Summer Training at
KushiBaby, Udaipur
(April 3 to June 2, 2017)

- **How Khushibaby Dashboard is Tracking, Presenting and Improving Informed Decision Making on MCH Data Collected by Khushibaby Application**
- **INSIGHT into Khushibaby Dashboard**

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CERTIFICATE

This is to certify that **Bhavika** has undergone summer training in **KhushiBaby** , Udaipur from 3rd april to 2nd june 2017.

The candidate herself completed the project assigned to her during summer training. Her approach to the project was sincere and proactive. The summer training is in partial fulfillment of the course requirement recommended for the award of MBA in Health & Hospital management.

I wish her success in all her future endeavors.

Col. (Dr.) Ashok Kaushik

Dean (Academics & Student affair)

The IIHMR University, Jaipur

Dr.Monika Chaudhary

Associate professor

The IIHMR University, Jaipur

KhushiBaby

CERTIFICATE OF INTERNSHIP COMPLETION

This is to certify that **Ms. Bhavika Sheokand** has successfully completed her 2 months of mandatory summer internship at Khushi Baby Project, Udaipur, starting from 3rd April, 2017 to 31st May, 2017 under my guidance.

I wish her best wishes for future endeavours.

Khushi Baby Association

Director

Mohammed Shahnawaz
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Thank you to all!

Best,
Dr Bhavika

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Abstract

Background: ANM's provides majority of rural primary maternal and child healthcare services. To documentation of information of ANC and immunization records that takes place at various levels i.e. first it is maintained by ANM in sub centre level, by data entry operators at PHC and CHC level and by district M&E officer at district level. The entire process takes up to a month to be converted into report at district level for any managerial decisions.

A unitary setup like KB ensures accountability of data and real time tracking of data. KB dashboard fulfills this need of centralized system that allows data of each patient to be accessed in shortest time. Reports can be downloaded and patients can be identified for intervention and tracked for immunisation and delays in treatment to identified high priority cases which can be monitored through dashboard.

Objectives: The study included the following objectives: (1) to study the functioning of data collection in KB app (2)to find out how data synced from field is updated and presented on KB dashboard (3)to study how that raw data is modified into various variables on dashboard.

Methods: The study was conducted in Udaipur district of Rajasthan, 5 blocks namely Gogunda, jhadol, salumbar, sarada and lasadia were covered during the study. The district was selected as the KB's m-health project on maternal health and child immunisation is ongoing.

At the end of each MCHN day observed, the data was synced to dashboard where it could be accessed and studied.

Results: Once the ANM sync data from the field it is updated and presented on dashboard. Following key features are identified after studying mother ,child and ANM reports downloaded from dashboard : (1) Real time tracking of mother and child details (2) whether session camp took place or not (if not why is the camp cancelled) (3) ANM attendance details (with check in and check-out time) (4) Details of ANC (5) Supply chain evaluation of vaccines (6) Can identify High risk mothers and children (7) Mamta card can be downloaded as well as given to patients in printable form (8) Due for delivery mothers can be tracked (9) Personalized voice calls in local dialect is another unique feature provided by KB dashboard where we can set voice calls and call rules and implement them at desired level (10) Customized graphs for sex-wise details of vaccination and intervention (11) Reasons for not providing vaccination to particular mother or child can also be tracked from dashboard .

Conclusion: khushibaby dashboard is one way further for tracking and presenting MCH data which help in quick and improved decision making as real time data is presented on the dashboard and provided analytics can help health managers in assessing present situation on real time basis which can further be tracked by data updated on dashboard

Keywords: ***khushibaby app, MCHN Day, KB dashboard, Immunisation tracking, RCH Register***

Contents

CHAPTER 1

INTRODUCTION

Executive Summary

Immunization is one of the most cost effective interventions of public health providing protection directly and indirectly against VPD's. India has one of the largest Universal Immunization Programs (UIP) in the world in terms of the quantities of vaccines used, number of beneficiaries covered, geographical spread and human resources involved.

Under the UIP, all vaccines are given free of cost to the beneficiaries as per the National Immunization Schedule. All beneficiaries' namely pregnant women and children can get themselves vaccinated at the nearest Government/Private health facility or at an immunization post (Aanganwadi centers/ other identified sites) near to their village/urban locality on fixed days. The UIP covers all sections of the society across the country with the same high quality of vaccines

Immunisation targets to vaccinate 26 million new born each year with all primary doses and ~100 Million children of 1-5 year age with booster doses of Universal immunization programme vaccines. In addition, 30 million pregnant mothers are targeted for TT vaccination each year. To vaccinate this cohort of 156 million beneficiaries, ~9 million immunization sessions are conducted, majority of these are at village level. As per Coverage Evaluation Survey (2009), 89.8%of vaccination in India is provided through Public sector (53% from outreach session held at Aanganwadi centre (25.6%), sub centre (18.9%) etc while private sector contributed to only 8.7%. ASHA and AWW support ANM by mobilizing eligible children to session site thus try to ensure that no child is missed

Although Immunisation has been a major contributor for the decline of under-5 mortality rate from 233 to 48 in last five decades in India[1], there are still 5 lacs children who die because of VPD's in India only out of the 15 Lakhs worldwide. Children in India currently are provided vaccination to fight against seven such vaccine preventable diseases namely, Tuberculosis, Hepatitis, diphtheria, pertusis, tetanus, Polio, Haemophilus influenza. The government provides these vaccines free of cost at their health care centers, Every child has the right to be fully vaccinated i.e up till measles dose that is given at 9 months of age. However the importance to measure the timely immunizations is often omitted from the immunization reporting systems. First, vaccinations are to be given as early as possible to save lives. Second, timely vaccination ensures higher levels of herd immunity by reducing the pool of susceptible individuals, thereby protecting infants that are too young to be vaccinated from deadly vaccine-preventable diseases.[2] One cannot think of reducing child mortality without giving regard to maternal health. A healthy mother gives birth to a healthy child is now a proven fact. The International Conference on Population and Development in 1994 had recommended reduction in maternal mortality by at least 50 percent of the 1990 levels by the year 2000 and further one half by the year 2015. Antenatal care provides an opportunity for a variety of preventive interventions during pregnancy, including tetanus toxoid injections, folic acid

supplements, high risk detections through routine haemoglobin, urine and sugar tests and educating women about nutrition, safe delivery, and postpartum allows women who face a high-risk pregnancy to be identified and monitored during pregnancy to ensure a safe delivery. The care received by her during her reproductive span specifically during her pregnancy stage is crucial for her health and her newborn's health. The focus of the govt. to a more holistic program, the RMNCH+A that follows life cycle approach and shows how each phase of the life cycle is interdependent on each other. The eradication of polio from India was a combined effect of both the medicine and administrative efforts .

ANMs provide healthcare to 10-12 mother and children per camp day and enter the details of the beneficiaries multiple times and spend more than half of the time in data documentation that monthly reports are submitted by the ANMs at the block office and the data is entered in the portal. A due list is made after every MCHN day that pre determines the number of mother or child due for the next service and vaccines that will be required .A copy of the duelist is also given to the ASHA to remind the mothers to come for the next visit doing multiple entry of the same patient at different columns in SEC-II of the RCH register

The network of ANMs, ASHAs and Medical officers are crucial to provide the benefits of the established public health system. There is a regular reporting system from the health sub-centre to PHC, district, state and national level. This reporting has been computerized in the country as a part of Health Management Information System (HMIS), and the data is available from health facility level and above every month.

The documentation of information of ANC and Immunization records takes place at various levels i.e. first it is maintained by ANM in the sub center level, by data operators at the primary health centre and community health centre level and then by District consulted/coordinator at district level. The entire process takes up to a month to be converted into a report at the district level for any managerial decisions. The fact that the same information goes through different channels makes it more vulnerable to discrepancies and the lag time between data entry in the field and report generation at the district level may lead to inefficiency of the program. Therefore a need for a centralized system that allows the data of each patient to be accessed in the shortest time and in a standard format is realized.

According to the Global Observatory for eHealth, WHO some of the healthcare challenges related to information system include:

- Lack of timely and actionable disease surveillance,
- Poor drug inventory and supply chain management,
- Slow rates of information flow and reporting delays .

The World bank Database. Available from http://data.worldbank.org/indicator/SH.DYN.MORT [2] Akmatov MK, Kretzschmar M, Kramer A, Mikolajczyk RT. Timeliness of vaccination and its effects on fraction of vaccinated population. Vaccine. 2008;26(31):3805-3811.

CHAPTER 2

Review of Literature

(A) MCHN DAY

Maternal child health nutrition day is a government of India initiative and is the most significant platform for providing essential care to maternal and child health care. Providing the first point of contact for primary health care community and it works as a common platform for convergence amongst service providers of health, ICDS and community. There is expected to be one MCHN day every month in a village of 1000 population. One Sub centre may have 4-5 such villages therefore every Thursday's of the week is allotted as MCHN day for a particular village. The engagement and mobilization of the community is taken care by the ASHA worker of every village. One day prior to the session, social mobilizer should be requested to conduct house-to-house canvassing and community line-listing to identify all eligible children and pregnant women. The MCHN day is conducted mostly in aaganwadi centres that is managed by an aaganwadi worker or in schools. If a village does not have an AWC or school some other site is identified to conduct the MCHN day. Cold chain handler at the PHC will be vaccine- carrier as per the requirements specified in the PHC plan, and label each vaccine- carrier. ANMs provide the antenatal care, child immunization services, and family planning counseling services to the people. All the details of the people is recorded in a Reproductive child health register (RCH) which is a huge register that has 3 sections each for eligible couple, Pregnant woman and child care. One RCH is exclusive for one village and is meant to be used for a period of 2 years.

