

Role of Khushi Baby mHealth System on Maternal and Child Health in Udaipur District

By

Tutumoni Baruah

*Dissertation submitted in partial fulfillment of the requirements of the degree
MBA Hospital and Health Management*

Academic year, 2018-2020



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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled 'Role of Khushi Baby mHealth system on Maternal and Child Health in Udaipur district: A Study' and submitted by Tutumoni Baruah, Enrollment No. 0854 under the supervision of Dr. Nutan Prabha Jain for award of MBA in Hospital and Health Management of the University carried out during the period from February to May 2020 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.



Signature

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MBA Health and Hospital Management (2018-20)

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List of Abbreviations

ANC- Antenatal Care

ANM- Auxiliary Nurse Midwives

ASHA- Accredited Social Health Activist

HH- Household

HMIS- Health Management Information System

IFA- Iron Folic Acid

JSY- Janani Suraksha Yojana

KB- Khushi Baby

MCH- Maternal and Child health

MCHN- Maternal and Child Health & Nutrition

MCTS- Maternal and Child Tracking System

mHealth- Mobile Health

NHM- National Health Mission

NFC- Near Field Communication

NFHS- National Family Health Survey

PMSMA- Pradhan Mantri Surakshit Matritwa Yojana

RCH- Reproductive Child Health

TT- Tetanus Toxoid

VPD- Vaccine Preventable Disease

Introduction

Improving Maternal and Child Health is one of the key components of the National Health Goals under the National Health Mission. Maternal and Child health is an important aspect for the development of any country in terms of increasing equity and reducing poverty, which lead to solve the economic, social and developmental challenges. Although the ratio of maternal death has declined from 167 (2011-13) to 130 (2014-16) to 122 (2015-17), indicating 6.15 percent reduction since last survey figures, still India is too far to achieve the latest UN target for the Sustainable Development Goal (SDGs) for MMR at 70 per 1,00,000 live births by 2030.

Table 1.1: Maternal and Child Mortality (India, Rajasthan, Udaipur)

Indicators	India	Rajasthan	Udaipur
Maternal Mortality Ratio	130	199	210
Infant Mortality Rate	41	41	45

Source: NFHS-4, SRS Bulletin (2019)

In India 5 lakh children die every year due to Vaccine Preventable Diseases.¹ After the initiation of various schemes for the improvement of maternal health indicators, the number of maternal deaths has dropped from 103,000 in 2000 to 35000 in 2017, a 55 percent decrease.² Still there is a huge gap in the coverage of life-saving health interventions and practices due to lack of knowledge, inappropriate policies and unavailability in resources.³ A number of cost effective interventions of public health such as immunization to prevent VPD's, Continuum of care, Antenatal care, PMSMA, JSY etc. to prevent maternal deaths or complications.

Table 1.2: Preventive Health Services (India, Rajasthan, Udaipur)

Indicators	India	Rajasthan	Udaipur
Institutional Delivery (%)	79	84	74
Immunization Rate (%)	62	55	44

¹ <http://www.businessworld.in/article/-5-Lakh-Children-Die-Every-Year-In-India-Due-To-Vaccine-Preventable-Diseases-/01-05-2018-147945/>

² <https://www.unicef.org/india/what-we-do/maternal-health>

³ <https://www.unicef.org/india/what-we-do/maternal-health>

Received 4 or more ANC (%)	51	39	46
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Source: NFHS-4

Besides the maternal complications i.e., the direct causes of maternal and neonatal death, in India, the indirect causes which can lead to maternal and neonatal deaths are of three types named as ‘three delays’⁴:

1. Delay in recognizing danger signs during pregnancy
2. Delay in reaching appropriate facility
3. Delay in receiving quality of care

The 1st and 2nd delay can be due to the reasons of poor socio-economic status of women and families, lack of community awareness and unavailability of good referral linkages. The 3rd delay can be due to poor public health care delivery system.

