

A web-based Child vaccination system in Bangladesh

Tanjia Chowdhury¹, Jesmin Akter², Sheikh Fahamina sultana³

Department Of Computer Science and Information Technology, Southern University Bangladesh, Chittagong, Bangladesh

Corresponding Author: Tanjia Chowdhury

Abstract: Vaccination is the way of prevention from various infectious diseases. It stimulates the immune system against a pathogen. In many developed countries, the process of Vaccination system is not technology based. In Bangladesh, patients use manual Vaccination system still now which is not secure. The existing systems are the paper-based system. Today peoples are going to be digitalized on their particular life in Bangladesh. So every parent's wants secured and flexible child vaccines system than the existing manual system. In fact, many parents don't register their childbirth just because the process of registering is tiresome. In this paper, we have implemented the web-based as well as android based vaccines system so that the parents get facilities to monitor vaccination activity by mobile application/online. We emphasized our government vaccines which have given after childbirth. Our digitalized vaccination system can solve many problems to monitor and maintain proper vaccination system. Especially problem of an unaware mother at third world country. It can be used for all government and non-government clinic or hospital who are working for mother and child health. Parents can register their childbirth and will know about vaccines schedule through a single & simple SMS by using our proposed system.

Keywords - Child Vaccination, Digitalized system, Manual system, SMS, Security

Date of Submission: 10-10-2018

Date of acceptance: 26-10-2018

1. Introduction

Vaccination system is a crucial part of Health technology. Vaccines are the first step of preventing diseases including polio, whooping cough, diphtheria, measles, rubella (German measles), mumps, Haemophilus influenza type b (Hib) and tetanus. The Vaccine helps to protect infants, children and even adults from infections and premature death caused by many infectious diseases. The dosage of vaccination remains the same among babies but may be different for adults. Modern health technology plays an important role in the improvement of immunization information system. There are a lot of problems parents are faced in the manual system like uncertainty, data loss, and misconduct, lack of efficiency, dishonesty, unawareness, and insecurity. All of these problems are a major threat for vaccination system and also for patients'. It may cause premature death. So Parents are ceaselessly thoughtful about the health and safety of their children. In many countries like Pakistan, Afghanistan and Nigeria are facing problems due to ineffectual and inadequate vaccination system method [1][2][3]. Their existing Polio vaccination system is ineffective due to mismanagement, corruption, and insecurity. According to WHO report of 2015, 51 cases of poliovirus happened in Pakistan. The reason behind having polio are illiteracy, unawareness, mislead, perversion and so many [4]. Immunization is one of the solutions to prevent polio. To make this process more efficient added modern health technology with the existing system. The support which is provided by the modern technology include Reminder systems, patients can easily communicate with doctors through SMS and get feedback timely through short SMS, save time, security, and administrative support by online. To consider all of the current problems, we designed a flexible system for parents and doctors. We have implemented a web-based child vaccination system. To make it more effective we also converted it to the Android based system. In android system, Short message service (SMS) is an important and useful service. It is offered in all types of mobile phones as it is easy to use and can operate with minimal cost. SMS permits users to communicate non-verbally and creates a connection between people of any distance. The main objectives of this research are summarized in the following manner:

- To design and develop a proper vaccination system to replace existing manual procedure that can help us to get every vaccine to schedule on a date.
- To present an overview of a digital vaccination system.
- Mostly parents lost their child vaccines schedule cards which is very important. But web-based vaccines system reminds the parents with the automated notification system.
- Parents also get a facility to monitor vaccination activity by mobile application and parents may get relief from the discordance environment.

- No duplication of data entry and security system is strong.
- Easy to make procedure reports and time maintain.

