measles, rubella, severe form of childhood tuberculosis, rotavirus diarrhoea, hepatitis b, meningitis and pneumonia due to *Haemophilus influenzae* type B and *Pneumococcal pneumonia* and sub-nationally against 1 disease-Japanese encephalitis.¹

The vaccination coverage has also improved a lot in the recent decade mainly in middle-income countries and in low-income countries such as India. It is highly essential to increase adult vaccination coverage since unimmunized adults may become carriers and have a potential risk to pass on their diseases to infants and children. PCV 14 (Pneumococcal vaccine 14) has been incorporated in UIP.

It has also been integrated to U-WIN and e-VIN portal as well. In districts or states where PCV 10 is not available or shortage persists, PCV 14 can be administered. Immunization in adults will have positive effects upon family and finally the community. National immunization programs provide add vaccines too which has led to decline in vaccine preventable diseases among children. Uninterrupted vaccine stocks, management of their flow, maintaining storage temperatures at all the cold chain points, ensuring continuous immunisation has been very well supported by e-VIN (Electronic vaccine intelligence network) portal. It facilitates the registration of vaccine appointments accompanied by proper scheduling. Moreover, it keeps a track of vaccination coverage too. Furthermore, monitoring adverse events and keeping a check on temperature fluctuations in cold chain. Apart from this, the residents can book their time slot for vaccination and also check if there is any routine immunization taking place within their vicinity. U-WIN will now book the RI sessions, whereas the vaccinator will update the vaccination status. For pregnant women and children, there would be vaccine acknowledgment and immunization cards tied to ABHA ID which is a 14-digit number, used for identification and authenticating the person. As the certificates are going to be issued spot and downloadable too, based on the convenience of the beneficiary.

To establish an efficient and fluent routine immunization system, various programme components need to be aligned in such a way that would present an opportunity for the child to be successfully vaccinated. Vaccines must be procured and must reach the service delivery level successfully, while maintaining them continuously through a functioning cold chain.²

This review talks about the role of the digital platform in improving the coverage of immunizations, as well as making efficient management in vaccine logistics.

LITERATURE SEARCH

Relevant literature was searched from electronic databases: PubMed and Google Scholar using search terms, "vaccination portals- U-WIN, e-VIN and CO-WIN," "routine immunization," and "digital transformation," with corresponding synonyms and subject headings. Articles related to routine immunization services across the digital platforms for children and pregnant women were reviewed and supplementary sources were accessed through analysis of the reference lists. Titles and abstracts were screened first to exclude irrelevant studies. For the remaining articles, full-text review was carried out to determine their relevance and quality. Literature search was done on published articles from January 2010 to June 2024.

Studies on implementation, and effect on U-WIN, e-VIN and Co-WIN. Research articles, reports and government publications, studies carried out in India or that would likely benefit the immunization program in India.

Articles that are not written in English. Studies of immunization platforms other than U-WIN, e-VIN, or Co-WIN. The authors cross validated data from various studies and sources for authentication and accuracy of the findings. Due to the concentration of published literature, there can be bias.

PILLARS OF U-WIN

Real-time data collection

Real-time monitoring is enabled at the session level as well as coverage. The main component is an immunization registry in electronic and digital format that captures the vaccination history of every individual. The health workers have the mobile apps or digital platforms to record vaccinations, update immunization schedules, and track administered doses. Real-time data collection is linked to national health information systems with aggregation possible at regional, state, and national levels. This allows follow-up on vaccine coverage, areas with low coverage, and speedy responses to possible outbreaks. The information is live through dashboards, which give insights into the rates of vaccine coverage, demographic trends, vaccine stock levels, and cold chain management. This enables policymakers to make quick decisions while acting in areas of low coverage or potential vaccine hesitancy.

Vaccine stock management

It assures continuous supply and reduces stock-outs. U-WIN has a digital vaccine inventory management system which monitors the level of vaccine stocks at all levels from national to local levels: the national, regional, district, and local healthcare centre. The system keeps records of the number of every vaccine available, its batch numbers, date of expiry, and storage conditions.

The vaccine stock management in U-WIN is aligned with the planned immunization sessions. This helps coordinate all mass immunization drives or campaigns.