The gaps are not in the process of service delivery, but also in the process of data collection. Incomplete and inappropriate HMIS data can’t represent the actual health status of a geographic area. This is due to the following reasons:

1. ANM performs incomplete documentation in RCH registers
2. Detail medical history not being collected
3. They enter false test results or sometimes randomly enter the results without performing tests
4. Incomplete documentation in MAMTA card

The government of India introduced village level health workers (ASHA), in 2005 along with NRHM, to perform some community- based MCHN services like home visits and community mobilization for promotion to seek ANC services, Institutional delivery, IFA supplementation for the pregnant women, home visits for postnatal care and new born care, identification of common childhood illness like fever, diarrhea, pneumonia and their management. In hard-to-reach areas, it is difficult for ASHA for provide their services adequately, thus the coverage rate of MCH services in those places is suboptimal.

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

⁴ Maternal newborn health toolkit

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. In response to the challenges of paper-based tracking at the field level, several solutions have been developed to digitally collect MCH data in rural healthcare settings, such as eJanSwasthya, Rajsangam, Medic Mobile, Commcare, mSehat, ANMOL, Khushi Baby share several features:

- mobile application for health workers to use to digitally collect structured health data in offline settings
- validations to assist health workers to take actions
- mechanism to sync data to a cloud-based database
- reporting mechanism such as a dashboard for district health officials to see progress against key indicators
- in some cases, use of SMS reminders for patients tracked with the system

One of such system namely Khushi baby is focused in the study.

About the Organization: Khushi Baby, Udaipur

Khushi Baby is a non-profit organization established in 2014 with the mission to motivate and monitor the health care of mothers and children at the last mile. Khushi Baby has delivered a service for tracking maternal and child health by a comprehensive platform which consists of the following key elements:

1. Near Field Communication (NFC) based health card for beneficiaries
2. Mobile application for frontline health workers
3. Analytics dashboard for health officials
4. Targeted automated voice call reminders in the local dialect for beneficiaries



Figure 1: Khushi Baby Intervention Schematic (Source: 3ie Impact Evaluation Report)

The NFC-based health card allows the beneficiary to carry their health record with themselves, i.e., it stores the unique IDs and the full medical history of the mother and child. Once the health provider scans the card and takes live biometric of the beneficiary, the health data retrieved from the card is displayed to the ANM in the tablet screen.

The Khushi Baby App is an android application used by frontline health workers (ANMs) which supports in clinical decision making during the point of care and planning for preventive health care camps. Using the NHM guidelines for RCH register sections ii and iii, all the data collection fields were made.

The Khushi Baby Dashboard presents the real-time updated summary of the data uploaded by the ANM for the health officials. The reports include the government identified major health indicators, attendance of health workers, availability of drugs, consumables and equipment and high-risk beneficiaries.

Khushi Baby Automated Voice Calls are set for specific beneficiary group for camp reminders and for maternal and child health education.

Review of Literature

2.1 Government efforts to improve maternal and child health in Rajasthan

Rajasthan has a significant improvement on its maternal and child health indicators in the last 10 years. For instance, the infant mortality rate has reduced from 65 (2005-06) to 41 (2015-16) deaths per 1000 live births (NFHS-3, NFHS-4). Similarly, maternal mortality ratio has reduced from 318 per 100,000 live births in 2008, to 199 in 2019 (SRS bulletin).

Table 2.1: Different MCH schemes running in Rajasthan⁵

SCHEME	PURPOSE
1. JANANI SURAKSHA YOJANA	To promote institutional deliveries by providing cash incentive to the beneficiary on delivery in health facilities.
2. KUSHAL MANGAL KARYAKRAM	To provide special care to high risk pregnancies
3. PRADHANMANTRI SURAKSHIT MATRITVA ABHIYAN (PMSMA)	To provide comprehensive ANC services to all pregnant women on 9 th of every month
4. YASHODA	To provide special care and support to mother and newborn
5. PREGNANCY, CHILD TRACKING AND HEALTH SERVICE MANAGEMENT SYSTEM	Online tracking of ANC, PNC and immunization, Promoting institutional deliveries, Identification of eligible couple, Identification of dropouts, Monitoring of health services
6. JANANI EXPRESS	To promote Janani Suraksha Yojana
7. SWASTHYA SANDESH SEWA	Information given from ANM through SMS on her mobile about the due services to the beneficiaries
8. MISSION INDRADHANUSH	To ensure full immunization among the children up to two years of age and pregnant women

There are several cost-effective solutions to control this unnecessary maternal and child

⁵ <http://www.sihfwrajasthan.com/ppts/full/MH.pdf>

deaths such as:

- Periodic antenatal check-ups
- Birth preparedness
- Institutional delivery
- Early detection of risk
- Appropriate and timely management of obstetric complications and postnatal care
- Immunization

But according to NFHS-4, only 38.5 percent mothers had four ANC visits, 9.7 percent mother had full antenatal care and 84 percent women delivered at health facilities. Similarly, 54.8 percent children of 12-23 months of age were fully immunized. Although there is a significant improvement in NFHS-4 results as compared to NFHS-3, still Rajasthan belongs to a group designated as High Focus States under the NRHM.

