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Improving the Services of Primary Health Centre using mCARE Technology to Reduce Infant and Maternal mortality Rate in Rural Area

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Abstract

Ninety-nine percent of maternal deaths due to pregnancy and its complications occur in developing countries. Similarly, a large number of neonatal deaths and stillbirths occur every year. Some 95% of total maternal and child deaths occur in 75 low- and middle-income countries and countries in the Asia region are at high risk. It has been estimated that, for each stillbirth, there is one neo-natal death. However, more than 70% of newborn deaths are prevent-able with evidence-based practices. Reducing maternal and neonatal deaths is an integral part of the global agenda to achieve millennium developmental goals (MDGs) by 2015. Despite of encouraging improvements in reducing Maternal Mortality Rate (MMR) in India, still more efforts need to be devoted to reduce the Maternal & Infant Mortality Rate. This paper proposed web based application mCARE system to collect maternal/Infant details and sending the SMS alerts message to reminding their check up/vaccination schedule.

Keyword: *Maternal Mortality Rate, Primary Health Centre, Infant Mortality Rate*

1. INTRODUCTION

Origin of the problem

The rapid development of internet and communication technologies in the past twenty years had changed the lifestyle of human beings in the entire world. People who are living in urban and rural area can have equal access to quality lifestyles. The communication technologies using mobile devices can improve education, health and economics of people everywhere and anywhere.

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Mobile phones are ubiquitous in India today with over 900 million subscribers, of which over one third are in rural areas. The reach of mobiles is much greater than that of computers and internet. They have relatively low physical infrastructure requirements and are more cost-effective in remote areas. SMS (Short message Service) and voice are powerful mobile technologies that do not require internet connectivity to work. This can prove to be a boon in rural and remote areas. As compared to other communication channels mobile text messages have the advantage of instant and low cost transmission. Basic text messaging has helped to enhance efficiency of health services, improve diagnosis, treatment and rehabilitation, provide appointment reminders, improve patient compliance with medications and monitor chronic conditions.

In recent year, maternal mortality has received a special attention globally. Over half a million women from developing world die each year of the causes related to pregnancy and child birth. There are about 500 maternal deaths for every 100,000 live births, and around 10% of the pregnancy is high risk.

Infant mortality has been inversely associated with the immunisation given to children [3][4]. In 2008, WHO estimated that 1.5 million deaths of children under the age of five were due to diseases that could have been prevented through vaccinations. In order to improve the health of people in rural area and an effort to reduce maternal & infant/child mortality rate, the ICT support is needed.

2. BACKGROUND STUDY:

International Status:

Most of the maternal mortalities and morbidities are mainly attributed by the known and avoidable causes. Blank A et al.[1] contend that, in 2010, a tragic 2,87,000 maternal deaths are expected to have taken place world-wide. 99% of maternal deaths occur in developing countries with maternal mortality being higher in women living in rural areas and among poorer communities. Young adolescents face a higher risk of complications and deaths as a result of pregnancy than older women beginning with unsafe abortion practices. Infants of adolescent mothers are also at higher risk to be preterm and low birth weight, leading to higher infant

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mortality and morbidity rate. In recent years, maternal mortalities have received special attention globally. Researchers show that, one woman dies per minute in a child birth around the globe because the pregnant women in rural area fail to get full access of accurate information when they are pregnant. H. Paul et.al. [2] Contend that of all women had access to the interventions for preventing of treating pregnancy and birth complications, an estimated 74% of maternal deaths could have been avoided.

National Status:

Primary Health Centre (PHCs) sometimes referred to as public health centre are state-owned rural health care facilities in India. They are part of the government-funded public health system in India and are the most basic units of this system. Presently there are 23,109 PHCs in India. PHCs in India have some special focuses Infant immunization programs, Anti-epidemic programs, Birth control programs, Pregnancy and related care, Emergencies. A major focus of the PHC system is medical care for pregnancy and child birth in rural India. This is because people from rural India resist approaching doctors for pregnancy care which increases neonatal death. Hence, pregnancy care is a major focus area for the PHCs.

An important proximate determinant of maternal mortality is accessibility and utilization of quality healthcare services. In this context child survival & safe motherhood programme have been a direct intervention to reduce infant/child mortality & maternal mortality. The key interventions included in the safe motherhood programme are:

- Immunization for pregnant women
- Prevention & treatment of anemia
- Antenatal care & early identification of maternal complications
- Delivery by skilled personnel's
- Promotion of institutional delivery
- Management of obstetrics emergencies

Infant mortality is inversely proportional to immunisation. In India, due to lack of awareness [2][3] and knowledge about the benefits of immunisation, the infant mortality stands at

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61%[5]. With the need to reduce this high percentage, the use of technology has proved to be beneficial.