(B) Efforts to reduce child and maternal mortality in India

To ensure the MDG 4, the routine immunization plays a very important role to bring down the IMR and U-5MR. Govt. of India's started the Universal Immunization programme (UIP) since 1985 for children between the age group 0-12 months to protect them against six preventable diseases: tuberculosis, diphtheria, pertusiss, tetanus, poliomyelitis, and measles. The goal of UIP was to ensure 100% coverage of all eligible children. A nationwide survey covering all States and Union Territories of India by UNICEF that was conducted during November 2009 to January 2010 suggested that the national FIC against the six vaccines among 12-23 month old children was only 61 percent. India national estimates found DTP3 coverage, which is the widely accepted RI global indicator, was still unachieved with 83 percent, against a global target of 90 percent by 2015[3].The increase in full immunization coverage has only increased by 1 percent from 2009-2013 that urged JP Nadda, union minister of health to take this on a mission mode and he on 24th December 2014 announced the launch of Mission Indradhanush in order to cover all children vaccine preventable disease through immunization by 2020. Delivery care is a crucial aspect of maternal care. Most non-abortion maternal deaths occur around the time of labor and delivery or within a few days after birth (Fauveau et al. 1988). Access to obstetric services from qualified professionals is therefore essential to preventing maternal deaths. Educated mothers are more likely to recognize a problem, seek medical care, and report a problem. Infant and child mortality rates are also greatly reduced if mothers received antenatal and delivery care from trained health

professionals (IIPS 1995). In India for example, infant mortality rates range from 97 per 1,000 for births with neither antenatal nor delivery care, to 64 per 1,000 for births with either type of care, and 44 per 1,000 for births with both antenatal nor delivery care. This pattern is constant for all the states under study. The findings are similar for institutional deliveries. Data from the NFHS show that infant mortality in India is 31 percent higher for births delivered at home than for births delivered in a public health facility and twice as high as for births delivered in a private facility. Promoting antenatal care and institutional deliveries have been a major Survey data on Maternal Mortality Ratio (MMR) is available from the Report of Registrar General of India - Sample Registration System (RGI-SRS). The latest available data on MMR is for the period 2011-13 which is 167 per 100,000 live births. Average decline in MMR between 2007-09 and 2011-13 has been 11.3 points per year, i.e. 5.8% compound rate of annual decline. Assuming that the annual compound rate of decline observed during 2007-09 and 2011-13 continues, India's MMR is likely to reduce from 167 during 2011-13 to 140 in 2015 against the target of 100 per 100,000 live births by 2017. The government definitely needs to gear up in order to reach the competitive target. Maternal health comprise of services like essential obstetric care, quality antenatal care, Post natal care, skill birth attendants, provision of emergency and referral services. SRS data shows that that so far only three states—Kerala with an MMR of 66 per 100,000 live births, Tamil Nadu with an MMR of 90 and Maharashtra with an MMR of 87—have been able to achieve the millennium development goal. Andhra Pradesh is close to achieving the target with an MMR of 110. Going by the trend, most other states will not be able to achieve the target. India, as whole, is also lagging behind.[4] Rajasthan state has ranks as one of the poor performing indicators on child and maternal health .

[4] http://www.downtoearth.org.in/news/india-nowhere-near-millennium-goal-for-maternal-mortality-43235

Figure1: Source: Rajasthan 2011-12 Factsheet[5]

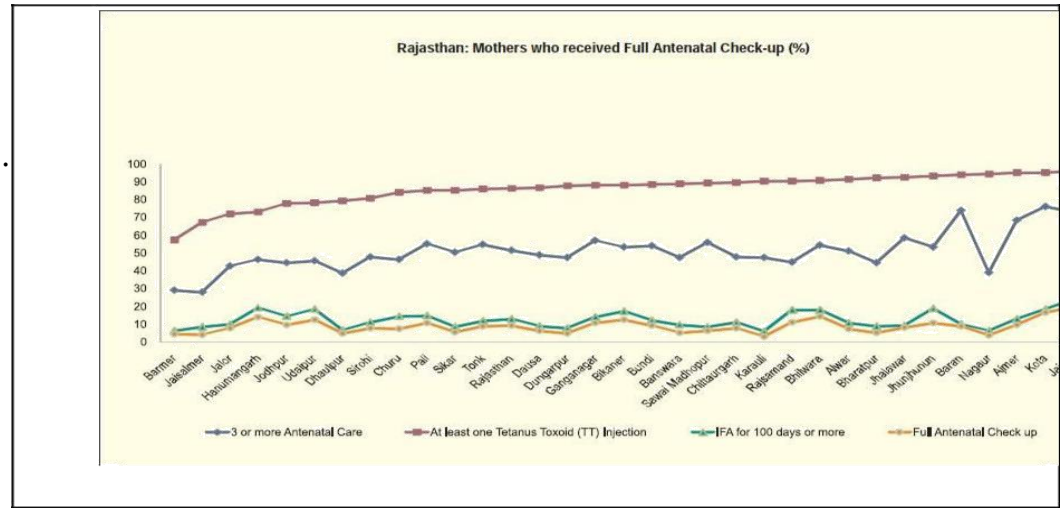
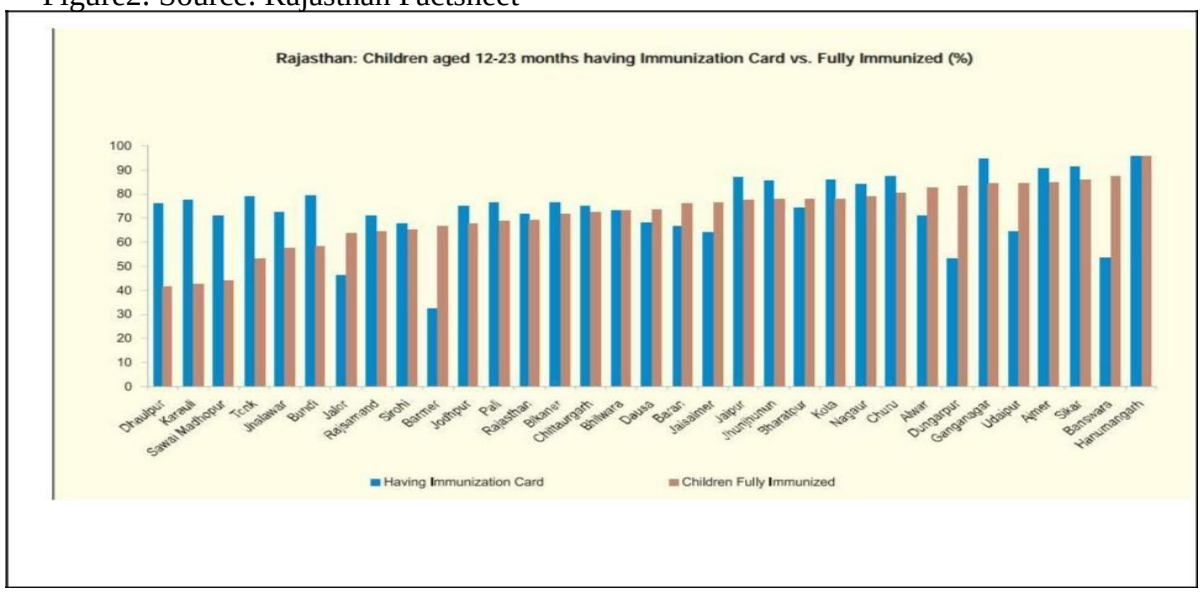


Figure2: Source: Rajasthan Factsheet[6]



Most maternal and child deaths in developing countries are preventable through adequate nutrition, proper health care, the presence of a skilled birth attendant during delivery and emergency obstetric care. To provide healthcare to the rural areas have always been a

[5] AHS-RajasthanFactsheet_2011-12(Pg.102): http://www.censusindia.gov.in/vital_statistics/AHSBulletins/AHS_Factsheets_2011_12/Rajasthan_Factsheet_2011-12.pdf

[6] AHS-RajasthanFactsheet_2011-12(Pg.105): http://www.censusindia.gov.in/vital_statistics/AHSBulletins/AHS_Factsheets_2011_12/Rajasthan_Factsheet_2011-12

challenge. The dearth of doctors to deliver last mile care has existed for long. Community health workers are therefore the most peripheral point of contact who delivery some most essential services.

Advanced wireless technologies offer a revolutionary opportunity to strengthen the capacity of frontline health workers, expand coverage and improve the quality and timeliness of delivery of critical maternal and child health interventions such as antenatal services, birth preparedness planning, prevention of mother-to-child transmission of HIV, essential newborn care, immunization and community case management of childhood diseases .

(C) Reasons for poor health performance

Supply side

- Budget as a constraint:

  An unfortunate fact however, is that India spends very little on routine immunization. Only 2.1 percent of the national government's health budget is allocated to routine immunization a small amount given the country's large population and number of births. The additional cost per capita each year to reach 90 percent of Indian children with the six basic vaccines already included in the national immunization program diphtheria, tetanus, pertussis, tuberculosis, polio, and measles would be less than three rupees, or eight cents, in the poorest states and even less in the other states.[7]Or equivalently, the vaccine cost per fully immunized child would be roughly eighty cents.

- Huge population to immunize:

  The reason to understand why India has not been able to achieve set targets is complex where the huge population with relatively high growth rate is a barrier in itself. Approximately 27 million children are born in India each year being the largest birth cohort in the world but less than 44 percent receive a full schedule of vaccinations. In contrast, in Bangladesh, on the

[7] Elliott C, Farmer K Immunization status of children under 7 years in the Vikas Nagar area, North India. Child Care Health Dev. 2006;**32**(4):415–21.

northeast border of India, 82 percent of children are fully immunized by age two. In adjacent Nepal, 80 percent of children are fully immunized by age one.[8]

- Lack of skilled human resources

Shortage of trained personnel to manage the program at both the national and state levels; WHO report on progress of human resources estimates that based on population need there is a shortage of 7.2 million healthcare workers and this is expected to rise to 12.9 million globally by 2035.[9] In India the doctor and patient ratio is very low specially the rural areas where approximately 70 percent of India's 1.2 billion populations live. There were 1,52,326 rural SC's, 25,020 PHC's and 5363 CHC's in March 2014, compared with 1,45,272 SC's 22,370 PHC's and 4,045 CHC's.[10] India has one government doctor for every 11,528 people and one nurse for every 483 people. This shortage of health providers in comparison to the health force is also unequally distributed where more than half of the global population live in rural areas are served with <38 percent of total nursing force and <25 percent of total desired physician[11].The transfer of roles and tasks from a higher cadre to a lower cadre also known as task shifting has resulted in FHW's such as CHWs, auxiliaries and midwives being responsible for the provision of crucial health services like ante natal care, skilled birth attendance, breastfeeding practices, immunizations, malnutrition and communicable diseases such as tuberculosis, HIV/AIDs etc. especially in areas where the burden of the diseases is maximum the FHWs are the first point of contact to deliver such essential care. Studies have suggested that there are many challenges faced by these FHWs at the field level in deploying these activities; some of them include inappropriate means to collect data, poor patient

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[8] Laxminarayan R, Ganguly, NK. India's Vaccine Deficit: Why more than half of indian children are not fully immunized, and what can—and should—be done. Health Aff 2011; 30: 61096-1103. Available from: http://content.healthaffairs.org/content/30/6/1096.full.pdf Accessed on October 12, 2012.