2.2 Reasons for poor health indicators

- **Incompleteness of MCTS data**

Low completeness of data is one of the root causes of the poor performance, which indicates that data collected by field staffs (ANM, ASHA) was often transferred incompletely to the MCTS portal. It was seen that, in Rajasthan, although there was higher rate of MCTS beneficiary registration, but the data entered into the MCTS portal was 78% complete.⁶ The possible reasons can be lack of training for health staff and lack of proper monitoring and supervision. As a result, the Front-Line Health Workers were overburdened with data documentation and there were long delays in data capturing.

- **Increased workload**

ANM in a sub-center is responsible to provide maternal and child health along with family planning services which she can do off-camp (in the SC) and on-camp (VHND day), educate the community about health and nutrition, encourage the community to maintain proper sanitation and hygiene, organize immunization camps to reduce the burden of communicable diseases, provide treatment of minor

⁶ An in-depth assessment of India's Mother and Child Tracking System (MCTS) in Rajasthan and Uttar Pradesh
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4530478/>

injury/ailment etc.

Besides these activities she also has to maintain the RCH registers with 130 columns, to fill the MAMTA card of each pregnant woman, to prepare the due list of pregnant women and finally, by the end of the month, the ANM is expected to show the details of each beneficiary to the Data Entry Operator (DEO).

During this process, the ANM often feels that recording of data took more time than delivering a service, which increases more when a pregnant woman forgets to bring her MAMTA card to the VHND day. This in turns causes difficulty to identify high risk pregnant women due to unavailability of previous records.⁷

- **Lack of awareness among community**

Utilization of ANC care is highest among those women with level of education 9th class and above. Lack of family motivation is another factor for availing ANC. Low utilization of ANC is also more in those community with low level of awareness.⁸

2.3 Technology can improve the coverage of maternal and child health services

Delivery of community based maternal and child health services are low in rural areas due to inappropriate coverage rate. Use of digital health system by ASHAs and PHC staffs can improve the coverage and quality of MCH services in rural area special in hard-to-reach areas⁹.

⁷ A study on developing an m-health solution as an alternate recording and reporting system for Auxiliary Nurse Midwives in Udaipur District, Rajasthan.
https://www.khushibaby.org/images/featuredIn/Doma_dissertaion.pdf

⁸ Factors associated with utilization of antenatal care services among tribal women: A study of selected States (2016)

⁹ mHealth intervention “ImTeCHO” to improve delivery of maternal, neonatal, and child care services- A cluster-randomized trial in tribal areas of Gujarat, India

METHODOLOGY

3.1 Background of the Study

A unblinded, cluster Randomized Controlled Trial with two groups- an Intervention and Control, took place from September 2016 to August 2018 in five blocks namely, Gogunda, Jhadol, Lasadiya, Salumber and Sarada of Udaipur District, Rajasthan. In the Intervention group (81 SCs), 81 ANM were used KB App, 5 Block Medical Officers, 5 Block Program Managers, 38 LHVs and DEOs were used KB Dashboard and 10,000 beneficiaries in the Intervention group were received KB Pendants. In the Control group (81 SCs), the traditional methods were followed. In the intervention group, the actual implementation of KB system uptake from February 2017 to June 2018. Out of 3300 targeted sample (both treatment and control), 2480 were remained for follow-up through end line. For each 162 SCs, ANMs were responsible to linelist the pregnant women. Mother who had already delivered were excluded from the study. Data collection was done by KB field surveyor team on the Survey CTO mobile application.

The 2-year, 3300-mother randomized controlled trial supported by the International Initiative for Impact Evaluation (3ie Study), showed that Khushi Baby system improved full infant immunization by 12 percentage points and decreased infant malnutrition by 4 percentage points.

