Survey App for ASHA Workers (Aarogya Patrika)

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***Abstract*— The "*Aarogya Patrika*" App is a unique solution which digitally links the three government frontline health workers in each village. These are the ANM (a nurse-midwife), the ASHA (community mobiliser) and the Anganwadi worker (overseer of nutrition in pregnant and lactating women, and pre-school children). These three women are responsible for providing health and nutrition services to the last-mile community across villages in India. Though they serve the same population, they don't team up naturally because of different supervisory systems, databases and work cultures. Further, they are expected to maintain numerous voluminous registers. They can improve effectiveness and efficiency by sharing data and the app enables this in a seamless manner. The App enables the frontline workers to utilize a common database, carry out their routine tasks with ease and maintain integrity of data. It also generates essential government reports, provides an online supervision dashboard and enables referrals. While some technology solutions for frontline workers exist, none bring them together. Through all this, the workers can focus on their primary responsibility of delivering care, aided by data.**

Keywords*— *Asha, Aarogya Patrika, CHW, Anganwadi, healthcare, Vaccines.

I. INTRODUCTION

ASHA Accredited Social Health Activists workers are helping to build a strong foundation for promoting healthy practices in our society. They play critical role for various health programs of the Government of India. Accredited social health activists (ASHAs) can prevent many of these deaths by helping women and their families recognize maternal and neonatal danger signs and promptly seek care. However, a majority of ASHAs are low-literate village women, and they face significant operational challenges in conducting routine maternal, new-born, and child health (MNCH) activities and in keeping their skills updated. In particular, ASHAs' lack of access to health care information, refresher training, supportive supervision, and user-friendly job aids compromise their ability to contribute to improved maternal and new-born health outcomes [1].

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Basically, ASHAs workers take surveys across different areas and collect information of families and on analysis they provide different Government Yojanas, financial aids and facilities to the eligible families. Currently, the information is collected on paper and data entry is done manually into excel sheets. This is time consuming and tedious procedure. Also, it becomes difficult to analyze these family's data and take necessary actions. So, we proposed an app "Aarogya Patrika" which digitalizes whole process of data collection and analysis.

Social development of a nation is dependent on the health of its population. The impact of ASHAs on their communities is largely dependent on the quality of their training and other health system factors. Currently there is inadequate health system support for ASHAs including a lack of strong supervision, limited opportunities for continuing education and training and poor workload management. They get limited training on community mobilization, child immunization and others due to which they have limited knowledge and skills. Empowering ASHAs with "Aarogya Patrika" will help them to overcome the barrier.

II. RELATED WORK

N.D. Valakunde, D. Kumari has developed an Android-based application that is used in Uttar Pradesh state to monitor pregnant women in unprivileged parts of the country. The main aim of this app was to reduce the Maternal Mortality Rate by digitizing the work of the ASHA Workers. ASHA Workers are provided a mobile device with a pre-installed app. These ASHA Workers visit every household in villages and collect pregnant women's details and their current pregnancy status. Admin Panel which is developed using Apache-PHP helped them to monitor the pregnancies of the women in their area. ASHA's Admin monitors the pregnancies of the women effectively and efficiently. Admin Panel is deployed on Blazer Pro using Apache-HTTP Server and MySQL database to store Pregnant women's details [3].

An Android application developed by **R. V. Vaidya and D. K. Trivedi** enables Doctor-Patient interaction. patient first downloads the app from Google Play Store and registers himself. After registering patients can track their fitness where

they have various options to choose the type of activity and specify how much time the patient is going to perform the particular selected activity. Here Mobile's geo-location sensor is used to calculate their speed and distance and accordingly various graphical analyses are presented on the app. ON the other hand, Patient can schedule their appointments with a doctor and can even set a reminder for themselves to take medicines on time. If a patient requires blood in case of emergency, then he/she can request blood from a nearby donor and can even inform their relatives about their current location. This app is implemented using Android Studio and Firebase is used for authentication [4].