[9] A universal truth: No health without a workforce, WHO and Global health workforce alliance (2014).

[10] Statistics Division: Ministry of Health and Family Welfare. Government of India. Rural health statistics in India 2012. Mar 2012. http://mohfw.nic.in/WriteReadData/l892s/492794502RHS%202012.pdf

[11] WHO. Increasing access to health workers in remote and rural areas through improved retention. 2009.

management due to lack of proper training, lack of communication and coordination between stakeholders. The FHW's spend substantial amount of time in recording data on the field, making monthly reports which later are manually entered by into database .

Demand Side

We cannot forget that one of the main challenges also lies on the demand side, the degree to which individuals do their part to be vaccinated. Poor literacy rates, which are consistently correlated with the likelihood that individuals will not complete vaccination schedules, pose a major barrier to expanding vaccination rates in rural areas.[5]Better communication about the benefits of vaccines and the potential but typically harmless side effects, such as sore arms and low- grade fevers, could greatly boost confidence in vaccines and the immunization program

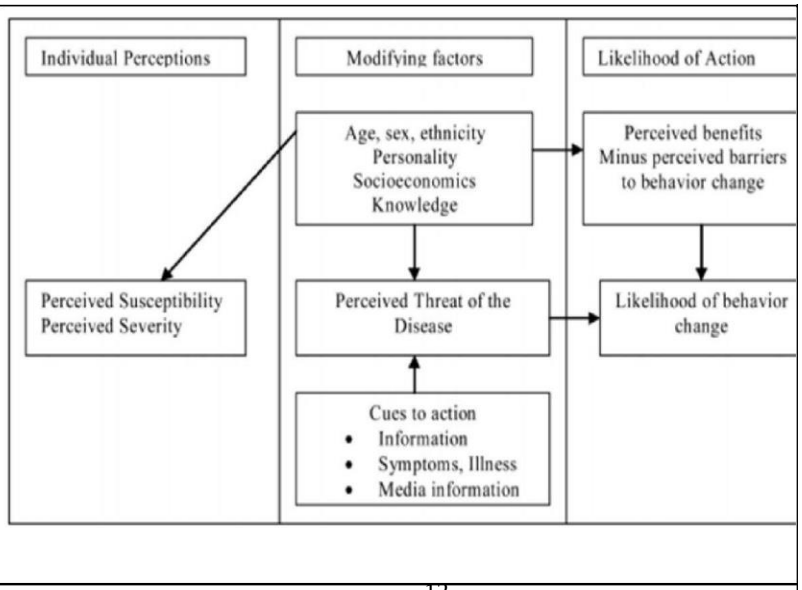


Figure3: The health belief model[12]

Perceived Barriers

The perceived barriers in availing healthcare facilities among women in rural areas are also one of the major challenges. The health belief model explains the various stages of obstacles that come in between availing health care services. The perceived susceptibility, severity and benefit action of the disease must outweigh the barrier to the action. Eg. The perceived risk of suffering from vaccine preventable diseases and the benefit of availing timely vaccination

[12] The HBM was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services

shots should outweigh the barriers like transportation, time constraints, and availability of health care staff and services.

(D) Identification and registration of eligible beneficiaries

It is expected that in a population of 1000, in one year there are expected to be 100 eligible couple, 40 pregnant women and 30 children who will come to the MCHN day site however the numbers patient's that receive timely vaccination is always less than the expected. It was found that ANMs contribution to identify patient is the least and she is entirely dependent only on the work done by ASHA's and Aaganwadi workers to bring mothers and children to the camp. Lack of awareness among people regarding the importance of immunization is one big reason to high dropout .During the MCHN day the mothers were not reminded about the next visit. Unawareness among the people about the services provided on the day, the timing and place where is it held that leads to low attendance and drop outs. ASHA worker and AWW do fully cover the coverage areas.

The reasons for delay in reporting information is due to delay in providing regular information and data not getting uploaded in the PCTS.

The particular window period i.e from 5^{th} to 10^{th} of every month to enter data in the PCTS system leads to last moment entry of huge amounts of data that affects the quality of the data entered. If PHC level did not have a data operator and most of the system were in non functional condition

(E) The need for Innovations

In rural settings within developing countries, records are mostly maintained on paper. Very often there are multiple points of entry of the same data transferred into numerous paper forms, before it gets transcribed and aggregated on a centralized computer system at an urban

location. This process of copying and compiling data on paper is both error-prone and time consuming, with long delays between initial data entry and data aggregation and digitization. High error rates in data are particularly problematic in the domain of healthcare where an errant entry may prevent lifesaving treatments from reaching patients. Furthermore, because of delays in aggregation, it may take weeks or months before decision makers view the data, resulting in corresponding delays in remedial actions such as providing emergency medical care.

Current solutions such as hard copies of records are easily lost, and there is no centralized location to retrieve this information. Moreover, in rural India, there is little incentive to get children immunized when it is at the price of losing valuable hours in the workday during which parents could otherwise be earning money for the family. These reasons compounded together ultimately mean that there are large hurdles to overcome in order to achieve effective and systematic immunization, and by extension, overall health in society.

A recent report suggests that by the end of 2014 there will be more mobile phone subscriptions than people in the world. [13]Currently, total cellular connections are estimated at 7 billion and are expected to grow to approximately 8.7 billion by the end of 2018.[14] Mobile phone penetration rates stand at 96 percent globally (128 percent in developed countries and 89 percent in developing countries. India is an important part of this market, with one of the largest telecommunications networks in the world as of March 2010. In terms of subscribers,

[13] (2013) ITU World Telecommunication /ICT Indicators database. Geneva, Switzerland: International Telecommunications Union

[14] GSMA Intelligence, July 2014; UN, July 2014

India had 807 million active mobile users as of August 2014.[15] The global mobile health market, including devices, software and services, is projected to grow eightfold, from $5.1 billion in 2013 to $41.8 billion in 2023.[16] An evaluation showed that by using existing mobile networks and low-cost feature phones, the system improved the ability of health workers to deliver services and improve health outcomes. More women had skilled assistance with their delivery, more women delivered in health centers, and more women received antenatal care. The system improved CHW capacity to respond in a timely manner and shows that in a context where internet coverage is low, mobile phones can be an effective way to improve health system performance. The internet and associated technologies have the potential to expand health services in developing countries, increase health system efficiency, and lead to better patient outcomes. E-health encompasses the full range of uses of information and communication technologies (ICTs)—from traditional administrative reporting systems to broader Health Management Information Systems (HMIS) to telemedicine, electronic medical records, clinical decision support, and patient portals—and a full range of technologies, including internet and mobile applications[17]

However, the success of the technology itself depends on a lot of factors. One of the most important is the role of the implementing institutions. Effective adoption of technology in organizations requires significant investments in skills and changes in working arrangements, and politicians and policy makers need to have the incentives to make these investments. Adopting new technologies also requires learning new skills and changing processes, which can add to the workload, at least initially. An unclear career rewards in patronage-based civil service systems, particularly given the difficulties in measuring the productivity of government agencies. Ministries and departments compete against one another for scarce

[15] http://www.trai.gov.in/Content/news/61152_0.aspx

[16] United Nations Millennium Development Goals and Beyond 2015, Goal 5 Fact Sheet. Retrieved on April 5, 2014 from http://www.un.org/millenniumgoals/maternal.shtml

[17] Otto K., M. Shekar, H. C. Herbst, and R. Mohammed. 2014. Information and Communication Technologies for Health Systems Strengthening Opportunities—Criteria for Success, and Innovation for Africa and Beyond. Washington, DC: International Bank for Reconstruction and Development/World Bank.

budgetary resources, leading to a silo mentality and resistance to horizontal collaboration. Most important, the automation of business processes and improved monitoring reduce bureaucratic discretion and opportunities for petty corruption in patronage-based systems. The main explanation for the varying impact of digital technologies lies in the mismatch or gap between rapidly changing technology and slowly changing political and administrative institutions. Political institutions can be distinguished by whether they are clientelist or pro-poor, and bureaucracies can be classified by whether they are patronage-based or performance-oriented[18]

Curative and preventive health care are private and public goods, respectively, and so differ in the citizens' incentive to monitor, although vaccinating children is a preventive measure that parents are likely to have an incentive to monitor. But the highly discretionary nature of clinical services and the difficulties in measuring the outcomes of treatment render curative health care more difficult to improve through the application of technology than preventive health campaigns that follow more relatively standardized procedures (such as control of communicable diseases). On the other hand developing countries have the fastest mobile growing rate and the Indian smartphone industry market growing with almost a third of all Indian mobile users expected to own a smartphone by 2017. The global smartphone penetration forecast shows that almost 50 percent of mobile users worldwide are projected to own a smart device by 2017.According to Forbes 2016 India has already crossed 1 billion mobile subscribers .

(F) Pregnancy, child tracking and health services management system (PCTS)

It is an online web based application launched on 15 Sept. 2009. Its new version as per Government of India guidelines has been made functional since 1st July 2010. The objective of PCTS is case specific monitoring of every pregnant woman and her child to reduce maternal and infant mortality. The software helps in maintaining an online directory of health institutions, automatic data consolidation, and online trend analysis.

[18] World Bank 2003.