In January 2020, the Khushi Baby started a follow-up survey of previously done randomized controlled trial (2016-18) selecting 2464 mothers with the criteria of women who delivered from September 2018 to December 2019 supported by Grand Canada Challenges (GCC). A total 1055 household visits have been completed as of March 2020. This study is a midline assessment of Khushi Baby mHealth system functioning.

3.2 Research question

Is there any difference in terms of access to maternal and child health services in intervention and non-intervention areas in Udaipur?

3.3 Objectives

- To review Rajasthan's MCH system
- To review the role of Khushi Baby m-Health system in MCH services
- To study the full ANC coverage, institutional delivery and health awareness index (maternal and child immunization) between intervention and non-intervention areas

3.3 Study Type

The study is descriptive in nature based on the secondary data made available by the Khushi Baby m-Health system.

3.4 Study Area

The study was conducted in five blocks namely, Gogunda, Jhadol, Lasadiya, Salumber and Sarada of Udaipur District, Rajasthan as the previous 3ie study was conducted in these five blocks only comprising of intervention (treatment) and non-intervention (control) areas.

3.5 Study Respondents

This study includes those women who participated in Khushi Baby 3ie study in 2016 and delivered any baby between Sept 2018 to Dec 2019.

3.6 Sample Size

The data was 1055 households (534 in control group and 521 in treatment group) of the five blocks and each block comprises of the participants from both control and treatment group.

3.6 Data Collection

A total of 1055 households were visited from January 2020 to March 2020 by the KB field surveyors. They used a pre-tested interview schedule for performing interviews to the participants through the Survey and the data was collected using SurveyCTO android mobile application. The KB core team evaluated data on daily basis to minimize the duplicates and missing parts.

Table 3.1 Number of Households covered by blocks in control and treatment area

Study group	Total sample
Control	534
Treatment	521
Total	1055

Table 3.1 shows that the surveyors visited 1055 households in the five blocks in both control and treatment areas, but they were able to perform the interview process only 300 women (153 women in control group and 147 in treatment group) due to the following

reasons:

1. Some households were closed.
2. As most of the villages of Udaipur are in hilly-remote area, the surveyors faced difficulty in finding the addresses and some addresses were recorded wrongly in the previous study (2016).
3. Returning to the households after 2 years which comes with another field-level challenge of obtaining a meaningful sample after loss-to-follow-up takes place due to migration.
4. Another reason is women were not available during the visits of the surveyors.
5. To fulfill other criteria of delivering any baby between Sept 2018 to Dec 2019, the 771 women were asked the question related to child delivery status, which concluded that only 300 women delivered baby within this period of time.

Table 3.2 Block wise record count in control and treatment areas

Survey Blocks	HH visited (Control)	HH visited (Treatment)	Mother's availability (Control)	Mother's availability (Treatment)	Child delivery status (Control)	Child delivery status (Treatment)
Salumber	138	154	104	116	38	36
Sarada	180	49	138	23	52	8
Jhadol	111	112	89	94	40	52
Gogunda	87	123	63	75	17	28
Lasadiya	18	83	12	57	6	23
Total	534	521	406	365	153	147

3.7 Data Analysis

The data was downloaded from SurveyCTO application into Microsoft EXCEL and analyzed using Google Data Studio.

Calculating Health Awareness Index (Maternal and Child Immunization)

The Maternal Health Awareness Index is comprised of awareness of MCHN day (for ANC)

being held in village, number of suggested ANC visits, rationale for attending ANC visits, presence of an ANC informant and communication about ANC importance to others.

Similarly, the Child Immunization Awareness Index is comprised of awareness of MCHN day (for immunization) in village, knowledge of recommended immunizations for each vaccine preventable diseases in the first year of life, rationale for immunization of infant, presence of an immunization informant and communication about immunization importance to others.

