Providing a friendly e-healthcare environment to rural women during pregnancy and child growth

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Abstract: *The most significant period for a woman in her life is pregnancy. Especially in rural areas of India, there are many cases of maternal and baby mortality. These are mainly due to the lack of proper care and attention given to the pregnant woman during their pregnancy .The women in urban areas have more facilities for their periodic health check-up in sophisticated hospitals. Using many electronic devices, they can schedule their health check-up and vaccination dates. They can easily clarify their doubts during pre-delivery and post delivery period through internet. In rural areas, these opportunities are rare. Even if it is available, they will not be using it because of lack of knowledge. Hence, an idea has been proposed to periodically guide the pregnant women through SMS, voice messages and personalized application regarding their pregnancy. Data is collected for every patient. They can access their check-up history along with doctor's name and contact. The process for getting e-Prescription is done, hence it is easy to maintain a record for future treatment purposes.*

Key words: Pregnant women, rural areas

I INTRODUCTION

The rapid development of internet and communication technologies in the past twenty years had changed the lifestyle of human beings. People who are living in urban areas can have access to quality lifestyles. The usage of mobile devices can improve education, health and economy. Some women in urban areas are well educated and they are capable of taking care of themselves as well as take care of their family. In rural areas, during pregnancy face both emotional and physical stress which leads to many problems. Since there is no proper nutrition the rate of maternal and baby mortality is high in rural areas. It can be prevented if the women receive adequate and timely medical care at the crucial moments. Information states that providing expectant mothers with adequate maternal care, birth supervision by skilled attendants, and access to emergency obstetric care in pregnancy and delivery can save lives. Delays in seeking healthcare, in reaching a facility are important factors accounting maternal deaths in rural areas. First we need

to register the details of pregnant women and newborn babies. Timely reminders to patients are provided. This application could help in improving services and reducing delay. This will motivate them to visit doctors for their regular health check-ups. This method will help in remote monitoring of pregnant women and development of the child. Additional details like the various Government schemes that are available for pregnant women can be sent as a notification / message to the registered women. Starting from the first month and even after the childbirth, personalized messages are sent to the registered pregnant women checkups dates, diet plans for each month and everyday diet charts and voice notes help the women who are illiterate . Even after the childbirth, the vaccination chart for the baby is sent to them and SMS about the vaccination details are also sent regularly. The messages and audio (voice notes) are sent to the application they have in their mobile . The data collected from the registered women are highly secured and private. This is an important public health implication, especially in the rural parts. Hence, women in rural areas need some assistance during their pregnancy period to take care of themselves. Since some women in rural areas are not highly educated, the idea is to assist them by sending periodic SMS, voice messages to their mobile phones. The basic necessity is the mobile phone and Internet connectivity.

II LITERATURE SURVEY

Jayaseelan et.al. [1] has given the information on the usage of the smartphone application during pregnancy. It shows that usage of internet is high among women in the rural areas of India. The survey also shows that nearly 65% women are using application that helps in pregnancy. They are most benefited by this application. Nearly 45% women use have access to healthcare applications when compared to men. This helps to save time. Some of the issues are financial issues in the family and they may not accept the technology but these can be solved by providing necessary training and awareness programs with the help of Government schemes for pregnant women.

Oluwagbemi.N et.al. [2] has proposed about developing AMAHD (Android Mobile Informatics Application for some Hereditary Diseases and Disorders) and spread awareness about the hereditary diseases. The main aim is to create application and provide useful information about various hereditary diseases to patients. The methods that are used to develop AMAHD are using programming languages in Java and XML (Extended Markup Language), SQLite for database. Logical Disjunction Rule-based Algorithm (LDRA) was the algorithm used to develop the application. The main issues are internet issues where it helps to find out diseases that are stored in the database. The issues that were sorted are knowledge about diseases were known. The result that is obtained from this application are 87 people participated in classifying the diseases as either common or rare.100 people participated in classifying the hereditary diseases as either a common type or a rare type within their respective regions.