The Service Delivery Register (SDR) is filled by ANM. She uses this data to fill facility based forms 6, 7, 8 at SC PHC, CHC/DH level. They are uploaded in PCTS by the Information Assistant or Data Entry Operators. The line listing (area wise reporting for catchment population for ANC, delivery and immunization) continues for the entire month which constitutes the line listing of the figures mentioned in Form 6. The Form 6, 7, 8 are then checked at the block level by the Block Data Entry Operator, both manually and using Assan software to correct the discrepancies in the data. The discrepancies are made to be corrected at the respective facility. At the block level Form 9A is generated automatically. Similarly at the district level Form 9 is generated automatically which includes the information from all the blocks. Also, through Assan software the information is uploaded in Health Management Information System (HMIS) which is checked by the District Nodal Officer .

CHAPTER 3

METHODOLOGY

3.1 Background and Rationale

Khushi Baby is a novel mhealth solution that provides a mobile health application coupled with a wearble necklace. KB app is currently working in government immunisation camps as pilot project. The mobile health solution delivered and implemented by KB app aims to reduce ANM burden

3.2 Research questions

- To study steps of data entry by ANM in KB app?
- To study how data is synced from local device to dashboard ?
- How data entered into app is presented on dashboard and how it helps in quick and improved decision making?

Aim

The study aims at evaluating how KB dashboard is tracking, presenting and improving informed decision making on MCH data collected by KB Application.

The objectives

1 To study the functioning of data collection in KB App

2 To find out how data synced from field is updated and presented on dashboard

3 To analyze and study how that raw data is evaluated into various variables on dashboard and can be monitored for further decision making.

3.3. Procedure

Study Type

This study is an exploratory study to find out the features of Khushibaby dashboard and how those features can help in improved decision making. In order to gather preliminary information that would help in knowing how data is updated into KB app and how that data is synced from the field on dashboard and how that data is presented on dashboard and can be used to monitor MCH data, exploration is required.

Study Area:

The study was conducted in Udaipur district of Rajasthan, 5 blocks namely Gogunda, jhadol, salumbar, sarada and lasadia were covered during the study. The district was selected as the KB's m-health project on child immunisation is ongoing here.

During the two months duration 8 such MCHN days were observed and At the end of each MCHN day observed , the data was synced to dashboard where it could be accessed and studied. Weekly reports on child immunization were downloaded

3.3. Data Collection

ANMs of 81 treatment group of the cohort on every MCHN day ie Thursday (if not changed due to some holiday) when reach the camp log in into Khushibaby app and collect and enter mother and child data into the app. After the camp is over and when ANM log out from KB app homescreen, she syncs the data to dashboard for which she needs internet.

On every Thursday updated data is synced on dashboard and features of dashboard are studied as how data entered in KB app is presented on dashboard

3.4. Procedure:

For Objective No. 1

1. Web based search for relevant literature and documents was conducted

2. Permission was taken from KB COO to study data entry of mother and child details in KB app on MCHN day.

3. ANM turns on the internet , and select Block and then PHC from the drop down list

4. ANM reaches the camp and she enters her login id and password into the app and enter login . Now she can turn off the internet as further process can be saved directly on the local device on app.

5. ANM selects the sub center and due list is generated on the screen .this due list is based on the patients (pregnant women and children) alredy registered in the KB system (Dashboard).

6. ANM fills the checklist so that she can be sure that she do not misses the required things

7.If ANM reaches the camp then she press reached camp and if haven't then , press not reached to the camp site and then have to pick one reason from the drop down list that what is the reason for example vehicle broke down, health issues, etc for not reaching camp

8. ANM will click on the camera icon for the next step ,if she has reached the camp, and proceed to check in .

9. The home page of KB app will appear. Here we can see following things. Like New Mother, Returning Mother, New child registration, Returning child, Search Patient and Delivery.

10. For every new mother or child visiting the camp, ANM selects new mother or child registration on the home screen and enter details in the app

11. ANM is done with filling the details ANM will scan a fresh pendant on NFC antenna and it shows a message that data writing is successful.

12. Again ANM will reach on the home screen here if a returning mother come to the camp then she have to click on returning mother or child

So there can be only 3 scenarios.

1. Mother is returning with the pendant then ANM have to scan the pendant on NFC antenna and the data of patient will come and ANM can give details of this ANC visit and child vaccination and medication details.
2. She is not having pendant or she is coming with pendant and the pendant is not working, We have to search for the patient by name Then click on the right patient and fill the details for this visit and write data on the tag.

13. ANM can provide patient closure details from the line list itself. She can fill Delivery outcome, Maternal Death or migration

14. ANM can now logout from KB system and sync the data

For Objective No. 2:

15. ANM turn on the internet which is necessary for syncing the data to dashboard
16. For syncing the data ANM chooses the option to sync data on pre-homescreen of KB app
17. After syncing the data, the data saved in the tablet goes to the cloud dependent dashboard

For Objective No. 3:

18. When the data is synced from tablet , data is updated on dashboard
19. On upper right side, total number of mothers and children registered in KB system can be seen
20. On left side of dashboard we get icons for the following features-
    - FIND PATIENTS-to find mother or child from name or any relevant information we are having
    - REPORTS- we can download monthly,weekly or daily reports for mother child or ANM attendance blockwise, PHC wise or SC wise
    - SET VOICE CALLS- this is the feature provided for personalized voice calls in local dialect for due for delivery mothers and due for vaccine children
21. On right hand side , district overview can be traced .it can be evaluated as following on dashboard-

- New registered mothers
- Returning mothers
- Dropout mothers
- Due for delivery mothers can be traced
- New children registered
- Returning children
- Dropout children
- Infants due for measles vaccine
- Mothers denied vaccines
- Mothers denied IFA
- Children denied vaccine

CHAPTER 4

Results

The findings are divided into 3 major steps. Starting from understanding the process of data entry in Khushibaby Application by ANM, How data is synced from app to cloud based dashboard and finally how data is presented on dashboard and revealing all general and specific features of dashboard

4.1 KHUSHIBABY SYSTEM

4.2 DATA ENTRY IN KB APP

KB APP is digitalized form of RCH register provided to ANM to record all the details of pregnant mother health and child immunisation . It is an approach to digitalise the record keeping process. KB monitors have given trainings to ANMs who fills the data of mother and child ,their respective details in the KB app. ANM do not need to be connected to internet in order to interface with patients.

The steps involved in data entry from ANM login to automated due list generation on homescreen of App are described below-

This is the pre-home screen of KB app. ANM needs internet to login into system. ANM have to fill her login ID and password and press the login icon on the screen.

The login time is recorded, which when data is synced to dashboard will tell us about the time when ANM started the particular session that day.

Please select block from the drop down list

Before ANM login into the app , she has to turn on the internet and choose the block from the drop down list given .

This reduces the chances of error and GPS coordinates are traced to track from where ANM actually did the camp . On every step there are checks provided by KB system so that chances of faulty data is reduced and real time reel data is updated to dashboard and with various levels of validations, they will not make mistakes

Please select your Primary Health Center from the drop down list.

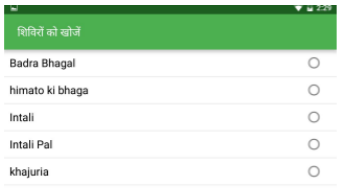
After choosing the block , ANM has to choose the PHC from the drop down list.

Please select the prefered language.

For ease of doing work and better understanding, ANM can choose her preferred language which is more comfortable to her. If she will choose HINDI , app will translate into hindi.

Please enter your login ID and Password and press log in.

ANM has to enter her login ID and password and press login

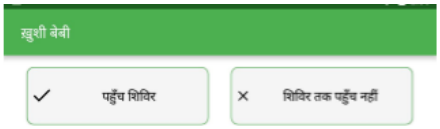


Please select your Sub- Center.

Sub-center is the smallest unit of reaching the community. ANM works at the sub center level and provide health benefits to the patients and refer the complicated cases to PHC.

Now this one is your Due list. These are patients who are already registered in the KB system. Left image is showing pregnant women and right image showing children who are already in the system

As ANM login to the App, she can turn off the internet and work offline now. An automatic due list is generated based on the previous entry in the app from the particular sub center.

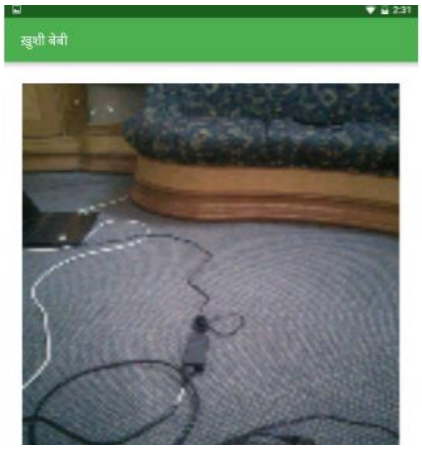


If you reached to the camp then press reached camp and if you haven't then please press not reached to the camp site.

If you are not able reach camp then you have to pick one reason from the drop down list that what is the reason for example vehicle broke down, health issues, etc.

If you have reached the campsite then please select the reached camp and click on camera icon.

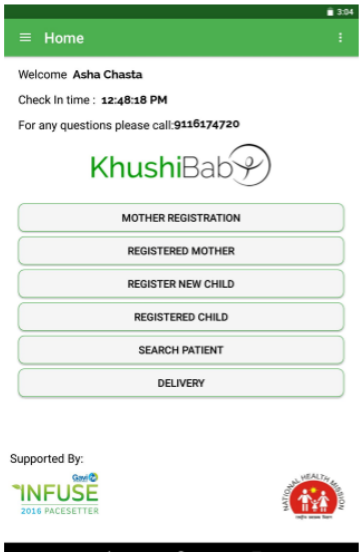
When ANM will proceed further she will get the following option, wheather she has reached the camp or not. If she has reached the camp she has to click a selfie of her in the camp site and proceed further , but if she has not reached the camp, she has to choose the reason for it from the drop down list or have to specify the reason. This is another check provided by KB system. When the data is synced to dashboard, ANM attendance reports can be generated , by which can know when she has started the camp and GPS coordinates for the location can be traced to recheck with the fidelity of camp location.