For increasing awareness about vaccines, the use of mobile technology and text messages have achieved success in different parts of the world [7][8][9].

OBJECTIVE

- The project aims to improve the healthcare quality in rural area through innovative technology.
- Empowering the communities in rural area to improve the child survival and maternal health.
- To bridge the gap between the PHC and community by innovative health services.

Significance of Study:

Despite of encouraging improvements in reducing Maternal Mortality Rate (MMR) in India, still more efforts need to be devoted to reduce the Maternal & Infant Mortality Rate. The article published in the newspaper "THE HINDU" projects the following statistics on Maternal and infant mortality rate in Coimbatore.

Record of Mortality Rate in Coimbatore Medical College Hospital(CMCH)						
Year	NMR	Percentage	IMR	Percentage	MMR	Percentage
2006-07	492/1624	30.30	42/378	11.11	27/8105	0.33
2007-08	481/1675	28.72	58/468	12.39	38/7866	0.48
2008-09	472/1773	26.62	55/427	12.04	47/7601	0.61
2009-10	521/1976	26.37	48/438	10.96	27/7107	0.37
2010-11	493/2227	22.14	52/522	9.96	35/6668	0.52
2011-12	406/2302	17.64	59/487	12.11	37/6915	0.53

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2012-13	391/2152	18.16	32/388	8.25	51/6575	0.77
2013-14	416/2513	16.55	48/442	10.86	47/6539	0.71
2014-15*	331/1799	18.40	55/472	11.65	27/3715	0.72

Note: NMR- Death of Newborn/No.of Admission. IMR-Death of Infant excluding ewborn/No. Of admission in paediatric w ward. MMR-Death of Pregnant women/No. Of eliveries.*2014-2015 data is for the period of April to Oct '14

Its Potential Contribution to Social Relevance:

Numerous obstacles to pregnant women in rural area will be removed if they will have access to technical services and information that can often prevent maternal mortality and morbidity. Therefore, there is a need for innovative technical solutions in health systems which can help to reduce MMR & IMR.

3. METHODOLOGY:

The proposed mCARE was designed as follows:

1. System study: collecting the information about the existing systems from primary health centres.
2. Data collection from primary health Centres.
    - The pregnant women in rural area needs to provide the following information like ID No.(RCH ID), Name, husband name, mobile number, Address, age, Community, Education status of women, Education status of husband, LMP date, EDD date, Date of registration, Height, Blood Group, HIV status, Date of visit to PHC.
    - The parents can register the details of the new born baby or the children under five in PHCs by giving the following information like ID No., Baby Name, Mother Name, Father Name, mobile number, Address, age, Community, Education status of Mother, Education status of Father,

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Birth date, Date of registration, Weight, Height, Blood Group, Date of visit to PHC.

2. Designing of the proposed prototype.

3. i) Maternal registration via Public Health Centre in mCARE system.

ii) Register the details of the new born baby or the children under five in mCARE.

4. After Successful registration, a scheduler is automatically triggered to create schedule for reminders.

5. Send Reminder

-Pregnant woman receives as per schedule the reminders to visit PHC for check-ups and medications. Constantly, the registered pregnant woman receives health information and medical advises such as nutritional feeding, food hygiene etc via SMS.

-The mobile numbers mentioned in the registration forms will be collected and the details of vaccination and scheduled date will be sent as SMS to the number. There are several vaccinations and injections to be administered to the new-born. The SMS facility will help parents to remember the exact date and period of vaccinations.

6. A simple search enables instant retrieval of patient's data and service records and allows developing the reports such as Maternal health chart,height-weight charts and growth & immunization charts. This, in turn, is easily accessed and analyzed by medical block officer.

4. RESEARCH STUDY & FINDINGS:

Research provides preliminary information regarding the current situation of maternal and child health service delivery and health information management in Tamil Nadu. Tamil Nadu has a vibrant public health system with a committed public health cadre. The health facilities in the public sector operate at three levels:

Primary—Primary Health Centres (PHCs), Community Health Centres (CHCs), and Health Sub-Centres (HSCs);

Secondary—district headquarters hospitals, taluk and non-taluk hospitals and dispensaries;

tertiary—teaching hospitals and specialty hospitals.