Uddina et.al. [3] has described about the usage of mTika which is a software in which pregnant women in rural areas must register their details. After the baby is born they must send an SMS to the registered scheme with details about the baby. For every four weeks, the mother will receive a message about the type of vaccine for the particular. They collected real time data from pregnant women to know the percentage of women who felt comfortable using the software. The percentage of women who missed to send the SMS after the childbirth etc. It was implemented in low income rural areas. Education and creating awareness to rural pregnant women of other areas will improve the health and immune system of the child and helps in prevention of any disease in future.

Marufu et.al. [4] has described about the utilization of mobile for determining the everyday health of a user. They focus on the collection of patient's data .The main objective is to determine the use of mobile health and identifying and describing the opportunities and the challenges faced by the medical doctors in using mobile health at a specific health care facility in Zimbabwe. They used quantitative and analytical design to determine the utilization of mobile health for patient identification and treatment activities. The issues in the system there were only one health care facility. They focus only on doctors but the possible list of mobile users could include nurses, pharmacists, lab technologists, radiologists and patients. The results suggest that 50% of them lack of knowledge using mobile health. The majority of the user (83.3%) believed that mobile health presented opportunities to improve health care delivery.

Tehrani et.al. [5] discussed about the pregnant women making use of mobile applications, social media and various other sources to maintain their health. It is helps them gaining knowing about their nutrition, child growth, complications or any updates .Changes are recorded automatically starting from the first month. It helps in monitoring of the fetal growth, stress test using application. They need not travel for long distances and time is saved. Any queries can be answered and guidance can be provided at any time. The heartbeat rate of the child can be monitored and the reports are stored. The issues are if some critical situation occurs it does not send the data or update the patient information, it can only be checked in presence of a doctor.

Alam et.al. [6] has proposed about the application, called APONJON provides messaging service and voice calls that helps to utilize the mobile application. The messages are sent to them who have registered. The messages are sent to them every month for their health check-ups, nutrition details etc. Voice calls are also which is available. The family member can also register for daily updates about the diet plan for the pregnant women. Data are collected from all of them to know the feedback about the application.

Implementing them all over the world will be very helpful in improving the child growth. It reduce the mortality of child and the pregnant women. The issues are only the usage of this application were more in urban than in rural regions.

Joshi.P et.al. [7] discussed about collecting data of pregnant women's BMI (Body Mass Index), Haemoglobin content using Haemoglobin meter, details about the past abortion, their height and weight and other details. The study suggest that 79% of pregnant women in urban areas are high maternal nutrition and about 57% of pregnant women in rural areas are with proper nutrition. Household pregnant women in rural areas are facing malnutrition problems more when compared to pregnant women who are working. The concession received from Government are used for other household purposes. It shows that many percentage of women in rural areas of India and other parts of the world are affected due to malnutrition every year .The advices are need to be given to rural pregnant women on a regular basis to avoid mortality of pregnant women and the foetus.

Watkinsa et.al. [8] discussed about the implementation of a health demographic surveillance system to provide communication for the rural region of South Africa through smart phone. The study suggest the current use of health related digital mobile communication. It helps to connect online communities to discuss on health issues. It focus on pregnant woman and people who are infected with chronic diseases. Recording calls which is password protection and destroyed after transcription is a feature that is added to benefit them. This help the patients initiated on m-health intervention. The issues were lack of digital infrastructure and high cost of network usage may lead this process to slow down. 68% of the diseases is sorted out through communication the surveillance system spread over 32 villages reaching 16,000 households.

Gurung et.al [9] discussed about the status of birth preparedness (BP) and Complication readiness (CR) among rural pregnant women in areas of Southern India. The questionnaires helped interviewing women and collect data from the pregnant women. The issues are there is no assurance whether the pregnant women are really aware of all the complications that might happen during pregnancy, some women may not show any interest to participate in these kind of programs. This study shows that the lack of awareness leads to complications and imparting complete knowledge about pregnancy is important in rural areas by conducting several training programmes and making the rural women to actively participate in these awareness programs.