Please select the check in for proceeding

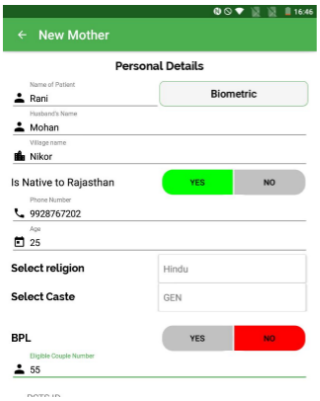
Now the app will show you the summary that you have to provide your services to this number of patients.

Automated Due list is generated to ANM , so no need to check the RCH register to check the due list of patients.

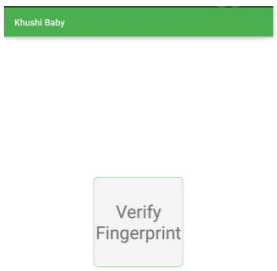


This is the home page of KB app. Here you can see following things. Like New Mother, Returning Mother, New child registration,Returning child, Search Patient and Delivery.

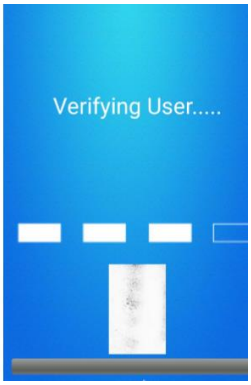
If a new mother comes to the camp, we will click on mother registration icon and proceed further with process of filling details of the mother and read the NFC enabled tag and save the data to the tag and give that pendant to mother.



Now you have fill the personal details of Pregnant Women like Name, Husband Name, etc. Here we have to take boimetric of pregnant women so data can be validated.

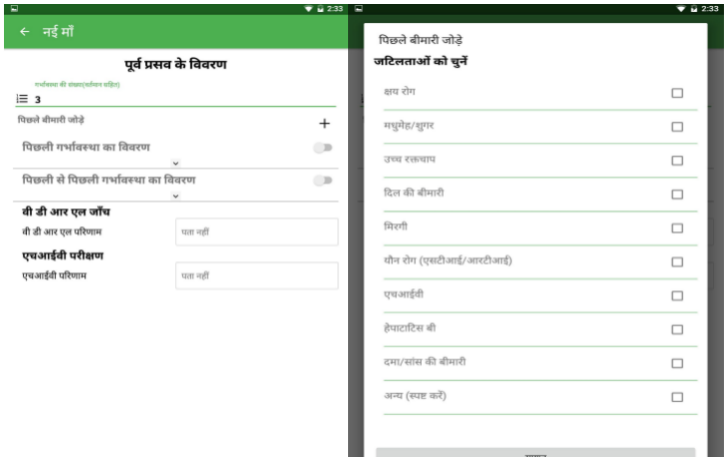


Verify fingerprint when this screen will appear

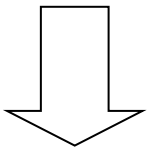


KB app provides the option of taking patient's biometric , which can provide another check to data entry. When the patient comes for her second visit to camp, ANM will take the biometric of patient and will be assured that the same patient comes to the camp.

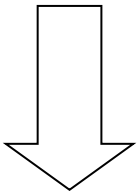
On this page please fill the Personal Information like Adhar Number, Bank account number, IFSC, etc

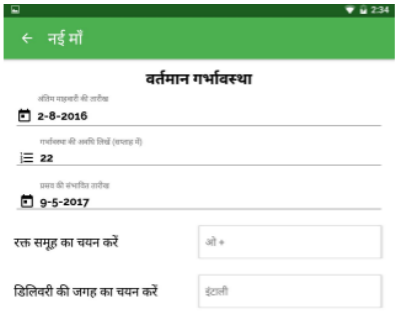


On this page provide prior pregnancy detail and if the women is having any complication in previous pregnancy please add them by clicking on the + button.



Please add details of previous and last to previous pregnancy details and if there were any complications then please select them.





On this page please provide the informations for present pregnancy. You just have to fill date for LMP and the pregnancy week and EDD will be calculated automatically. Please select blood group and expected place of delivery.

On this page we can edit the ANC's. We are taking a example like the women is coming for 2 ANC then we have to select the checkbox next to ANC 1 then it indicates that ANC 1 is already done. Then we can edit details of ANC 1 by clicking on 1st ANC and we can edit details of ANC 1.

Continued on next screen.

Here we can edit the details of 1st ANC like Date of ANC visit, Weight, Haemoglobin,etc. Here we can also edit the TT details and IFA details.

On this page we have to entered details of various test like urine test, blood sugar test, fundal height examination details, fetal movements and fetal heart rate.

On this page if the women is having any high risk then ANM can select high risk by clicking on the Plus(+) button (high risk are shown in the right side image) and has to enter the date of refer and enter the name of referral facility.

Here she can see the summary of the patient according to the filled details like for this the women is having history TB, Blood Transfusion and C-section, and now she is having Anemia.

After that some suggestion according to the high risk are also given that prescribe her 200 IFA tablets and refer to nearest 24x7 PHC, etc

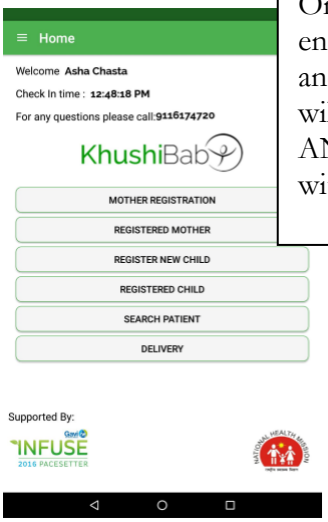
Here she has to fill facility phone number also.

Then click on Next ANC 2 button because we have taken an example that the women is coming for 2 ANC.

Like ANC1 we can see the summary on this page. On the bottom of this page there is a option for write tag click on that. This message which is showing in the right image will appear. Click on the write tag.

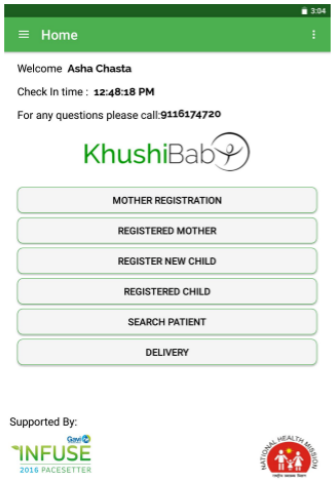
Continued on next page.

When we are on this screen please scan a fresh pendant on NFC antenna and it shows a message that data writing is successful.



Once the data entry is complete, ANM will take NFC enabled pendant and scan the tag with NFC of tablet and write the data entered into app to the tag. Mother will carry her tag with herself and bring it on her next ANC visit , so mother is carrying her digitalized data with herself.

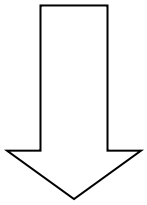
If returning mother comes to the camp , we will read her tag and proceed with the second ANC and write that data to tag. If mother forgets her pendant at home , we will search for her by clicking search patient icon and update the new details.



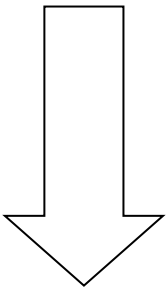
Again we will reach on the home screen and will fill the data for new child.

For a new child , we will select register new child icon and proceed further and similarly as above save the data to the tag. If the mother was already registered in the system, ANM can directly read the tag of mother and proceed with entering other details for the child

On this screen we have to enter personal details for the child. We can write personal details of the child by own or if the mother of this child is already registered with the Khushi Baby system so we can scan the mother tag and the child data is linked with mother data. Some basic information like mother name, father name, phone number, pcts id, etc will be automatically filled by scanning the tag. Here we have to take boimetric of mother so data can be validated.



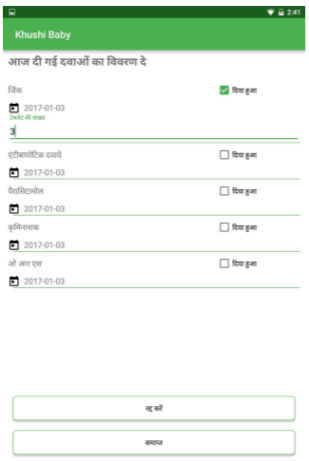
On this screen please enter previous vaccine details that which vaccine is administered on which date.



On this screen if there is any Adverse Event happened from last vaccine then please mention the date of AEFI

On this screen we have to give details of today's vaccine. If vaccine is administered then date will automatically come. And if vaccine denied then ANM has to enter a denial reason that this vaccine is denied due to this specific reason.

On this screen we have to enter about the details of diseases like diarrhea, etc and give required medication according to diseases.



Here on the top there is summary according to the details filled by ANM and suggestions according to the details of child.

ANM has to write data on the tag as we have write data in the mother module.

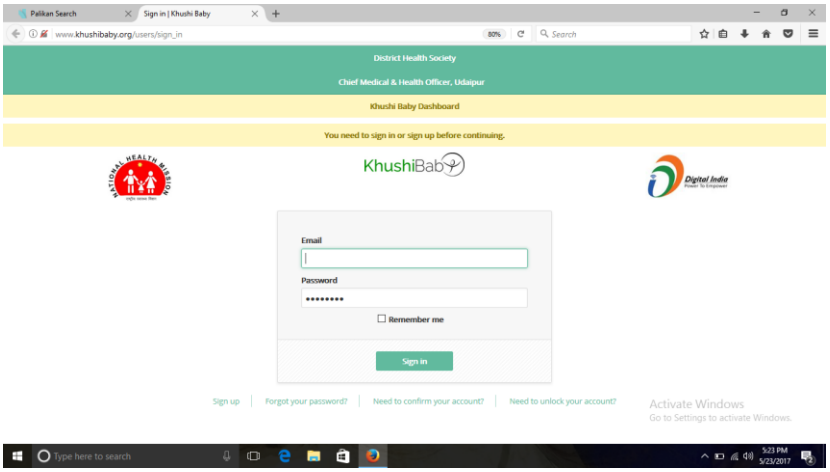
Again we will reach on the home screen and we can edit details in returning child module.

