

Tracking of Indian Children's Immunization System for Private Hospitals using Real-Time Data

Renuka R. Kajale¹ and Dr. Varsha Namdeo²

¹Research Scholar, Department of Computer Science Engineering SRK University Bhopal, Ass. Prof. NMIET, Talegaon Dabhade

²Department of Computer Science Engineering SRK University Bhopal

Abstract— One of the fundamental infrastructure components of creating smart cities is smart healthcare, a recent endeavor of the Indian government. This highlights how important it is to create intelligent solutions to offer everyone access to higher-quality healthcare services. Given that all three of these causes are preventable—malnutrition, poor sanitation, and inadequate healthcare—India has the highest rate of child mortality in the world. In this study, we introduce a general healthcare system that provides a single platform for storing and retrieving comprehensive kid medical history data. It contains the child's required immunization schedule information as well as past medical history documents. There are also prompts to parents reminding them to vaccinate their children on time to protect their health.

Keywords—Smart Cities, Smart Healthcare, Healthcare, Immunization, Inadequate.

I. INTRODUCTION

India has a population of more than 1.36 billion, which is around a fifth of the world's total population, and around 30% of this number are children under the age of 15. It is very crucial to make sure that our youth have access to quality healthcare and that a good immunization program is in place.

Not getting the necessary vaccinations at the required age can lead to serious health problems in the child's life. vaccination rates in India are still not up to the mark, two of the most common reasons being misinformation and forgetfulness.

We need mass-level immunization programs, better systems to track and record data, and programs that will teach the masses about the importance of vaccines, to lower mortality rates.

In 2015 in the country, around 1.2 million children lost their lives before turning 5, due to diseases that could've been prevented, if the children had been given on-time vaccination, as per a UNICEF (United Nations International Children's Emergency Fund) report that emphasizes on how serious the situation of healthcare in India is. In 2020 an estimated 5 million children under the age of 5 years died, mostly from preventable and treatable causes.

In third-world countries like India, no noteworthy technical interventions have been done, that could successfully change the scenario of vaccination, unlike some developed countries, where tools like websites and apps have been developed to improve the situation.

There is no children's vaccination tracking system for private hospitals and our government also does not have any data for the total vaccinations done in a private hospital.

A. Need for immunization tracking in India:

The government should know vaccination updates for all children of our country even if it is given in private through a systematic and monitoring system. A smart system that stores user data and their medical information in one place, and makes the vaccination management process easier for the authorities, is very important. With the rapidly increasing use of smartphones and the internet, using such a system is a very convenient way to manage immunization programs.

II. LITERATURE REVIEW

A. Nurses and infant vaccination coverage (Elsevier,2022)

discussed that Adhering to a baby's immunization schedule on time might help the healthcare system save money and promote the health of the population. Can timely uptake be encouraged by public health initiatives like nurse home visits? We investigate this query in light of universal house calls. for Danish new parents. We examine the outcomes of families, who differ in the precise timing of their nurse visits around the recommended age for infant vaccines, by utilizing combined nurse records and administrative data and an event research design. We discover that parents are more likely to vaccinate their children on time if they receive a nurse visit before the advised vaccination age. Over time, the vaccine coverage rates of parents who receive treatment and those who do not converge. Based on this, our research indicates that nurses largely serve as human immunization.

B. Immunize - Baby Steps for Smart Healthcare (IEEE,2017)

The system provided vaccination details of children with their DOBs to store the child's medical history in a common database. An SMS and e-mail-based reminder system is also proposed. The architecture is a client-server architecture. A relational database, MySQL is proposed for storing data. It helps parents avoid delays in their child's vaccination. Using the data, new learnings can be found and new trends in diseases can also be studied, by using artificial intelligence and data analytics. This will help improve the healthcare system.

C. ReadyVax: A new mobile vaccine

information application This application had information about vaccines, diseases, common questions, and resources. The relevant screens developed were home, diseases, vaccine, resources, questions, alerts, about, and menu. Notifications were used for alerts. The app was used in 107 countries. The most used screen was 'vaccines' and the most common vaccines searched for were DPT, pertussis, and tetanus.

D. Use of Apps to Promote Childhood Vaccination: Protocol for a Systematic Review

This study reviewed the available evidence on the use of apps to support childhood vaccination uptake and information storage. A possible limitation is that the quality and number of studies using similar topics may be limited. The results of the study can be used for developing a vaccination app.