Su Yuan et.al [10] has discussed how SMS advice impact and change on the behavior of pregnant women. SMS provides information starting from the first month of pregnancy like regular health check-up dates, nutrition details, Government Schemes for pregnant women, parental care , vaccination details and child care .It observes the change in behaviour of pregnant women after receiving regular SMS advices. To know the outcome and effects an interview was conducted among various rural women groups in China by collecting data from them. The implementation of this SMS advice mechanism in large communities especially in rural areas will show a huge. Issues the system are most of the women in rural women do not have access to internet.

PROPOSED SYSTEM

To overcome the limitations in the existing system, a new system has been proposed which will be easily accessible by rural pregnant women. The system architecture is shown in fig1.1.

Fig1.1 System Architecture

In this system, the rural pregnant women must register themselves by providing all the details like Name, Address, Mobile number etc. The registration process can be done by visiting the nearby rural hospitals by which each individuals need to provide their AADHAR number for their verification purposes to enroll themselves into the process. The application which is customized into their native language is loaded onto their smart phones. Then application begins with one time passcode for user authentication. It provide multiple information such as daily diet plan, check-up history, contact details of their prescribed doctors, e-prescriptions and also each month baby development process. The diet plan provides a complete breakdown of the foods to eat on all the 7 days for Breakfast, Lunch, Dinner and Snacking. Check-up history contains the detail information of the date of visit and doctor's name. Contact details contains number of the hospital, Doctor and emergency helpline and e-prescription contain the image of all medicated information written by the doctors. According to the users date of pregnancy input a the information is maintained in a database and then periodic notifications or SMS are sent regarding their health checkup dates, diet plans and also after child birth it is helpful since vaccination schedule for the babies are maintained. If the pregnant woman are illiterate they are provided a voice message which convey the same information as SMS in their native language.
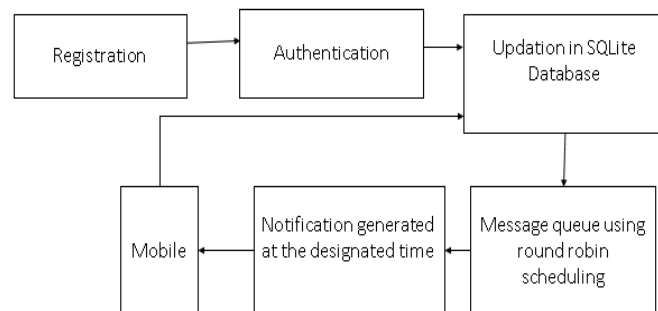
Functional Architecture