Bhatia, Kavita in her research paper describes that in the Shahpur Taluka of Maharashtra, India, ASHA Worker is equipped with a UPASANA toolkit by which they can provide cheap and quality healthcare to the people in rural areas. UPASANA is a non-invasive medical diagnostic toolkit designed to be used by ASHA Workers. UPASANA measures the vital parameters of the patients in rural areas and collects the data. These collected data are transferred to the doctors at the hospital for diagnosis. The hospital even monitors their health status and in case of emergency, they help the villagers with necessary medication facility [5].

III. Problem Description

Since ASHAs faces this problem, so to overcome this problem of Manual Data entry and difficulty of Analyzing the family data the "Aarogya Patrika" is designed with the aim of eliminating all these possibilities of lack of access to healthcare information, refresher training and meaningful supervision so that their ability to contribute to improved maternal and new-born health outcomes will play a major role. The App simplifies public administration, eliminating the need of data-entry operators. Basically, app manages to convert the data into digital format right from the point of entry, to be used, analyzed, accessed and processed across the health system by all relevant staff members. CHW (Community Health Workers) manages admin panel where they analyze the health data of families.

All the ASHA Workers are provided with an Android Application through which they can enter data without any hassle. The data is stored in real time database which can be accessed any time. A dashboard is provided for the CHW who is Admin of ASHA Workers. The dashboard contains statistical analysis of the data. Also, data analysis can be done based on different aspects of data. This also allows the real-time monitoring of frontline workers by their supervisors. This also empowers the women in rural areas with technology.

To maintain the security and integrity of "Aarogya Patrika", the system will cater to two user groups viz. CHW Admin panel and Aarogya Patrika app. The activity flow of "Aarogya Patrika" is shown in Fig. 1.

A. Aarogya Patrika App

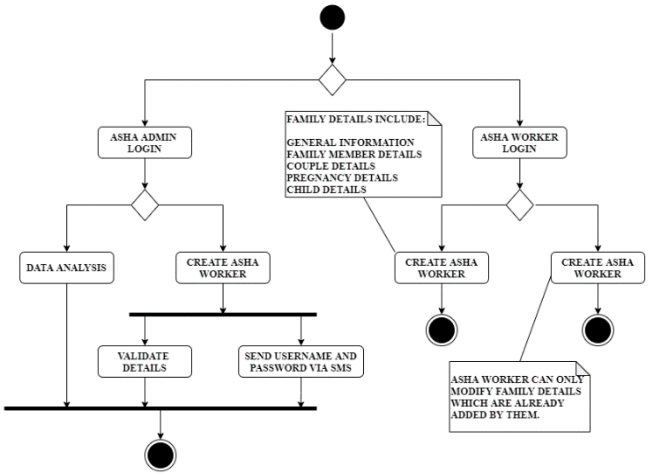

Fig. 1. Activity Diagram for Aarogya Patrika

ASHAs worker login to the App then they can either Add new Family Details or Modify existing family details. They can only modify the details of those families whose details are added by the particular ASHA worker. This helps in maintaining confidentiality and integrity of the app. For adding new family detail ASHAs need to enter data into 5 stages:

- GENERAL INFORMATION: General Information consists of common details of families like whether the family is having "**Kachha**" or "**Pakka**" House, is there any toilet facility in family's house, do family belongs to below poverty line, type of water supply, caste and village name from where the family belongs.
- MEMBER INFORMATION: Family Member Information consists of member name, age, gender, mobile number (optional), Bank name (optional), Bank IFSC Code (optional), Account number (optional), family member having some kind of disease, disability and whether family member is undergoing from some treatment.
- COUPLE INFORMATION: Couple Information consists of Husband Name, Wife Name, Couple ID, currently using family planning method, total male children, total female children, gender of last child and number of child/children.
- PREGNANCY INFORMATION: Pregnancy Information consists of Mother Name, Para (Number of times women is pregnant. If this count is equal to or greater than 3 then it is denoted as high risk and then ASHAs insist them to you family planning method), last menstrual period, expected date of delivery, expected place of delivery, applied to JSY scheme (This is only available if family belongs to SC/ST caste) and applied to PMMVY scheme (This scheme is only available if women got pregnant for first time).
- CHILD INFORMATION: Child Information consists of Child name, Mother Name, Father Name, date of OPV / B2VIT / BCG / OPV1_IPV1_Penta1_Rota1 / OPV_2_Penta_2_Rota_2/OPV3_IPV2_Penta3_Rota3 / MR1_VitA1 / DPTB_QPVB_MR2_Vita2 and Child RCH ID.