E. e-vaccination: Fingerprint-Based Vaccination Monitoring System

The app keeps track of the vaccination schedule of children and stores records in a database. Notification is sent when a child is to be vaccinated and this is done by fingerprints collected. The system kept information safe electronically and can be improved by studying and implementing ways to capture infant biometrics and making the database more secure.

F. An Artificial Intelligence-Based, Personalized Smartphone App to Improve Childhood Immunization Coverage and Timelines among Children in Pakistan: Protocol for a Randomized Controlled Trial

The app had text, voice, pictures, and video messages, which were based on previous studies to improve the messages. The messages were reminders and information about the adverse effects of the vaccine. The app included a vaccination schedule, resources, and notifications. According to the users, the app should have had details about the doses and purposes of each vaccination to be given. Parents found that a mobile app helped track their health.

G. Can mobile technologies improve on-time vaccination? A study piloting maternal use of Immunize CA, a Pan-Canadian immunization app

To evaluate if the use of an app could change beliefs and behaviors related to vaccination, users were asked to attempt surveys before and after 6 months of using the app. Even though the app was well received, some

participants were more likely to vaccinate and others were less likely. On-time rate of vaccination was improved.

H. An Intelligent Baby Care System Based on Smart Phone Application

This app was built with modules about information, benefits, and schedules of vaccines, along with age groups. The users are reminded about upcoming vaccines using push notifications. This application proved to be a helpful tool for parents struggling to manage work lives and family, to ensure that their children can have the required immunity.

I. Vaxign: the first web-based vaccine design program for reverse vaccinology and applications for vaccine development

This app integrated open-source tools and developed modules with user-centric interfaces. Users can add their vaccine information and questions which would be processed by PHP/HTML/SQL. The result is given to the user. 191,192 proteins have been computed in the app, and the users can use this data by raising queries on the web interface. Vaxign was a user-centric app.

J. Effectiveness of a smart phone app on improving immunization of children in rural Sichuan Province, China: study protocol for a paired cluster randomized controlled trial.

The app had the option to record and update information, make appointments, get a list of children who missed their vaccinations, and send details to the doctors. One survey was done at the end, after 8 months of use.

The study helped to determine how useful an app could be to efficiently manage immunization in China and how it would build the knowledge of parents about vaccines.

III. PURPOSE

Due to a lack of adequate healthcare, India has high Infant Mortality rates. Due to a lack of adequate healthcare, India has high Infant Mortality rates. The government should keep child vaccination track even if the hospital is private or government.

IV. OBJECTIVE

To provide better quality healthcare services to track the Children's immunization information.

It will provide mandatory vaccination schedule Details of the child along with the previous medical history records which is online available on the portal.

V. METHODOLOGY

The system's primary objectives are to offer immunization records according to the child's birthdate and to have a shared database with the child's whole medical history. A method to view these details is proposed to have online access anywhere at any time through both desktop and mobile applications, given the significant rise in internet usage and mobile usage.

A reminder system utilizing SMS and email regarding the type and date of vaccination is also suggested in order to remind parents to have their children vaccinated on time. It mostly assists parents and their kids in not delaying vaccinations. In order to provide the appropriate vaccination to the patient, the doctor can access the vaccination history information in addition to prior medical records.

The vaccine system's suggested architecture is Model View Control architecture in a client-server configuration. The design of web applications is suggested to use JSP technology.

Java-based technologies, like JavaScript and J-Query, are also suggested. MySQL is a relational database that is suggested for data archiving and retrieval.

An Android-based app is suggested since there are more smartphones running the Android operating system. Android Studio and PHP technology are suggested for mobile application development. The Indian Academy of Pediatrics vaccination schedule is suggested to be taken into consideration when reminding parents to vaccinate their children regularly.

A Web-based application and Android mobile-based system design and development is designed and developed to store and retrieve the child's medical history using the technologies mentioned in the proposed architecture of this paper. The overview of the vaccination schedule chart proposed is provided in Figure 1



Figure 1: Vaccination Scheduled chart

Figure 1 represents the IAP recommended vaccination chart. The system determines the vaccination due date based on the child's date of birth and the age requirements. Parents and doctors have access to the child's due date computation.