II. Literature Review

Vaccination plays an important role in advanced health technology. Vaccines can prevent us from infectious diseases. Vaccination system is an effective method for developing the individual's immune system and protects us from a pathogen. The current existing manual system has a lot of problems so it does not provide a better result. The main problem is improper clinical management, difficult to maintain doctors and patients interaction properly, fault dosage of vaccines, storage of expired vaccines and so many. According to the Handphone User Survey by Malaysian Communication and multimedia commission (<http://www.skmm.gov.my>), fourteen percent of people who are under 20 years old used mobile phones. Hence, using a reminder system through mobile phone messaging service may benefit the community especially those parents who are between 20 and 49 years old. Salameh, et al. was proposed a web-based system to ensure pregnant mothers be notified regarding their pregnancy progress by sending an SMS message. The design and development of the system which is known as Pregnancy Progress System (PregProSyst) [1]. Zhang et al. were proposed a system for fall detection. They used off-the-shelf electronic devices and tri-axial accelerometer sensor in a mobile phone to detect the fall. If a fall is suspected, a notification is sent to the users. If a user (children) are incapable to respond it send an SMS alert to the parents [2]. Osama was implemented a mobile phone SMS-based system for diabetes self-management. This system is user-friendly. The patients can communicate to his or her physician through simple SMS [3]. KenVACS is the open source data collection prototype. Using this prototype patient can get more information about vaccination [4]. In our proposed system we have emphasized EPI vaccination which provided by Bangladesh government. A Government of Bangladesh have been taken support from World health organization. The Immunization program has played an important role to reach children with BCG (99%), DPT-3 (87%), Polio-3 (94%) and Measles (88%) and 75% children (1 year) are vaccinated with all doses of vaccines. Bangladesh is polio-free since 2006, and eradicate measles mortality by using vaccine-preventable diseases control strategy [5]. WHO also introduced of new vaccines in Bangladesh –Hep B (2005) and Hib (2009). Bangladesh has started Pandemic Influenza H1N1 vaccination since 2010. We have shown EPI vaccination schedule of Bangladesh in below Fig1.

শিশুদের নিয়মিত টিকাদান সময়সূচী

রোগের নাম	টিকার নাম	টিকার ডোজ	ডোজের সংখ্যা	ডোজের মধ্যে সর্বনিম্ন বিরতি	টিকা দেয়ার সঠিক সময়	টিকাদানের স্থান	টিকার প্রয়োগ পথ
বস্কা	বিসিডি	০.০৫ এম এল	১	-	জন্মের পর থেকে	বাম বাহুর উপরের অংশে	চামড়ার মধ্যে
ডিম্বেবিয়া, ছুপিবেশি, ধুইধুইকোর, হেপাটাইটিস-বি, বিনোবাইনাস ইনফ্লুয়েঞ্জা-বি	পেন্টাভ্যাকসেট টিকা (ডিপিপি, হেপাটাইটিস-বি, বিবি)	০.৫ এম এল	৩	৪ সপ্তাহ	৬ সপ্তাহ ১০ সপ্তাহ ১৪ সপ্তাহ	বাম উরুর মধ্যভাগের বিহারাংশে	মাংসপেশী
নিউমোকোকাল নিউমোনিয়া	পিনিডি টিকা	০.৫ এম এল	৩	৪ সপ্তাহ	৬ সপ্তাহ ১০ সপ্তাহ ১৪ সপ্তাহ	ডান উরুর মধ্যভাগের বিহারাংশে	মাংসপেশী
পোলিওমাইনাইটিস	বিওপিডি	২ কঁটা	৩	৪ সপ্তাহ	৬ সপ্তাহ ১০ সপ্তাহ ১৪ সপ্তাহ	মুখে	মুখে
	আইপিডি (ফ্রেকশনাল)	০.১ এম এল	২	৮ সপ্তাহ	৬ সপ্তাহ ১৪ সপ্তাহ	ডান বাহুর উপরের অংশে	চামড়ার মধ্যে
হাম ও কবেলা	এনআর টিকা	০.৫ এম এল	২	-	৯ মাস ও ১৫ মাস বয়স পূর্ণ হলে	ডান উরুর মধ্যভাগের বিহারাংশে	চামড়ার নিচে