Cold chain monitoring

Keeps the vaccines at optimal storage conditions. Proper maintenance of the cold chain ensures that vaccines remain effective from the point of manufacture to administration. The system can also track the schedules for the maintenance of cold chain equipment and alert managers on routine maintenance, calibration, or replacement of equipment needs. Effective maintenance of equipment will prevent cold chain failures and ensure reliability of the devices of temperature monitoring.

The U-WIN system integrates advanced cold chain monitoring solutions that maintain the vaccines at ideal temperatures during storage, transport, and handlings. Appropriate maintenance of temperature levels ensures that the vaccines are preserved and well-effective.

Beneficiary identification

Identification of unimmunized children and pregnant women U-WIN is often integrated with national identification systems (such as Aadhaar in India) to authenticate the beneficiary details. This helps in minimizing errors and rechecking the identity of the beneficiaries while immunizing them. Health workers or beneficiaries themselves can register in the immunization program through mobile applications or web services. When registered, one holds all the critical details like name, date of birth, contacts, and medical history, which might be stored in their electronic profile. All beneficiary information is maintained on one central database, updated in real-time every time a new vaccination is administered or a beneficiary information is updated. This ensures that the latest available information is always prepared for health professionals to use; therefore, minimizing or eliminating the possibilities of errors or overcounting.

Vaccination history for all recipients is saved in digital. It is accessed through their mobile application or web portal. After confirmation of proper vaccination schedule, the recipient is enabled to print a downloadable certificate showing vaccination.

Integration with health systems

Connects with ABHA and other health application. ABHA is a part of the ABDM that aims at building a digital health ecosystem in India. ABHA is a unique health ID that is provided to citizens, which facilitates easy access to medical records and healthcare services digitally. This helps in better management of health records and easy access to health services in the healthcare ecosystem.

HISTORICAL BACKGROUND AND TIMELINE

From e-VIN to U-WIN

UIP was incorporated into child survival and safe motherhood programme in 1992. Since, 1997, immunization activities have been an integral part of national reproductive and child health programme and is at present one of the principal sub-programmes under national health mission (NHM) since 2005. It aims to vaccinate 2.6 crore new born and 3 crore pregnant mothers annually for vaccines under UIP. More than 90 lakh Immunization sessions are conducted annually with nearly 27,000 cold chain points in the country.³

2015: Inauguration of e-VIN

The electronic vaccine intelligence network (e-VIN) was launched by the ministry of health and family welfare (MoHFW) along with the United Nations Development Programme (UNDP) to consolidate and streamline the immunisation supply chain in India.

E-VIN aimed to ensure efficient vaccine logistics management by providing real-time information on vaccine stocks and flows and maintaining optimum temperatures in cold chains. The system was first tested in a few states and later quickly rolled out across the country.

2018: Scaling up of e-VIN and its achievement

By 2018, more than 20 states and union territories had e-VIN in place and had played an important role in the reduction of vaccine stock-outs by 80% and the availability of vaccines up to 99%. The system was generating data to help with further planning and management of immunisation sessions.

2020: COVID-19 pandemic and the urgency to have a new platform

COVID-19 has ushered in the need for a robust digital platform to manage mass vaccination programs. India responded by developing and rolling out Co-WIN, an app that supported the COVID-19 vaccination campaign. The app allowed citizens to register for vaccinations, schedule their appointments, and obtain digital certificates of vaccination. It also allowed real-time monitoring of vaccine administration.

2021: Panacea for Co-WIN

CO-WIN turned out to be an effective management tool in the COVID-19 vaccination campaign. Campaign, immunizing millions of Indians.

The success here reflected the effectiveness and potential of digital health interventions in large-scale immunization initiatives.

2022: Idea and conceptualization of U-WIN

From what had now been learnt through both e-VIN and Co-WIN, the MoHFW created the U-WIN with the objective of taking forward the UIP progress. U-WIN would link up with the ABDM and interact with ABHA, the ABHA so that a fully digital health system could be established.

2023: Pilot launch of U-WIN

The program was piloted in some of the states to test its functionality and for getting responses from health workers and beneficiaries. U-WIN focuses on real time data collection, vaccine stock management, cold chain monitoring, and identification of beneficiaries.

2024: National roll out of U-WIN

After the pilot launch, U-WIN was launched all over the country that covered all the states and union territories. The U-WIN aimed to provide uninterrupted supplies of vaccines, better schedule routine immunization, and comprehensive immunization status of children and pregnant women. The system also facilitated the addition of new vaccines like PCV 14 to the UIP.