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PICME or Pregnancy and Infant Cohort Monitoring and Evaluation (PICME) is a system deployed by the Tamil Nadu government to track all pregnant women. Pregnant women can register on https://picme.tn.gov.in/picme_public right from inception of pregnancy until obtaining birth certificate for the new born. Persons registered under PICME are provided with a 12 digit Reproductive and Child Health (RCH) ID , which is to be used to track all aspects of the pregnancy by the Public Health Department. **As noted, a new RCH register was introduced in January 2017.**

Government of Tamilnadu has mandated to register all pregnancies, which will be registered by Village Health Nurse or Urban Health Nurse. Village Health Nurses (VHNs) are often the primary source of antenatal and postnatal care for rural women in Tamil Nadu. Only the village nurse can give the RCH ID. So without RCH ID, one cannot get birth certificate. Once, registered on the system, the expectant mothers can also avail benefits under the RCH scheme. financial assistance of upto Rs.12,000 is provided by the Tamil Nadu government for expectant mothers under Dr. Muthulakshmi Reddy Maternity Benefit Scheme.

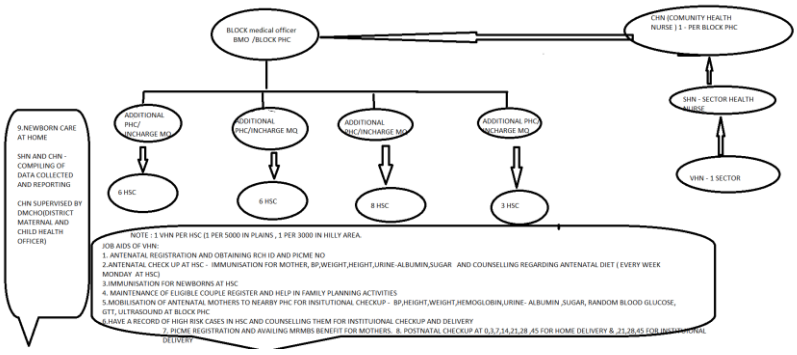

Figure 1. Health Department for Rural

As Tamil Nadu Healthcare moves towards a paperless data recording system, it was apparent that this push has yet to come to fruition at front-line with health workers such as VHNs and observed parallel paper-based and computer-based data recording systems, For each visit, the VHN writes the patient's data in her personal diary and she transfers the data into the patient's PICME Mother Card & PICME Counter Card which keeps at the HSC. The VHN then fills out the Reproductive & Child Health (RCH) register with the patient data. At the end of the month,

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the VHN uses her diary or the RCH register to categorize and sum patient information, entering the summed data into the HMIS system. which took VHNs roughly 9-15 hours to complete each week [16].

In the present system, to determine which children require an immunization that week, the VHN looks at the PICME system/ register maintained in PHCs and writes down which babies need which vaccines that day, as well as the phone numbers of the mothers. She makes a call to remain about child's immunisation schedule individually.

5. APPLICATION DESIGN :

Based on the field work observation, the proposed system mCARE web based application has been designed & developed using open source softwares.

Login Page – The users namely Admin, Medical Officer (MO), Village Health Nurse(VHN), Cmmunity Health Nurse and Sector Health Nurse login through this page.

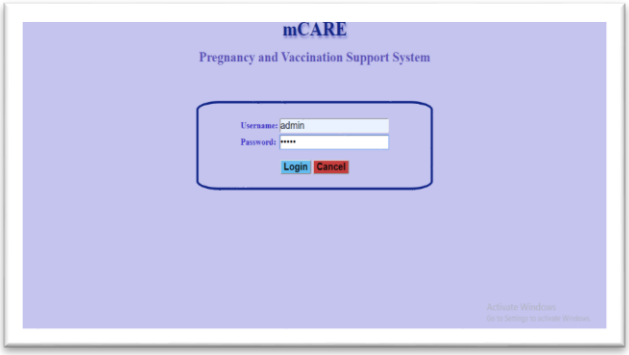

Figure 2: User's Login

Admin is responsible for adding the personal health Care Center (Primary Health Center) details and the users namely doctors, village health nurse, community health nurse and sector health nurse details. Once the details are added then the user will get the login credentials into the mCARE website. The admin can also view the PHCs, users and the patient's details. In this system, the patient ID is RCH-ID given by government of Tamilnadu. If the mother become pregnant again, she can use the existing RCH ID for maternal registration.