১৫-৪৯ বছর বয়সের মহিলাদের টিকাদান সময়সূচী

রোগের নাম	টিকার নাম	টিকার ডোজ	ডোজের সংখ্যা	টিকা শুরু করার সঠিক সময়	টিকাদানের স্থান	টিকার প্রয়োগ পথ
ধনুইকোর	টিটি (টিটেনাস টক্সয়েড)	০.৫ এম এল	টিটি-১	১৫ বছর বয়স হলেই যথাসময়ে	বাহুর উপরের অংশে	মাংসপেশী
			টিটি-২	টিটি-১ পাওয়ার কমপক্ষে ২৮ দিন পর		
			টিটি-৩	টিটি-২ পাওয়ার কমপক্ষে ৬ মাস পর		
			টিটি-৪	টিটি-৩ পাওয়ার কমপক্ষে ১ বছর পর		
			টিটি-৫	টিটি-৪ পাওয়ার কমপক্ষে ১ বছর পর		

সম্প্রসারিত টিকাদান কর্মসূচী (ইপিআই)
স্বাস্থ্য অধিদপ্তর
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

Fig 1. EPI vaccination schedule [6]

Parents have taken facility from different government clinic or hospital. Every child has been vaccinated by EPI after their birth. Then Parents received EPI vaccination card from a clinic or hospital. This process of vaccination is paper-based which is not secure. The motive of this paper is to create a technology-based system. The EPI vaccination card which is provided by the Government clinic as shown in Fig 2.

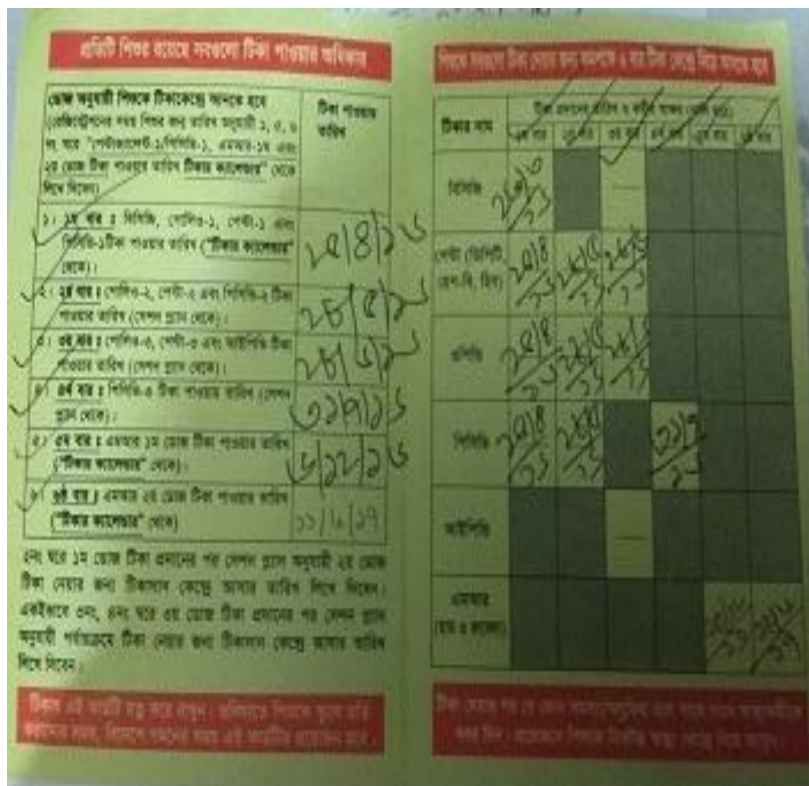
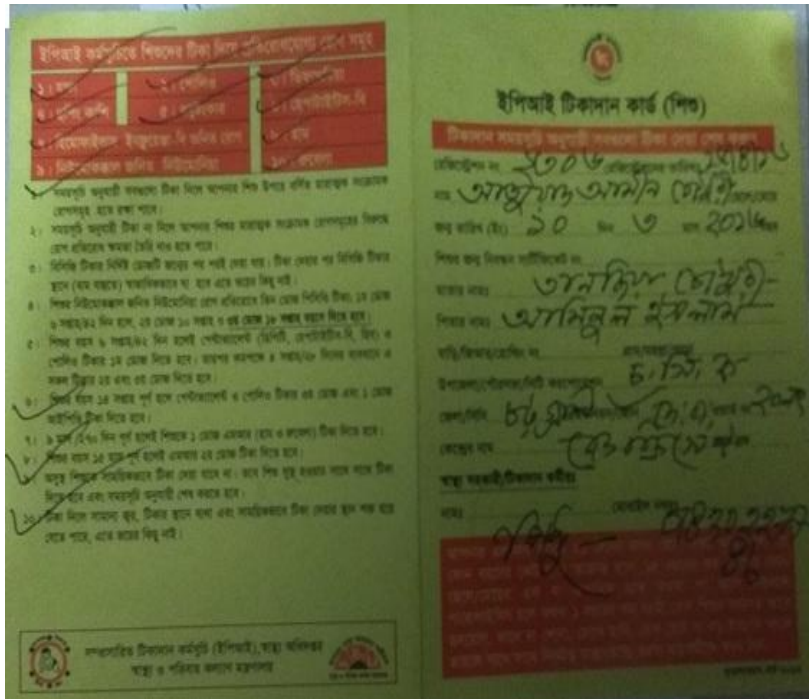