B. *CHW Admin panel*

On other end, CHW can only have access to admin panel. CHW admin can either do the analysis of family details where they can see the statistics of family whose houses is either “Kachha” or “Pakka”, how many couples are using family planning methods, etc. Or CHW can create ASHA Workers account which is needed to have access to the App. Web Server provides all the website features (Login, Creating ASHA Workers, Web Dashboard, view family details, Analytics) to admin who is CHW. CHW also have access to the whole app features. ASHA Workers are created in admin panel and they have only access to App. Where ASHA Workers need to login to the app to access all the other features. After logging in, they can add family details which includes general information, family member details, couple details, pregnancy details and child details. ASHA workers need to compulsory add these details and ASHA worker can also view family details and they also they have option to update family details.

IV. System Design

The software architecture is comprised of the database, server and the client application as shown in Fig. 2.

Mobile Application (Aarogya Patrika) is developed on Android Studio. Here in Mobile Application ASHAs can log in and Add/Update Family Details. For Authentication, AWS Amplify is used which is an open-source framework that includes an opinionated set of libraries, UI components, and a command-line interface (CLI) to build an app backend and integrate it with your iOS, Android, Web, and React Native apps. The framework leverages a core set of AWS Cloud Services to offer capabilities including offline data, authentication, analytics, push notifications, and bots at a high scale. Once ASHAs login to the app, they can add/update family member details. Here GraphQL acts as a Medium used for communication between Android App and Project Backend. With GraphQL, no extra repeated data are fetched. It fetches as much data as the module required. It saves time and bandwidth and it also allows multiple resources request in a single query call, which saves a lot of time and bandwidth by reducing the number of network round trips to the server. It also helps waterfall network requests, where you need to resolve dependent resources on previous requests [6]. All Family Member Details, ASHA Workers details are stored in MongoDB Database. We have used the Aggregation Pipeline in MongoDB which is defined as an operation that performs a particular action on the given data and returns the computed results. It is used for handling a large amount of data collected by ASHA's. By default, pipeline stages have a limit of 100 megabytes so we have used the allowDiskUse to handle a large amount of data. We have grouped the data from multiple documents, perform the given action on the queried data, and groups the relevant data to return one combined result JSON. By using GraphQL, we only send the specified fields on an object that were mentioned by the client.

On other hand, Admin Panel is used by CHW (Community Health Worker) to analyze and monitor Family Details and can even add ASHA Workers into the database. A Node.js web application is used for Data Visualization and Analysis. Even here, Amplify is used for user authentication. CHW Workers can create an ASHA Workers account, whose details will send to their respective Mobile Number as a text message. To send text messages, we have used Amazon SNS which provides low-cost infrastructure for the mass delivery of messages, predominantly to mobile users.

Project Backend and Admin Panel (Website) is deployed on Amazon EC2. Amazon EC2 provides the user with a virtual computer on which to run their applications.

The basic hardware requirement for the system is any device having access to the internet connection which can run the “Aarogya Patrika” app and a server to store the database and host the Smart ASHA website.