For returning child, ANM will read the tag and update the next immunisation details to the tag. If mother forgets the pendant at home or the system could not read the tag, ANM will search for the child by clicking on patient search icon and details of previous immunisation will come on the screen

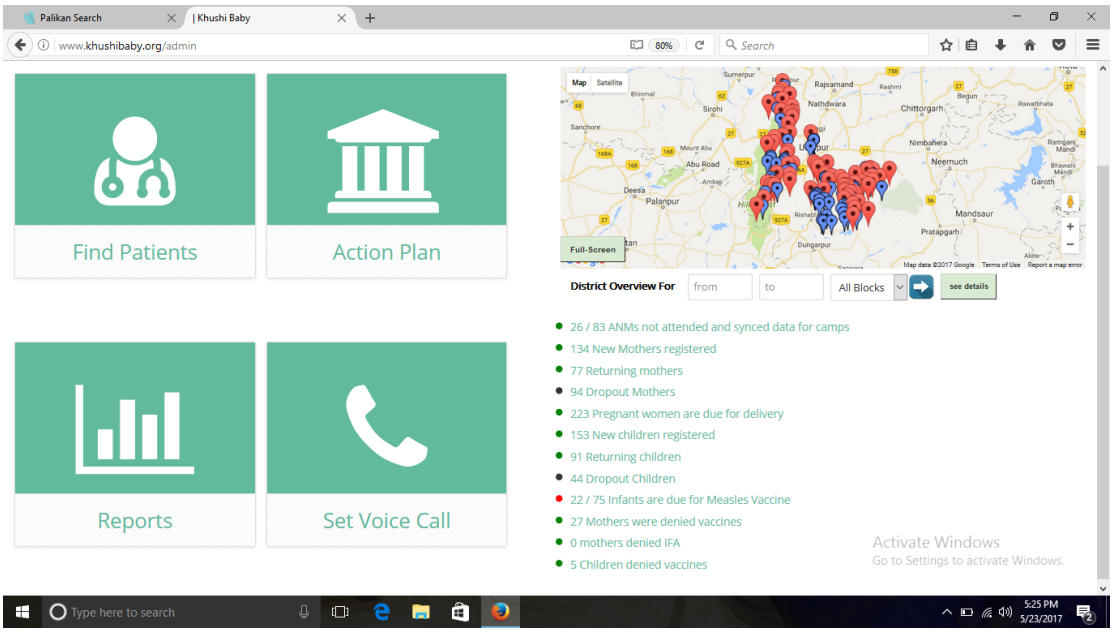
4.3 Syncing the DATA to cloud dependent dashboard

For syncing the data ANM has to connect to the internet. ANM has to go to pre-home screen and click the sync data icon. The patient record data is synced to the cloud and displayed on analytical dashboard. So Kb app provides with real time access to mother and child details on dashboard. The backend data synced to the dashboard can be used to better schedule the camp, manage resources, to confirm whether the camp took place or not, What are the reasons for not providing mother and child with vaccines , to track high risk patients for better intervention and improved engagement with the community by using dialect specific voice call reminder system.

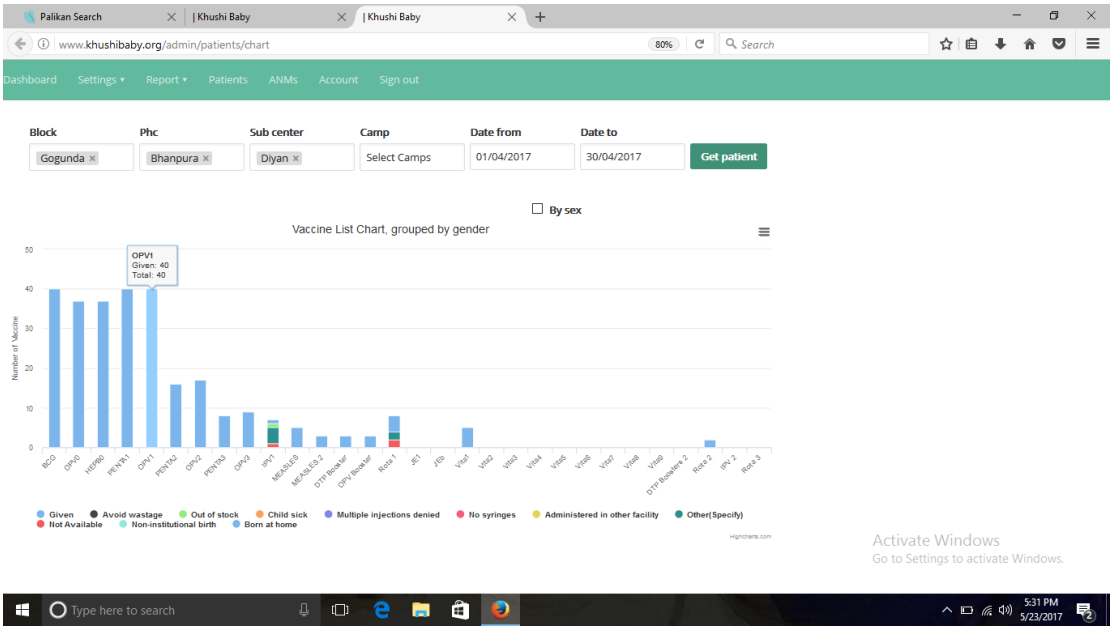
4.4 KHUSHIBABY DASHBOARD



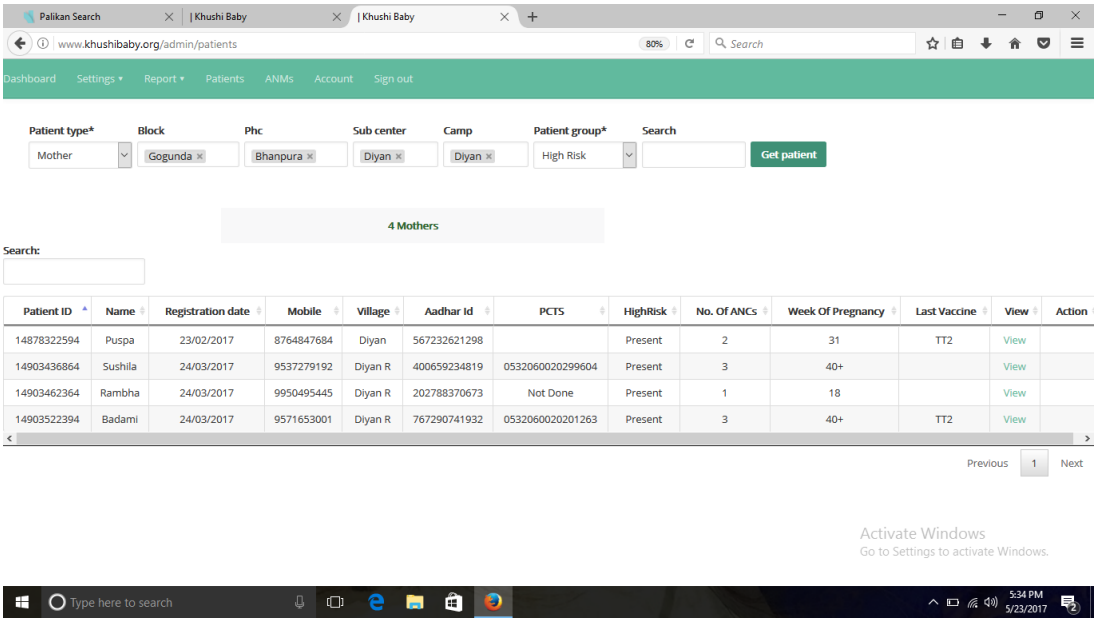
This is the home page of khushibaby dashboard. Health administrators can login into the dashboard and have access to field details at anytime. Data synced from field is updated and presented on dashboard. The data can be used for improved and quick decision making. Data is synced from the field by the ANM , so the chances of data manipulation and discrepancies is reduced. Moreover anybody having credentials of kb dashboard cannot manipulate data because for manipulating data one should have Biometric of mother with same pendant location and day which is impossible.

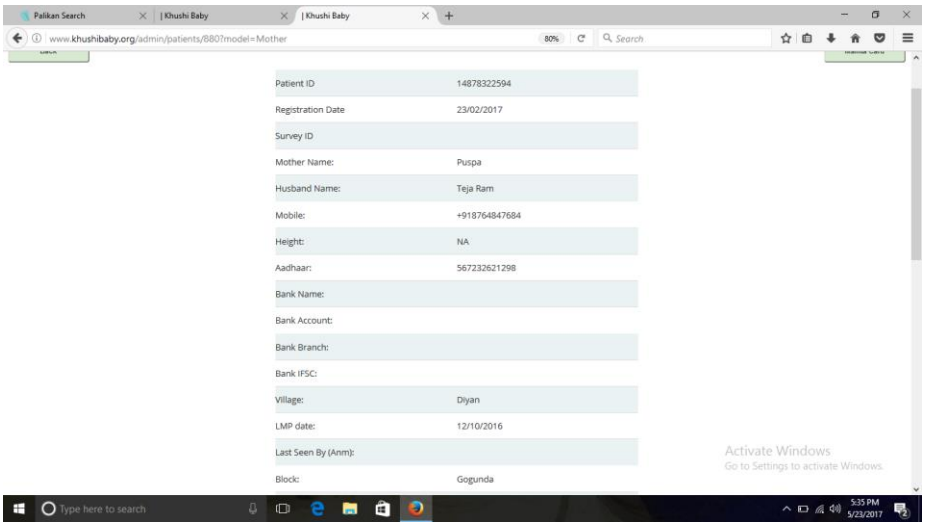


This is kb dashboard. On right side, District overview of Udaipur district can be seen. Tags with red codes are the sub centers and tags with blue codes are camp sites from where ANM have checked in into app.
Just below that we can apply the date filters and get summary for the whole district and information about ANMs who have attended and synced data to camps, new mothers and children registered, dropout mothers and children, due for delivery mothers, children due for measles vaccine Mothers who were denied IFA tablets, mothers who denied vaccines and children who denied vaccines. If someone is having credentials for Kb dashboard, he can monitor important field situation and take necessary actions just by checking the district overview.