Fig 2. EPI Vaccination card

In Fig 2 have shown that, the child of Azwad Amin Chowdhury have been vaccinated by six vaccines. This card holds all information on vaccines dose. If parents do not keep this card safely, all information will lost. So that this paper-based system is not secure for us.

III. System Design

In this research, we have developed a web-based and an android application which can be used by admin or staff to monitor child vaccination system. The proposed system architecture has been designed on the basis of three-tier architecture. The Three-tier architecture consists of the presentation layer, application layer, and data storage layer. The system design describes detailed information of this proposed system. Here admin and user (parents) can log in by online or mobile phone. Admin can manage the process of a system. The vaccination system architecture as shown in below Fig 3.

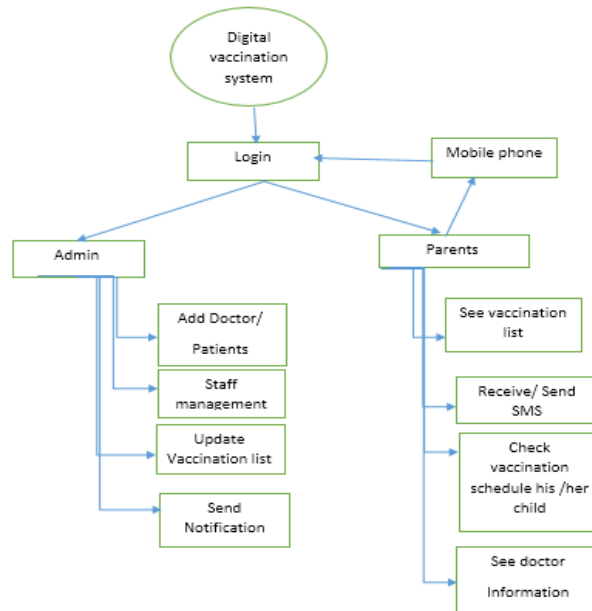


Fig 3. Vaccination system architecture

IV. Implementation

The system interface is shown in Figure 4. The system interface acts as an intermediary between user and system. This system interface is user-friendly. A user can access it easily without any complicity or any cost. At first, user could register here through login. Any registered user can see his/her child vaccination schedule, and availability of vaccination also. Parents can communicate with child specialists because this system also stored the doctors' record. Admin creates awareness to parents using SMS alert. The details of the results which have been yield through the implementing of this research are organized as follows:



Fig 4. Home Page

Registration

<input type="text" value="Name *"/>	<input type="text" value="Email *"/>
<input type="text" value="Phone *"/>	<input type="text" value="Date Of Birth *"/>
<input type="text" value="Male"/>	<input type="text" value="Blood Group *"/>
<input type="text" value="User Name *"/>	<input type="text" value="Password *"/>

Fig 5. Registration page of doctor/ patients

Using this page parent can register their child. Then he/she would use this system by a login. Figure 6 shows the login page. After login to the system with registered user password or username, a user can access the dashboard where they can create folders, upload and share files. This system also holds the various vaccination information and their price which is useful for parents.

The login page features a white form box on a light gray background. It contains the following elements:

- Username:** A text input field with the placeholder text 'username'.
- Password:** A text input field with the placeholder text 'Enter your password'. To its right is a link that says 'Forgot your password?'.
- Remember me:** A checkbox followed by the text 'Remember me'.
- Sign In:** A wide, blue rectangular button.
- Website:** A wide, green rectangular button.

Fig 6. Login page



Fig 7. Overview of Dashboard

Admin can log in with admin user password and access the admin panel where admin can add doctor and patients and edit the database of patients. Admin sends the SMS to parents for knowing the next dose of vaccines. Parents can see the update vaccination information from anywhere. The process of adding doctor/patient and sending SMS alert is showed in below Fig 8, 9.

The 'Add Doctor' form is located within the admin panel. It includes the following fields:

- Full Name:** Text input field.
- Email:** Text input field.
- Phone Number:** Text input field.
- Gender:** Radio buttons for Male, Female, and Others.
- Department:** Text input field.
- Joining Date:** Text input field.
- Username:** Text input field.
- Password:** Text input field with masked characters (dots).
- Address:** Text area for address.
- Image:** A 'Choose File' button and the text 'No file chosen'.

A green 'Submit' button is located at the bottom left of the form.

Fig 8. Add the doctor/patient

Fig 9. SMS sending process to the patient

After adding patients, admin can see the database of patients list. Admin can edit or delete the information of patients. They updated the list of vaccination. Parents can see whether vaccines are sold or available.

Name	Email	Gender	Blood Group	Date of Birth	Phone	Action
Jahidul Alam	freelancerrudro@gmail.com	selected	selected	2017-04-12	8801917138757	Delete Edit
Jahidul Alam	freelancerrudro@gmail.com	others	selected	2017-04-12	01673293637	Delete Edit
jesmin	jesmin@gmail.com	female	b+	1/1/2017	8801914528236	Delete Edit

Fig 10. Patient's database

Enquiry List

Copy CSV Excel PDF Print Search:

Date	Name	Email	Message
2017-05-17	Zohora Mou	engr.rudro@hotmail.com	I am requesting for an vaccination pricing
2017-05-17	jesmin	jesmin@gmail.com	Hello sir
2017-05-17	fahmina	fahmina@gmail.com	This is my admin page

Showing 1 to 3 of 3 entries Previous 1 Next

Fig11. Patient inquiry database

Vaccination List

Copy CSV Excel PDF Print Search:

Vaccination Name	Age	1st Dose	2nd Dose	3rd Dose	4th Dose	Price	Action
Engerix B	Any age	Any day	1 month from 1st dose	6 months from 1st dose	N/A	1250	Delete Edit
Havrix	From 12 months	Anyday	6-12 months from 1st dose	N/A	N/A	800	Delete Edit
Hiberix	From 12 months - 5 yrs (Previously unvaccinated)	Anyday	N/A	N/A	N/A	3000	Delete Edit
Infamrix	From 2 months	Anyday	1 month from 1st dose	1 month from 2nd dose	6 months from 3rd dose (Should be completed by the age of 18)	500	Delete Edit
Priorix	From 9 months	Anyday	3 months from 1st dose	N/A	N/A	1200	Delete Edit
Rotarix	From 6 weeks	Anyday	4 weeks from 1st dose (Must be completed by the age of 6 months)	N/A	N/A	1000	Delete Edit