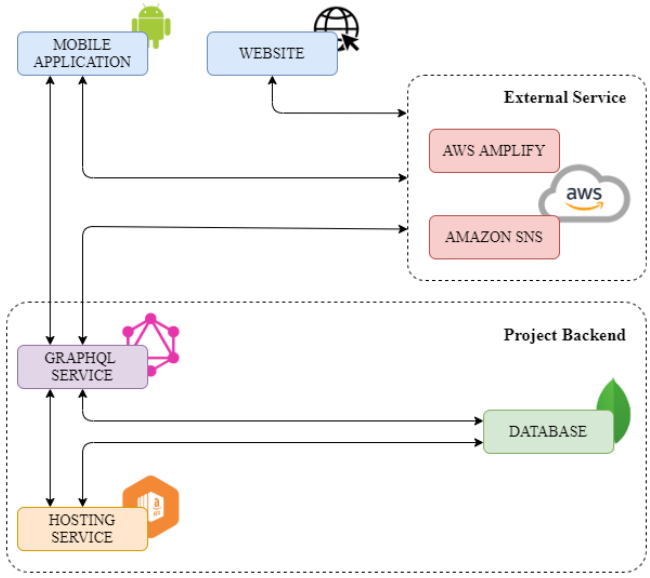

Fig. 2. System Architecture for Aarogya Patrika

V. Implementation

The “Aarogya Patrika” consists of an Android Application and Website (CHW Admin panel).

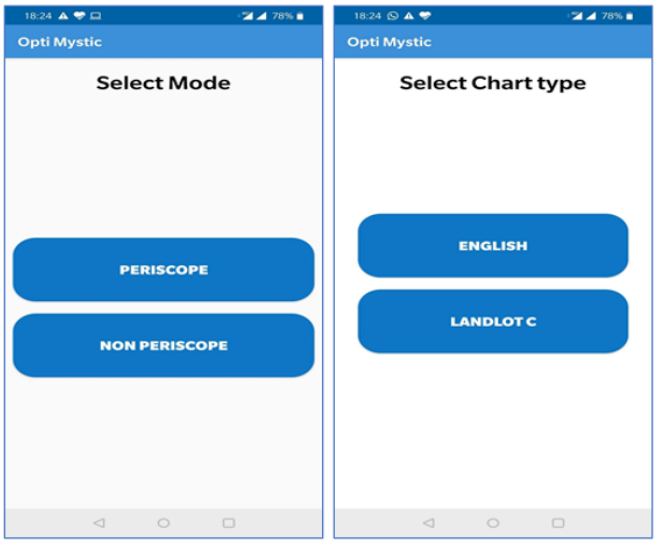

Fig. 3. Screenshot of Android Application

Aarogya Patrika Android App consists of Login Page where ASHA Workers and CHW Admin Panel can login to the app. After login ASHA Worker can either add or update family member details. Family member details consists of General Information, Member Details, Couple Details, Pregnancy Details and Child Details.

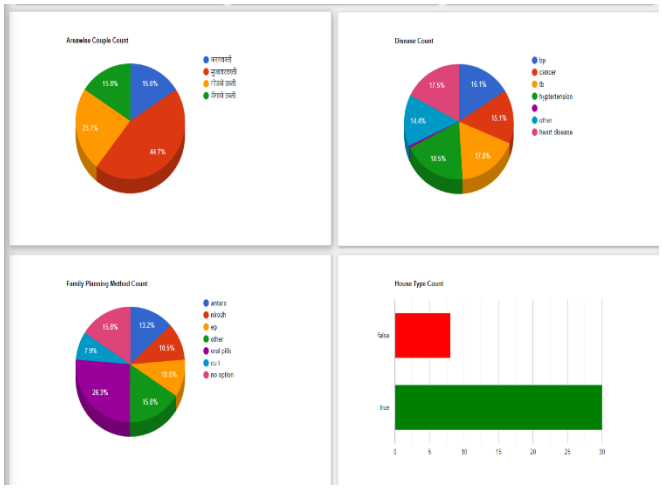

Fig. 4. Screenshot of CHW Admin Panel Dashboard

To prevent the non-authorized users from using the application, ASHA has to login with the username and password given to her by the medical supervisor working at the Primary Health Care Center. On click of the login button, the asynchronous process fetches the personal information of ASHA like her name, contact number, village id and stores the session in local storage for offline use. Dashboards that help medical professionals quickly analyze large sets of data can save time, and can even save lives. The graphs and charts are custom-made, interactive, and customizable according to the data viewer wish to visualize.