Fig 1.2 Functional architecture

Once the registration process is done, the details are authenticated and then updated accordingly in the database. The database that is used is SQLite as it's the most standardized and convenient to use for web designing. The security of the database is ensured by implementing RSA algorithm. A message queue is maintained using round robin scheduling algorithm which is used to send the customized notifications for checkup dates using the data stored in the database. The queue has a set of customized messages for every certain interval of time one the input is matched with the date a periodic messages and audio clips are sent in their native language. Every month the notification is sent and if the checkup date is preponed then it is updated in the database by the administration and the notification are sent correctly to their registered mobile phones.
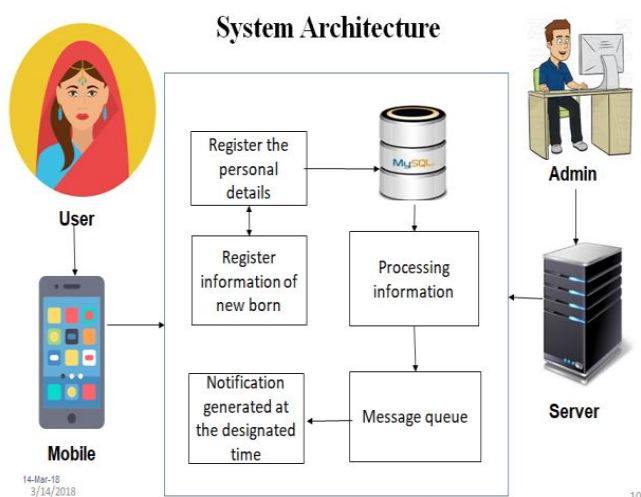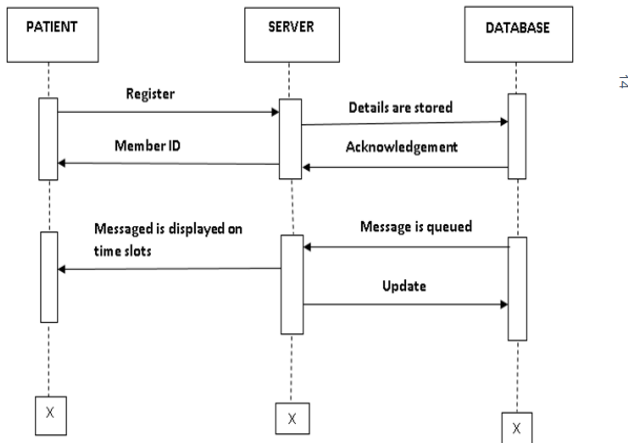
Module 1 Registration module

Fig 1.3 Registration module

The user registers all the details and once it reaches the server, the details are stored in the database and then an acknowledgment is sent to the server and then an unique ID is sent to user's mobile which provides an one time password to ensure if the user is regiment. Based on the registered date, message queue is maintained and when the time slot is matched, the message is displayed in the mobile phone.
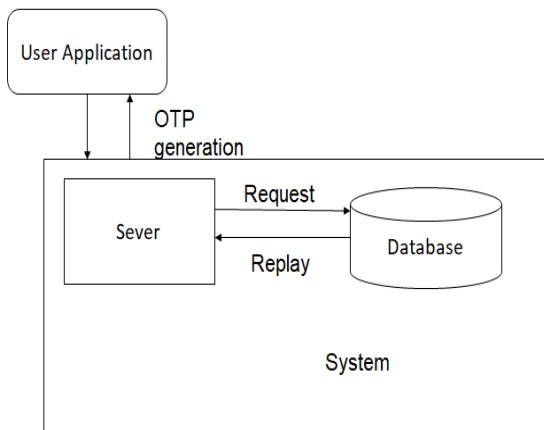
Module 2 Notification module

Fig 1.4 Notification Module

In this module, after the application is installed in user's mobile, the server request for the data which is stored in the database and then a reply is sent to server as an acknowledgment that the user's details are updated correctly and in turn an OTP (One Time Password) which is an unique number which is sent to the user's mobile phone and the OTP is read automatically and then it the user can login the application and access all the necessary information such as daily diet plan, check-up history, contact details of their prescribed doctors, e-prescriptions and also each month baby development process.
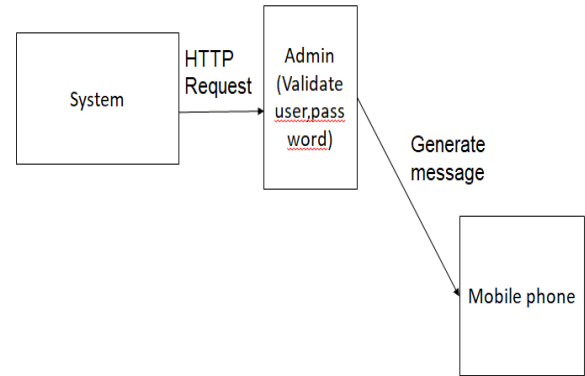
Module 3 SMS generation module

Fig1.4 SMS generation Module

In SMS generation module, HTTP Request is sent from the system to retrieve the data that is needed for the user. Before the data is retrieved, the admin validates and then based on the data stored for the particular user, the messages are generated automatically and then sent to the user's mobile with the help of service providers.