KEY FEATURES AND BENEFITS

e-VIN

Vaccine logistics management is enhanced, and stock-outs are reduced, thereby ensuring minimum cold chain conditions. It facilitates planning of vaccine needs, averts overstocking and stock-outs, and limits vaccine losses. It standardizes vaccine logistics. The e-VIN enhances vaccine supply chain management support to India's UIP and contributes towards better immunisation coverage. e-VIN has performed a crucial role in handling vaccines for regular immunization as well as for the COVID-19 vaccination campaign in India. It has been awarded a coveted ranking as one of the most outstanding innovations in public health supply chain management.

Co-WIN

Has effectively managed COVID-19 vaccination thus creating an online platform for digital registrations, scheduling and certifications. Co-WIN possesses an extensive record system for vaccination data, indicating detailed information about administered doses and demographic data. This will enable it to measure vaccine coverage and identify areas that require improvement. It has greatly assisted in the logistics management of COVID-19 vaccination in India, a sure means to the effective and efficient service of the vaccination campaign. Individuals can get themselves registered for COVID-19 vaccination through the Co-WIN portal or mobile app. Users can book and reschedule appointments for vaccinations at vaccination centres. It is a means of

public information dissemination on vaccination centres, types of vaccines, and COVID-19 vaccination guidelines.

U-WIN

It enhanced the UIP by introducing real-time information, monitoring stock management of vaccines, cold chain monitoring, and connecting through ABHA for health record management. Effective procurement, distribution, and managing vaccines so that there would not be stock outs and wastage. Track progress, assess performance to ensure immunization services are of high quality. This ensures universal immunization programme reaches across and covers all people groups with really high-quality vaccination services.

DISCUSSION

Benefits

U-WIN is a complete registry for immunization programs that enables health workers to provide the right vaccine on time, to collect real-time data, and thereby plan better. It aims to cover 2.6 crores of new born babies and 2.9 crores pregnant women every year. The stockouts had reduced by 80% and increased vaccine availability to 99% due to digital platform integration. U-WIN is a one-stop registry and record of immunization programmes. Besides that, the health workers will also help in reaching out families for due time administration of vaccines, real-time data on routine immunization sessions, better planning, and distribution of vaccines; and tracing and following in case of dropouts.⁴

It strengthens health systems and ensures equity through easy and timely availability of vaccines to all children by streamlining the vaccine flow network. Conceptualizing learnings and achievements of e-VIN and Co-WIN in ensuring seamless management of UIP and COVID-19 vaccines, the MoHFW launched U-WIN to overcome the disruption of routine immunization services in India. Thus, U-WIN aims at reaching everyone and everywhere and it will prove to be game changer in addressing inequities related to immunisation services in India.⁵

Challenges

Despite the successes, challenges remain in vaccine supply chain management, cold chain reliability, and vaccine wastage. Continuous monitoring and upgrading of digital platforms are necessary to meet the demands of health care workers and improve service delivery.

Future directions

Future efforts should focus on expanding the use of digital platforms, Improvement in the training for health workers, and accepting the use of feedback to issues. Continuous investment in digital health infrastructure will be important to help maintain and extend immunization

coverage. To manage the complexities of vaccine supply chain management and ensure adequate delivery of the vaccine to the beneficiaries, there needs to be improvement in five basic aspects that would include leadership, oversight, design, data, and cold chain equipment. Electronic data systems may also support the reduction of stock-outs as well as the maximum availability of vaccines.⁶ For the reliability of a cold chain, regular constructive supervision and monitoring are necessary. To avoid vaccine wastage, use of bulk and thin dose vials in the immunisation session would also be helpful. The application may be further developed depending upon the need of health care providers who work under the programme of immunization.⁷

The U-Win will be the one-stop-shop for immunisation services for immunisation services that will capture details of pregnancy and outcome, newborn registration and immunisation at birth. Updating the immunization status and scheduling the live routine immunisation session are part of its core.⁸

Case studies and examples

Rajasthan: improving vaccine management via e-VIN

One among the earliest users of e-VIN was Rajasthan, a state that was facing tremendous geographical challenges. Vaccine stock-outs were no longer an uncommon phenomenon earlier, resulting in affected immunization activities coverage. With e-VIN, stock-outs were cut by more than 80% so that vaccines were available at all times. Real-time tracking of cold chain points ensured proper storage of vaccines at temperatures that did not let the vaccines go bad.