Figure 11: Vaccination list

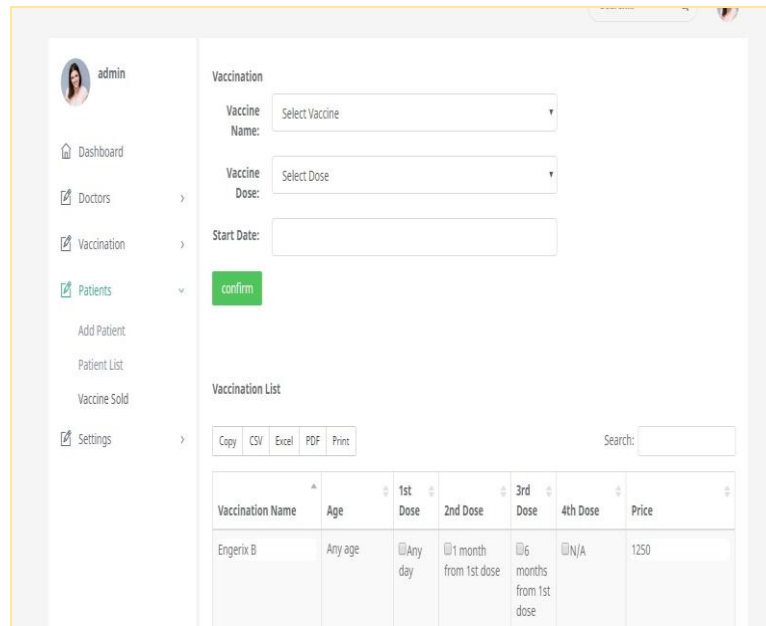


Fig12. Vaccination sold list

V. Conclusion

Our proposed system is user-friendly because the online based system provides more facility and flexibility to the user. A user can access it without any cost or any stress. The main aim of this research is to develop our health technology by replacing the manual system with online base/Android apps. A user can access this system using their smartphone by a mobile application. Usually, most of the parents forget their child vaccination schedule and also lost the vaccination card. This system helps parents by sending SMS alert. Without vaccination card, parents did not get a permit to vaccinate their child. Even some parents tell the wrong date of the previous dose which causes threat for children. All of these problems can be eliminated by using our proposed system. It also shows that how can we manage and maintain proper child vaccination schedule from cloud and android application. The limitations of our system are that the development of an Android application for this research is a web view application, not the native one. It can create some problem in the older android device due to non-native functionalities. In future work, we will extend this features. If Bangladesh government accept our suggested system, then it could be helpful to all parents.

References

- [1]. Salameh, Anas A. Mohammad, et al. "Web-based support for pregnant mother." *International Journal on Advanced Science, Engineering and Information Technology* 1.3 (2011): 307-310. *M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.*
- [2]. Zhang, Tong, et al. "Fall detection by embedding an accelerometer in cellphone and using KFD algorithm." *International Journal of Computer Science and Network Security* 6.10 (2006): 277-284.
- [3]. Salameh, Osama. "A Mobile Phone SMS-Based System for Diabetes Self-Management." *Int. Arab J. e-Technol.* 2.3 (2012): 161-166.
- [4]. Gatuha, George, and Tao Jiang. "KenVACS: Improving vaccination of children through cellular network technology in developing countries." *Interdisciplinary Journal of Information, Knowledge, and Management* 10 (2015): 037-046.
- [5]. <http://www.searo.who.int/bangladesh/areas/immunizationvaccine/en/>
- [6]. <http://www.dghs.gov.bd/index.php/en/mis-docs/epi>

IOSR Journal of Computer Engineering (IOSR-JCE) is UGC approved Journal with Sl. No. 5019, Journal no. 49102.

Tanjia Chowdhury. "A web-based Child vaccination system in Bangladesh" *IOSR Journal of Computer Engineering (IOSR-JCE)* 20.5 (2018): 17-24