DISCUSSIONS AND RESULTS:

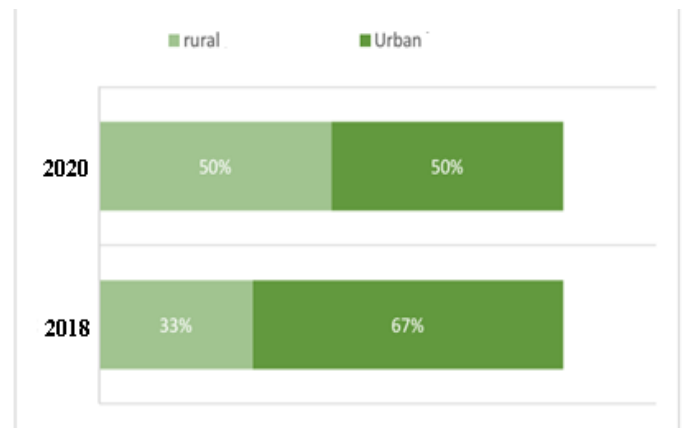These are some of the results that were obtained for our system

Fig1.5 Internet Usage in Rural VS urban areas (Source-EY)

According to Boston Consulting Group (BCG), 70%of internet users are from rural areas of India. It is expected that about 315 million will be connected to internet by 2020. Due to this exponential growth in internet usage among rural areas of India, it is found that India will face a digital revolution by the year 2020. Since internet usage is expected to be high, so our application is excepted to be accessible to everyone. The efficiency and reliability is more in the future. The graph shows the usage of the application in the rural and urban areas. The usage will be increased exponentially every year especially in rural

areas since the network connectivity in rural areas are almost becoming equal like urban areas. The amount of literates are getting increased in rural areas and at least people in rural areas have their basic education so usage of smartphone applications will be not a great issue for people in rural areas.
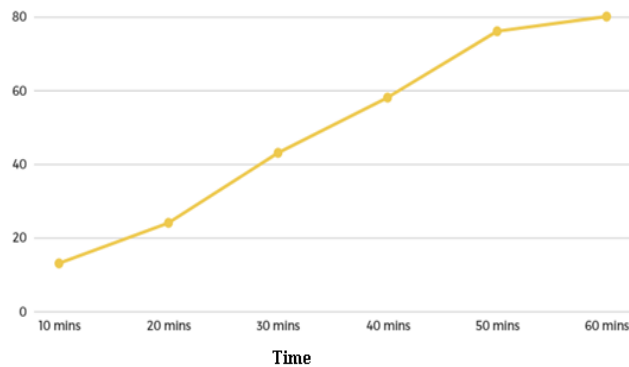

Fig1.6 Power Consumption

This study shows that the power consumption is constantly increasing by 10% for every 10 minutes. This explains that it draws more power due to its internet facility like WI-FI, 3G and 4G. The search for the signal when the mobile is not in coverage area makes the battery to drain. Since the application runs on internet this is major reason for power drain. It is also based on how much background programs are running on the phone.

III CONCLUSION

It is very important to provide necessary information to improve the growth of baby and proper nutrition for pregnant women. The study shows that pregnant women in rural area are malnourished and anemic. Due to this reason all pregnancies can benefit from continuity of care, continuous monitoring, data collection, and access by physicians by using the mobile application. The SMS give them a continuous reminder during their pregnancy. It helps them get motivate them towards the care of their pregnancy. Voice notes have also been specified so that they can get the information through sound. This is especially for people who are illiterate. Since it stores the history of messages they can view it anytime and anywhere .Therefore the pregnant women have a personalized health care at home.

Future work

In future, these methods are implemented in large areas and communities will decrease the mortality rate. Some more features can be added where the mothers can be given assistance about their appointment for the checkup of their baby. Automatic calls can be implemented to get timely updates. Implementing this in regional language of the rural areas will be useful for them to get gain their knowledge and understand it well.

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