Table 3.3 Maternal Health Awareness index

Question	Answer Options	Corresponding Value label in Survey	Weighting of Responses
Why do you go to the camp?	In order to ensure good health throughout their pregnancy and good health for their child	1	1
	The government says they have to go	2	0
	They see neighbors going	3	0
	To get materials for food	4	0
In your experience, how many antenatal care visits should you have, when you are pregnant?	3	3	0
	4	4	1
	5 or more	5	1
	1	1	0
	2	2	0
	other	777/888/999	If 0 then 0 If >5 then 1
Do you know if a camp exists?	Yes	1	1
	No	2	0
Does someone inform you about the need for this appointment?	Yes, ANM	1	2
	Yes, ASHA worker	2	2
	Yes, Other Health Worker	3	2

	Yes, Someone else	4	1
	No	5	0
Have you ever informed anyone outside your family about the need for ANC, and if so, who?	Yes, Relative	1	1
	Yes, Friends	2	1
	Yes, Neighbors	3	1
	No	4	0

Table 3.4 Child Immunization Awareness index

Question	Answer Options	Corresponding Value label in Survey	Weighting of Responses
Do you know if a camp exists?	Yes	1	1
	No	2	0
Why should children go to camp?	In order to ensure the child is healthy and protected from diseases	1	1
	The government says they have to go	2	0
	They see neighbors going	3	0
	To get materials for food	4	0
Who informs you about these session/immunization camp?	Yes, ANM	1	2
	Yes, ASHA worker	2	2
	Yes, Other Health Worker	3	2
	Yes, Some else	4	1
	No	5	0
What diseases can be prevented by vaccine that infants get during the first year of their life?	T.B.	1	1

	Diphtheria	2	1
	Whooping Cough	3	1
	Polio	4	1
	Tetanus	5	1
	Measles	6	1
	Jaundice	7	1
Have you ever informed anyone outside your family about session/immunization camps, and if so, who?	Yes, Relatives	1	1
	Yes, Friends	2	1
	Yes, Neighbors	3	1
	No	4	0

Steps for calculating Health Awareness Index

1. Each response is assigned a point discrete value.
2. The “Total index score” for each respondent on each index is a separate number, which is calculated by adding up the assigned points of the relevant questions.
3. Take the average of the total index score of each respondent.

RESULTS

The findings of the study are comprised of attendance of MCHN day for ANC, number of ANC visits, ever received IFA tablets, number of IFA tablets consumed, ever received TT injection, place of delivery and Health awareness index (maternal and child immunization). In each category results of both control and treatment groups are compared.

4.1 Attendance in MCHN Day for ANC

MCHN day is organized once in every month at AWC in which ANM, ASHA, AWW, male MPW (if available) take the responsibilities. Services like Registration of all Pregnant women, ANC, Tracking dropout pregnant women, Vaccination, Distribution of condoms and OCPs to all eligible couples, Counselling, Discussions about Importance of institutional delivery, Danger signs during pregnancy, PNC, JSY, Nutrition, Exclusive Breastfeeding, Prevention of malaria, TB, and other communicable diseases etc. are provided.

ANC provides all pregnancy-related health care which includes monitoring a pregnancy, identifying danger signs by taking proper medical history, vitals examination, providing treatment for the pre-existing complications, counselling, diet during pregnancy, natal and post-natal care etc.

This survey asked the women in both control and treatment group, who received ANC were asked about total number of ANC visits, IFA consumptions and whether received tetanus toxoid injections or not.

In the control group, out of 157 women, 97 percent attended MCHN day and in the treatment group, out of 150 women, 94 percent attended MCHN day for the utilization of ANC services.

4.2 Number of ANC visits

The number of ANC visits is important for the health of the mother and the baby. According to WHO recommendation, at least four ANCs are essential for all pregnant women in a specific time interval. A periodic ANC by skilled health provider at regular intervals throughout the pregnancy can reduce perinatal mortality rate.

Table 4.2: Percentage distribution of ANC visits (both in control and treatment group)

Number of ANC's	Control (n=153)	Treatment (n=141)
1	5	4
2	22	28
3	42	33
4 and more	31	35

Table 4.2 shows, highest number of ANC visits is three in both control and treatment, and while comparing between both groups, 42 percent women were undergone three ANC visits in control group and 33 percent women were undergone three ANC visits in treatment group. But a total four ANC visits, which is slightly more in treatment group (35 percent) than control group (31 percent).

4.3 Ever received IFA tablets during pregnancy

Iron supplementation during pregnancy is one of the main components of ANC. During pregnancy most of the women suffer nutritional deficiency most commonly iron deficiency anemia, as an additional nutrition is required for the foetal growth. It is a major threat to safe motherhood and to the health and survival of infants because it contributes to low birth weight, lowered resistance to infection, impaired cognitive development, and decreased work capacity. The provision of iron and folic acid (IFA) tablets to pregnant women to prevent nutritional anemia forms an integral part of the safe motherhood services offered as part of the Reproductive and Child Health Programme in India. The programme recommendation is that women consume 100 tablets of iron and folic acid during pregnancy.