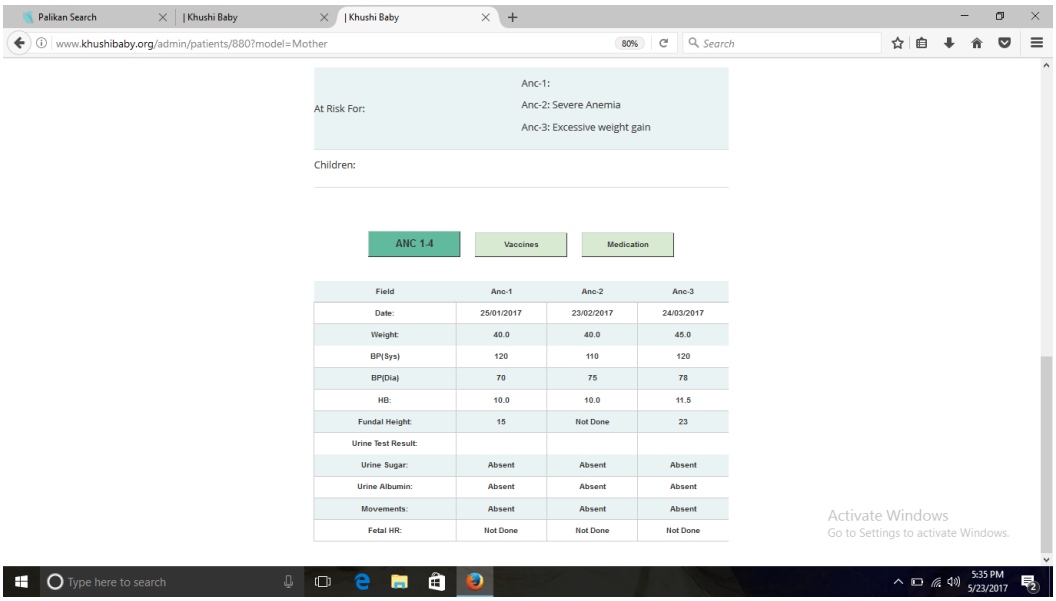


By clicking the patient's icon, we can find patients by applying filters for block, PHC and SC and date filters. Vaccine list chart can be accessed on this page grouped by gender. A general overview of children who received a particular vaccine, and number of children's who denied vaccine, vaccine and medication which is out of stock etc.

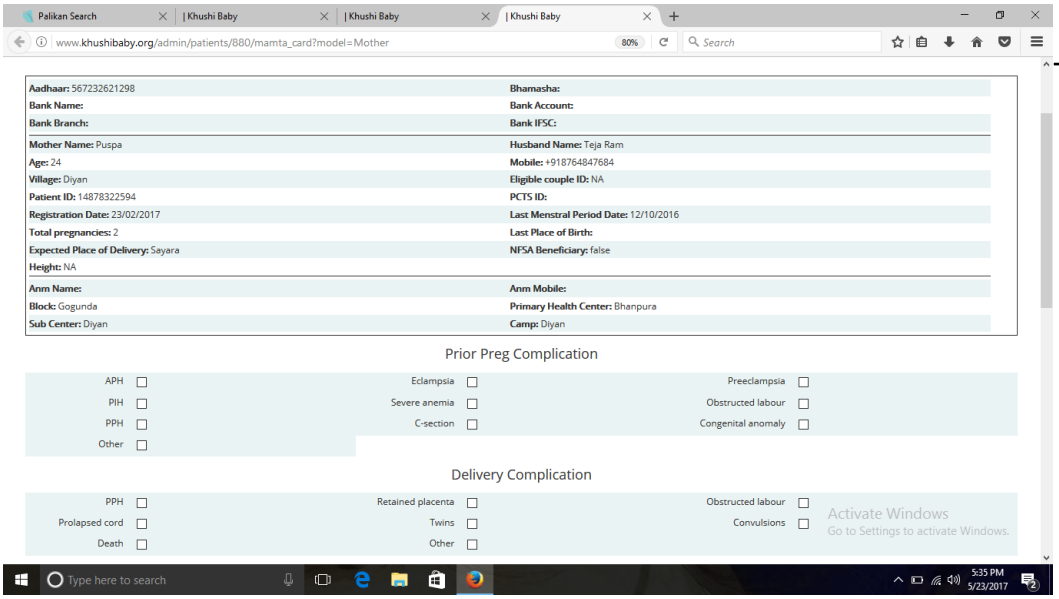




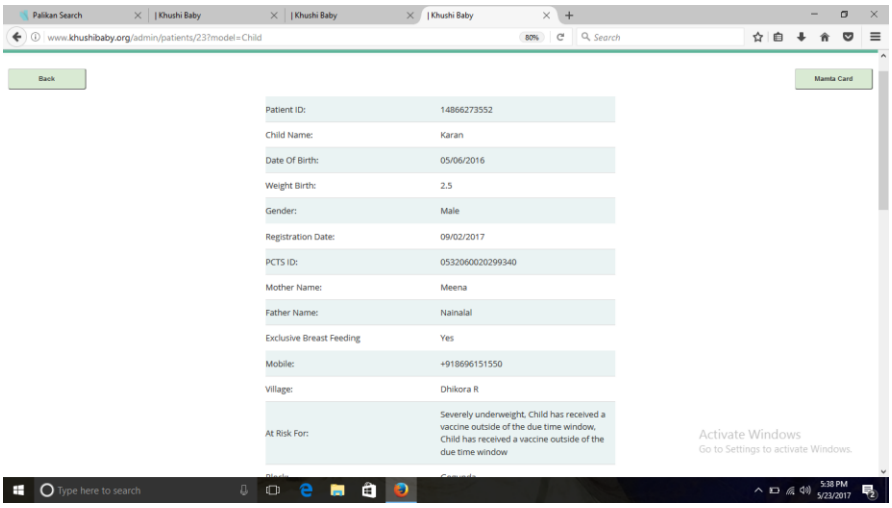
This is how mother's information filled in app, is presented on dashboard.



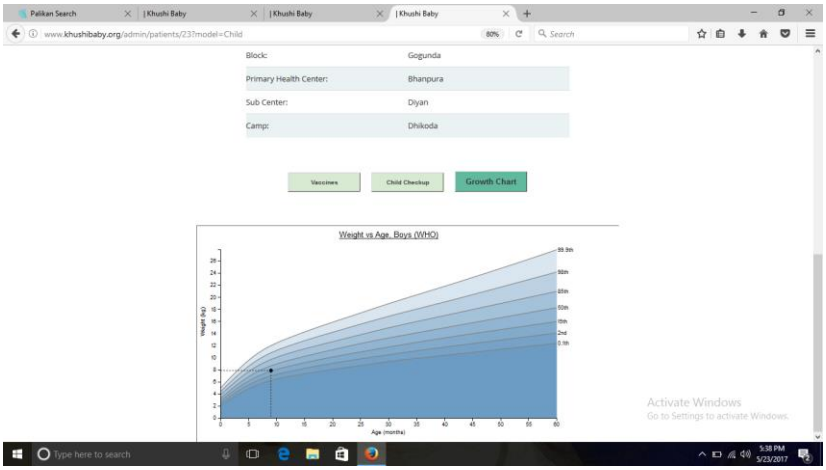
Mother's ANC details, vaccination (weather TT administered or denied) and medications (Number of IFA tablets given or reasons for denial) can be seen .



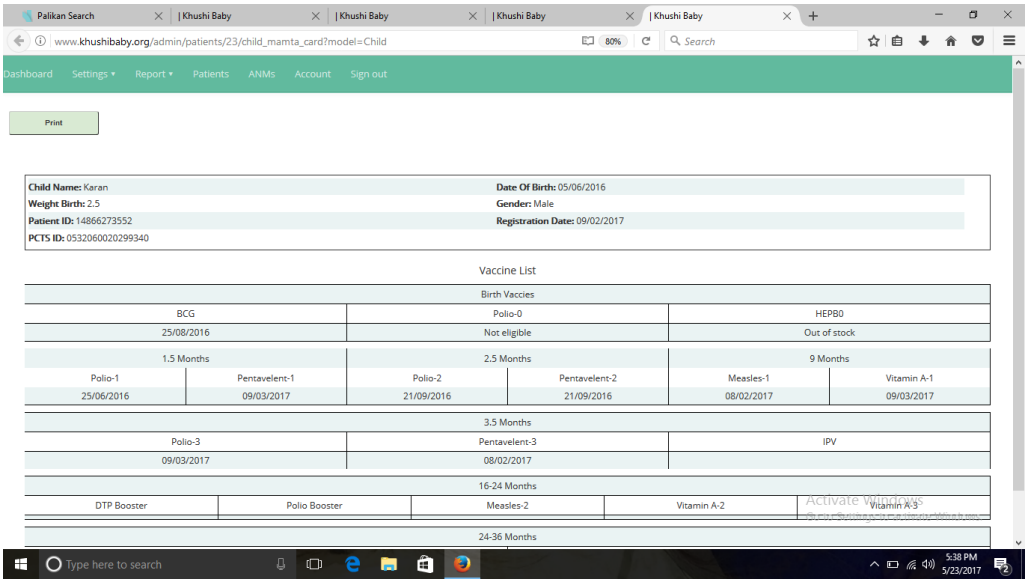
Mamta card can be printed and given to mother.