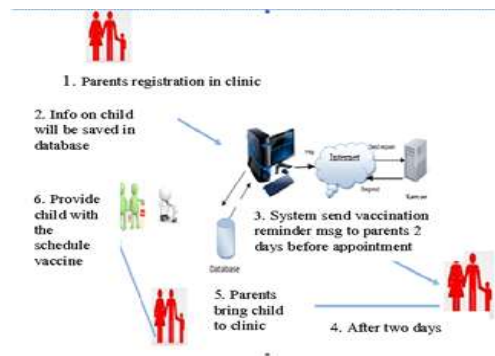


Figure 2: Proposed System

Web applications are developed utilizing Java Rest API web services and a client-server architecture connected via the internet. In this design, a request-response messaging pattern is used for message exchange between the client and server across the network. The overview of the proposed system with SMS technology is as represented in Figure 3. SMS gateway technology is proposed for triggering SMS to the parents on the vaccination due date schedule. Java Restful web services technology is proposed for web application development. The proposed system for mobile applications is as represented in Figure 3 Android-based system. On the server side interacts with MySQL database for retrieving and storing data And interacts with the Android client to use the application. The vaccine's due date is determined by the system using the child's birthdate and the age criteria. Parents and physicians can view the child's due date computation. The activities of the Doctor and Parent details are as follows:

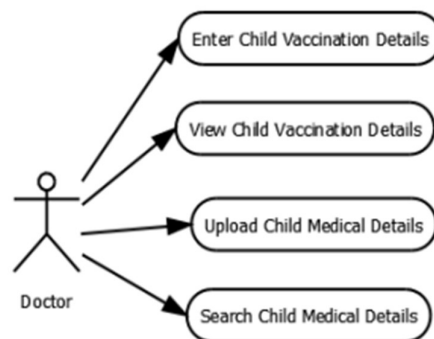


Figure 3: Use case Diagram for Doctor

Figure 3 represents the use case diagram for A doctor with the activities is provided.

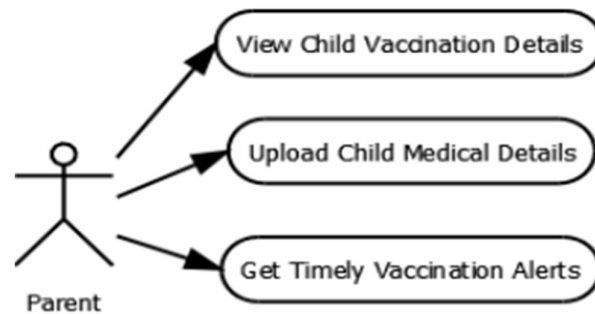


Figure 4: Use case diagram for Parents

The primary use cases for physicians and parents are listed below: Figure 3 and Figure 4. Separate access privileges to Doctors and Parents are provided for both web and mobile applications. The parent can access the vaccination of his or her child. The details of the medical records, whereas a physician can look at them Complete details of the child, including vaccination history and previous medical history records.

The possibility of viewing the child's medical records on the Internet anytime anywhere can help treat the child efficiently and effectively. In case of medical emergencies, where there is a lack of access to past medical records, The system will come to the rescue and provide all the necessary aid. Information to get started on the treatment, as well as saving the lives of children.

VI. CONCLUSION & FUTURE SCOPE

It is critical to adjust to intelligent solutions as ideas for smart cities continue to advance. In light of Smart Healthcare's significance, a shared platform to store to communicate medical knowledge, make accurate diagnoses, and administer appropriate therapy, it is necessary to get and retrieve the medical history data.

Since vaccine-preventable diseases account for a disproportionately high number of child deaths, this study proposes a system that would allow for the shared storage and retrieval of medical records, including facts about the child's required immunization regimen. With the rapid evolution of mobile and internet technology, parents should receive regular reminders to vaccinate their child or children on time to protect them from cured diseases.

In the future, data storage on the cloud platform will allow for this cloud-enabled technology. Integration with big data will also help to find patterns. By collecting all the children's vaccine and medical history data, new medical insights and discoveries can be made. New patterns and trends of various diseases can be studied by using advanced technologies like data analysis, predictive analytics, and artificial intelligence. This will lead to improved treatment and quality of services and reduce the burden of paperwork for medical examinations. This can be extended to include not only children but also older people. By leveraging IT in health technologies, we can improve the quality of life in the future.

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