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Figure 3: Admin added the uers

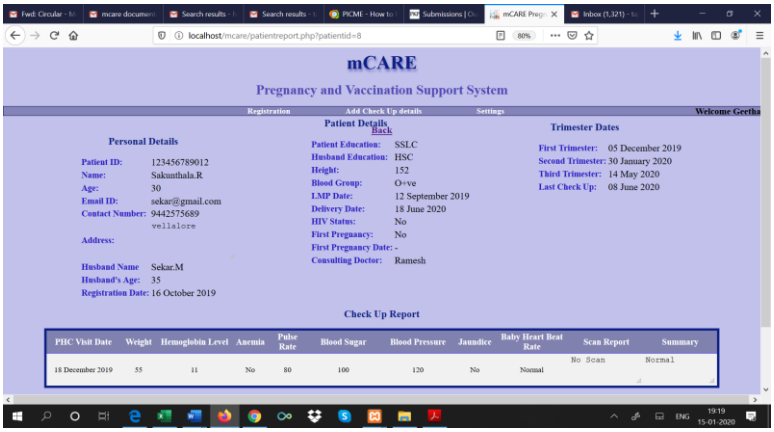

Figure 4: Pregnancy Women Registration by VHN

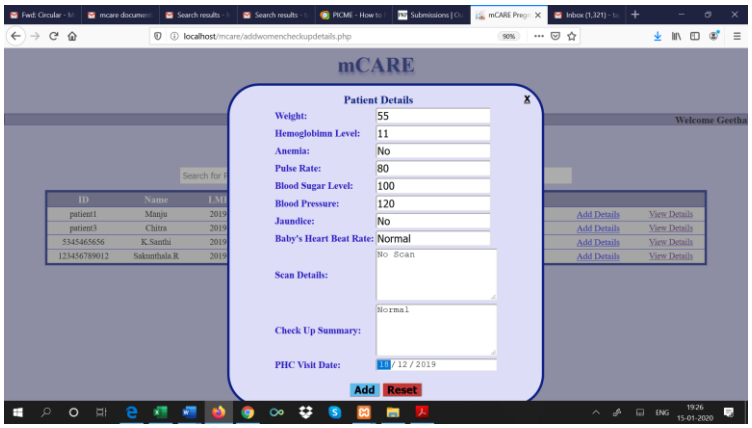

Figure 5: Pregnancy Women Health Check up Data Collection

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Figure 6: Registration for New Born Baby

Medical officer can view the patient's history by login and enter their patient's RCH ID during visit. They can identify the patient's high risk factor.

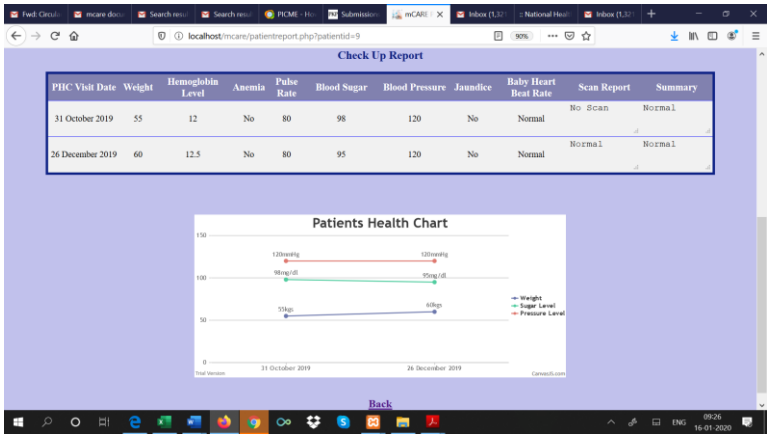

Figure 7: Patient's history Chart

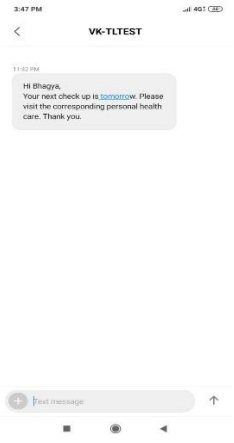

Figure 8: SMS Screen Shot

The web App's core functions will support the health workers for the following:

- Avoid paper-based registers during visits;
- Computerizing the data after it is collected in the field;
- Regular visit schedule is automatically generated and stored in patient's record.
- Using the patient's RCH ID, Health officials can get the patient's record.
- Weekly and/or Monthly report can be taken as requested by their supervising PHCs;

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- Sending the remainder about the vaccination/ check-up schedule automatically one day before the scheduled date.
- Identifying high risk pregnancies earlier by viewing the patient's history chart and admitting the women with risk factors well before the EDD.

6. CONCLUSION

With the developing countries looking at a large maternal and infant mortality rate, the use of innovative technologies have certainly brought a positive change. The proposed tools was designed to store all the maternal and infant data in primary health care in rural areas. The system will be accessed by all the medical officials associated with the primary health care. Automatically the system will send the alert message to provide timely vaccination/check-up remainders. The doctors can view the patient's health chart using this system. It conclude that cost effective alerts, such as emails and SMS, the innovative technical solutions in health systems which can help to reduce MMR & IMR by finding the high risk factor.

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