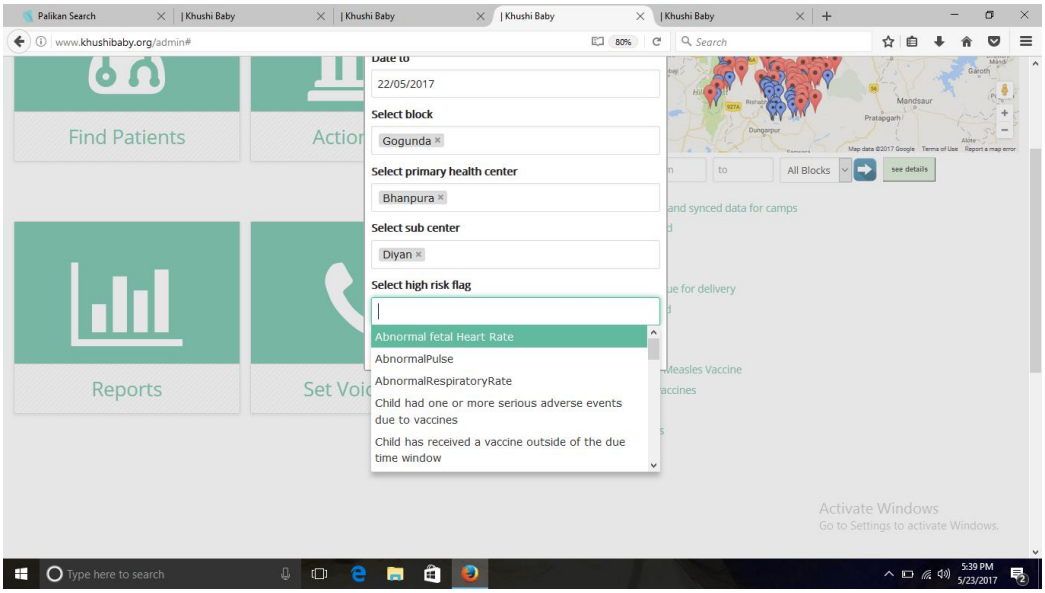
All the details filled by ANM for child is presented in following format on dashboard. Mamta card can be downloaded for child and given to mother. Summary is made based on ANM findings and at risk for, summary is made.



Growth chart is made based on ANMs findings and data entered into app for child, which can be accessed to monitor child's growth .



Mamta card can be printed and given to child's mother.
It contains all the details about child's vaccination and medication.



Reports can be downloaded for mother, Child or ANM attendance. To download mother or child reports, filters for specific block, PHC name is applied and additionally date filters are applied for further segregation. Reports for high risk patients can also be downloaded by selecting the particular high-risk group from the drop-down list and further actions can be taken based on those reports and their findings.

4.4 DISCUSSION

Each year 1.5 million children die from vaccine preventable diseases. Avoidable maternal mortaliy is also unacceptably high. By improving the process efficiency of following up patients and by increasing the programe efficacy of eliciting good health behavior, we can expose areas in need all the way to the last child while creating system that can draw at risk families to the essential care they need.

Data access to ANMs was limited to only the RCH registers that they maintain. Administrative reports generated manually by the ANMs were found to have many duplicate data fields.The flow of data was one way and little to no feedback from administration on the data collected was provided leading the ANMs unaware of data quality. Non-availability of

equipments at the facility due to poor resource management lead to incomplete services at the site.

KB system is a record breaking digitalizing RCH data platform. It provides enough data to administration that helps them to maximize the success of immunisation programmes.

KB dashoard provide decentralized access to health workers to both read and update child and maternal health data. The patient record data is synced to the cloud and displayed on analytical dashboard, which can be looked after by health officials for quick and better decision making. Health officials can better schedule, manage resources, forecast demand and engage with communities using dialect specific voice call reminder system using KhushiBaby Dashboard.

Khushibaby system which now is working on maternal and child tracking, can further be linked to beneficiaries aadhar or with the PCTS Id for improved supply of incentives and other benefits to the beneficiaries which can reduce a long bounded supply chain and reduce and deduce the chances of error and faults in the management. Money can be directly transferred to beneficiary's bank account which can be traced directly by the health administrators using khushibaby dashboard.

CHAPTER 5

Supplementary

ANNEXURE I

A table showing the mobile app feature with corresponding data elements and data type.

Feature/Step	Data element/Variables	Data Type
ANM Login	ANM name	Textual input
	Password	Textual Input
Camp selection	Select camp location	Multiple choice
Due list	Check Due list	
Check list	Check list	
ANM Check-in	Check- In picture	Image GPS stamp Time
Registration date	Date of Registration for Mother or Date of Birth for Child	Date
Personal Details	Name	
	Caste	MC - 4 options
	Husband Name	Textual input
	AADHAR Number	Numerical Input
	MCTS ID Number Mother	Numerical Input
	MCTS ID Number Child	Numerical Input
	Village	Multiple Choice
	Mobile Number	Numerical Input
	JSY Beneficiary	Multiple Choice
Past History	LMP	Date input
	Number of Children	Numerical Input
	Diabetes	
	Hypertension	Multiple Choice
	Heart Disesae	Multiple Choice
	Epileptic (Convulsions)	Multiple Choice
	STI / RTI	Multiple Choice
	HIV+	Multiple Choice
	HepB	Multiple Choice

	Asthma	Multiple Choice
	APH	Multiple Choice
	Pregnancy Induced Hypertension (PIH)	Multiple Choice
	Repeated Abortion	Multiple Choice
	Stillbirth	Multiple Choice
	Congenital Anomaly	Multiple Choice
	C-Section	Multiple Choice
	Blood Transfusion	Multiple Choice
	Twins	Multiple Choice
	Obstructed Labour	Multiple Choice
	PPH	Multiple Choice
	Hemophilia	Multiple Choice
ANC Test	First ANC Date	Date input
	Days from ANC 1 to 2	Numerical Input
	Days from ANC 2 to 3	Numerical Input
	Days from ANC 3 to 4	Numerical Input
	WT 1	Numerical Input
	WT 2	Numerical Input
	WT 3	Numerical Input
	WT 4	Numerical Input
	BP 1S	Numerical Input
	BP 1D	Numerical Input
	BP 2S	Numerical Input
	BP 2D	Numerical Input
	BP 3S	Numerical Input
	BP 3D	Numerical Input
	BP 4S	Numerical Input
	BP 4D	Numerical Input
	Position 1	Binary Input
	Position 2	Binary Input
	Position 3	Binary Input
	Position 4	Binary Input
	Movement 1	Multiple Choice
	Movement 2	Multiple Choice
	Movement 3	Multiple Choice

	Movement 4	Multiple Choice
	Fetal Heart Rate 1	Numerical Input
	Fetal Heart Rate 2	Numerical Input
	Fetal Heart Rate 3	Numerical Input
	Fetal Heart Rate 4	Numerical Input
	UT 1A	Multiple Choice
	UT 1S	Multiple Choice
	UT 2A	Multiple Choice
	UT 2S	Multiple Choice
	UT 3A	Multiple Choice
	UT 3S	Multiple Choice
	UT 4A	Multiple Choice
	UT 4S	Multiple Choice
	HB 1	Numerical Input
	HB 1	Numerical Input
	HB 3	Numerical Input
	HB 4	Numerical Input
	TT1 Date	Vaccine – Date
	Given/Denial Reason Code	Vaccine - Given/Denial
	TT2 Date	Vaccine – Date
	Given/Denial Reason Code	Vaccine - Given/Denial
	IFA Date	Medication – Date
	Given Dose / Denial Code	Medication - Given/Denial
	IFA Date	Medication – Date
	Given Dose / Denial Code	Medication - Given/Denial
PNC	PNC 1 Date	Date input
	Days to PNC 2	Numerical input
	Days to PNC 3	Numerical input
Complications		
	PPH	Yes (with Date)/No
	Fever	Yes (with Date)/No
	Sepsis	Yes (with Date)/No
	Severe Ab Pain	Yes (with Date)/No
	Severe Headache	Yes (with Date)/No

	Difficulty Breathing	Yes (with Date)/No
	Chills	Yes (with Date)/No
	Eclampsia	Yes (with Date)/No
	Fever/Chills	Yes (with Date)/No
	Convulsions	Yes (with Date)/No
	Obs Labour	Yes (with Date)/No
	Prolonged Labour	Yes (with Date)/No
	Abortion	Yes (with Date)/No
	Twins	Yes (with Date)/No
High Risk	High BP (Sys >140 and/or Dias >90)	Yes (with Date)/No
	Convulsions	Yes (with Date)/No
	Vaginal Bleeding	Yes (with Date)/No
	Foul Smelling Discharge	Yes (with Date)/No
	Severe Anemia (Hb Level < 7 GMS%)	Yes (with Date)/No
	Diabetes	Yes (with Date)/No
New Child registration		
	Child Birth Order	
	MCTS ID of Child	Auto-generated
	Date of Registration	Date type
	Name of Child	Textual input
	Sex of Child	Multiple Choice
	Mother	Textual input
	Father	Textual input
	Mobile Number	Numerical input
	MCTS ID of Mother	Auto-completed on Scan
	Address	Textual input
	Weight at birth (kg)	Numerical input
	Place of Birth	Multiple Choice
	Religion	Multiple Choice
	Caste	Auto-complete from Mother
	Exclusive breastfeeding given up to 6 months (Yes/No)	Yes/No/Dont_Know
	Complementary Feeding initiated after 6 months (Yes/No)	Yes/No/Dont_Know

	If answer to 109A is no, which month complementary feeding was initiated?	Numerical Input
	Date of visit	Date
	Weight of the Child (Kg)	Numerical Input
	Diarrhea in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, ORS given (Yes/No)	Yes/No/Dont_Know
	Pneumonia (fever and fast breathing/chest-in drawing) in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, Antibiotics Given (Yes/No/Dont_Know)	Yes/No/Dont_Know
	Date of visit	Date
	Weight of the Child (Kg)	Numerical Input
	Diarrhea in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, ORS given (Yes/No)	Yes/No/Dont_Know
	Pneumonia (fever and fast breathing/chest-in drawing) in last 15 days (Yes/No)	Yes/No/Dont_Know
	If Yes, Antibiotics Given (Yes/No/Dont_Know)	Yes/No/Dont_Know
	OPV Birth	Vaccine - Date - Given/Denied
	Denail Reason	
	HepB Birth	Vaccine - Date - Given/Denied
	BCG	Vaccine - Date - Given/Denied
	OPV 1	Vaccine - Date - Given/Denied
	Penta 1	Vaccine - Date - Given/Denied
	OPV 2	Vaccine - Date - Given/Denied
	Penta 2	Vaccine - Date - Given/Denied

	OPV 3	Vaccine - Date - Given/Denied
	Penta 3	Vaccine - Date - Given/Denied
	Measles	Vaccine - Date - Given/Denied
	DTP Booster	Vaccine - Date - Given/Denied
	JE 1	Vaccine - Date - Given/Denied
	JE 2	Vaccine - Date - Given/Denied
	VitA 1	Vaccine - Date - Given/Denied
	VitA 2	Vaccine - Date - Given/Denied

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