Improved logistics and supply chain management boosted immunisation coverage to unprecedented levels, especially in inaccessible regions.

Uttar Pradesh scaling up COVID-19 vaccination with Co-WIN

The state of Uttar Pradesh alone accounts for over 20 per cent of India. Managing the COVID-19 vaccination process was no easy affair in this most populous state in India. Due to its voluminous population and logistically complex issues, COVID-19 vaccination campaign was not an easy thing. Co-WIN allowed easy registration, scheduling, and tracking of millions of vaccination appointments.

The platform managed huge crowds and ensured a smooth process of vaccination. Information given through Co-WIN in real-time helped the health officials take informed decisions, utilize resources efficiently, and eradicate vaccine hesitancy through targeted communication. Digital certificates issued to the beneficiaries became important during travel and other activities due to the pandemic.

Immunisation

Complete, holistic through U-WIN Pilot Madhya Pradesh was one of the pilot states in the U-WIN platform to strengthen the UIP. Leveraging the U-WIN platform facilitated real time tracking of immunisation sessions and coverage, enabling health workers to identify and follow up on unimmunized children and pregnant women. The integration with ABHA helped build holistic health records that got linked with up immunisation data. Immunization session planning and scheduling were also made easier to minimize missed opportunities and drop-outs.

Assam: monitoring cold chain through e-VIN

Even Assam is a state that has very tough terrain and climatic conditions. Its people have derived tremendous advantage from the e-VIN system. The vaccines have been well maintained and transported at proper temperatures because of the cold chain monitoring facility under the e-VIN. This prevented wastage as well. Real-time alerts about temperature fluctuations helped make corrective measures on time preventing vaccine spoilage. Training was given on the use of e-VIN for the health workers. This elevated their ability to handle vaccines productively.

National impact: CO-WIN for COVID-19 vaccination campaign

The COVID 19 vaccination campaign across the country required a robust digital platform to operationalize the enormous scale and complexity. CO-WIN assisted in registration of millions of beneficiaries that entailed prioritization by age, comorbidities, and position as a frontline worker. The platform helped ensure an equitable allocation of vaccines among the states and through districts, thus ensuring that vulnerable population groups were vaccinated in the time frame. The adverse events after immunization were monitored thus providing necessary information for safety of the vaccine as well quelling the apprehension of the public. The procurement of vaccines and cold chain equipment are carried out by ministry of health and family welfare. Projections made for two years only since procurement takes some lead-time. Apart from this, supply orders are placed which gives 80% supplies to state stores and 20% cushion at global mobile satellite distress system. Hence, the supplies are centrally controlled by the ministry across 36 states/union territories.⁹

Digital technologies can provide critical underpinning for vaccine deployment through enhancements in planning, monitoring, and management processes; however, they depend on the capacity of local infrastructure, regulatory environments, and the digital readiness of populations to ensure results. Governments face challenges in ensuring that access is equitable and managing cyber risks alongside leveraging the tools effectively.

Digitization of vaccine portals has transformed vaccination campaigns worldwide by enhancing efficiency and accessibility but poses some unique challenges that require different approaches to ensure equitable healthcare delivery. Misinformation concerning vaccines remains one of the major obstacles to uptake; digital platforms can effectively counter such misinformation as government and health organizations leverage social media to provide accurate information and clarify misconceptions. Automating systems will include mobile reminders and personalized messages, which can keep them updated on the schedules and importance of vaccination. Studies have demonstrated the success of such automated systems in increasing coverage by communicating directly with the individual and family. These platforms, collectively, form a comprehensive approach toward enhancing vaccination coverage and management in India through technology leverage for streamlined processes, improved data visibility, and the on-time delivery of vaccines to the populations. The digital platforms, through information dissemination, community engagement, personalized communication, and ensuring that the data-driven strategy is utilized for vaccination, have the multifaceted approach toward vaccine hesitancy reduction.

CONCLUSION

U-WIN, e-VIN, and Co-WIN has become the benchmark in providing digitalised immunisation services in India. These platforms had an upgrading of routine immunization sessions, management of stock, and cold chain monitoring to ensure equitable vaccine distribution. Case studies and examples show how e-VIN, Co-WIN, and U-WIN have made a significant improvement in immunization coverage, vaccine management, and public health outcomes in India. Since India started using digital platforms, it significantly enhanced the availability, accessibility, and effectiveness of vaccines ultimately contributing to the betterment of its health system.

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