Analysis tab helps CHW to filter search family member details based on the list of pregnant women, list of pregnant women getting the benefit of JSY and PMMYY Scheme, Family Planning counseling, Immunization where CHW can analyze and take necessary action on a particular area/region. List of registered Pregnant Women details is shown in Fig 5.

The data of pregnant women as shown in Fig. 5. with high-risk pregnancies, such as swelling in the face or hands, low or high blood pressure, or convulsions, and women in their third trimester are shown. Pregnant women who are attending antenatal care are also shown. Using the data, they can be consulted and educated on the importance of ANC services and can refer to them to Village Health Nutrition Days (VHNDs) which are much closer to their homes.

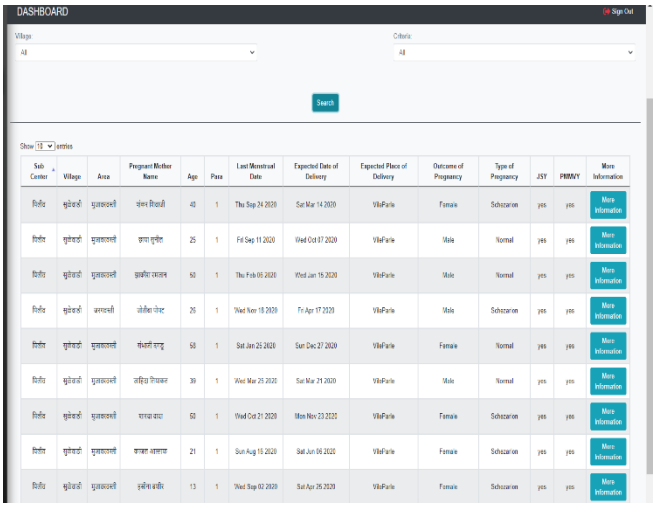

Fig. 5. List of registered Pregnant Women details.

VI. Conclusion

In the fashionable modern era, folks would like info on their journeys. comparatively low-cost wireless mobile communications, creativeness, and also the pursuit of knowledge have arranged the muse for mobile applications. Mobile application trade. seeable of the generality, usability, and blessings of mobile applications, it is extended to boost the capabilities of ASHA workers. the event and implementation of the Aarogya Patrika mobile application in numerous regional languages will facilitate the implementation of health plans initiated by the Indian government through ASHA workers. supported Aarogya Patrick's assortment and analysis of health-related knowledge, the demand for medical solutions like vaccines and medical tools may be optimized. It may time existing and new diseases to predict future medication, medical facilities, equipment, etc. This edges ASHA employees, society, and also the country as an entire.

References

[1] Wikipedia Website. Accredited Social Health Activist , Available: https://en.wikipedia.org/wiki/Accredited_Social_Health_Activist, last access: 10/3/2021

[2] The Role of ASHAs in Improving Maternal and Newborn Health, Available: https://www.mhtf.org/2017/08/07/the-role-of-ashas-in-improving-maternal-and-newborn-health-a-closer-look-at-indias-community-health-worker-program/ , last access: 10/3/2021

[3] Valakunde, N. D., Kumari, S., Kulkarni, P. S., Jumbad, S. B., Chavan, S. S., Shah, P. B., & Ustad, A. J. (2017). Smart ASHA pregnancy monitoring system. 2017 International Conference on Big Data, IoT and Data Science (BID). doi:10.1109/bid.2017.8336596

[4] Vaidya, R. V., & Trivedi, D. K. (2017). M-health : A complete healthcare solution. 2017 International Conference on Computing Methodologies and Communication (ICCMC). doi:10.1109/iccmc.2017.8282527

[5] Bhatia, Kavita. (2014). Performance-based incentives of the ASHA scheme stakeholders' perspectives. Economic and political weekly. 145-151.

[6] Why and When to Use GraphQL , Available: https://www.contentstack.com/blog/tech-talk/why-and-when-to-use-graphql/, last access: 26/3/2021