Out of 153 women, 92 percent women in the control group, and out of 141 women, 94 percent in the treatment group received IFA tablets during their pregnancy.

4.4 Number of IFA tablets received

Sometimes due to low stock of IFA tablets with frontline workers, poor supply of IFA tablets from the centralized location, less number of home visits by ASHA etc., pregnant women are not able to get the complete course of IFA tablets during their pregnancy. This study asked the women about the number of IFA received during their pregnancy periods.

Table 4.4: Percentage distribution of women received prescribed IFA (100 number) tablets

Number of IFA received	Control (n=153)	Treatment (n=141)
0	8	6
< 100	66	67
>= 100	26	27

Table 4.4 shows, in the control group, 26 percent and in the treatment group, 27 percent women received IFA tablets during their pregnancy period.

4.5 IFA tablets consumed during pregnancy

Due to lack of awareness for nutritional anemia and benefits of IFA tablets during pregnancy, many women don't consume IFA tablets which leads to lower the hemoglobin level and finally increase the perinatal mortality rate.

Table 4.5: Percentage distribution of women consumed IFA tablets

Number of IFA tablets consumed	Control (n=138)	Treatment (n=128)
< 100	75	79
>= 100	25	21

Table 4.5 shows, out of 153 women 138 received IFA tablets in the control group and out of 141 women 128 women received IFA in the treatment group where, only 25 percent in the control group and 21 percent women in the treatment group consumed 100 or more IFA tablet during their pregnancy period.

4.6 Ever received Tetanus Toxoid vaccine

Tetanus Toxoid (TT) is recommended for all pregnant women by WHO to prevent the neonates from tetanus infection. TT 1st dose is recommended early in pregnancy and 2nd dose should be given 4 weeks after 1st dose. If the pregnant women have received 2 doses TT within last 3 years, then only one booster dose is given, which should be given before 36 weeks of pregnancy.

Out of 153 women who attended MCHN day, 99 percent (152 women) in the control group received TT vaccine and out of 141 women 96 percent (136 women) received TT vaccine in the treatment group.

Table 4.6 Percentage distribution of women received TT 1st dose/ Booster and TT 2nd dose

Received TT injection	Control (n=152)	Treatment (n=136)
TT 1/ Booster	46.71	50.74
TT 2	53.29	49.26

Table 4.6.2 shows, out of 153 women, only one woman didn't receive TT vaccines in the control group and out of 141 women, five women didn't receive TT vaccine.

Out of 152 women, 47 percent received only TT 1st dose or TT booster dose and 53 percent received both TT 1st and 2nd dose in the control group. In the treatment group, out of 136 women, 51 percent received TT 1st dose or TT booster dose and 49 percent women received both TT 1st and 2nd doses.

4.7 Place of Delivery

Another important thrust of the Maternal and Child Health Programme is to encourage deliveries in proper hygienic conditions under the supervision of trained health professionals. To promote institutional deliveries, Government of India launched Janani Suraksha Yojana by providing cash incentive to the beneficiary on delivery in health facilities. This is one of the major initiatives to reduce maternal mortality rate in India.

Table 4.7: Percentage distribution of the women by place of delivery

Place of Delivery	Control (n=153)	Treatment (n=147)
Hospital	82	84
Home	17	16
Transit	0.65	0

Table 4.7 shows, institutional delivery rate in the control group is 82.35 percent while in the treatment group is 83.67 percent.

4.8 Health Awareness Indices (Maternal Health and Child Immunization)

Both the Maternal Health Awareness and Child Immunization Awareness indices were developed to measure the level of “health awareness” in the study groups.

The normal range of the Maternal Awareness Index is 0-13, whereas for Child Immunization Index the normal value should be lied between 0-19. If the value lies within these particular ranges, then it can be said that the people are aware of importance of maternal health services and child immunization services.

Table 4.8 Health Awareness Index

Study Groups	Control	Treatment
Maternal Awareness Index	5.66	5.62
Child Immunization Awareness Index	5.90	6.26

Table 4.8 shows that the Maternal Awareness Index and Child Immunization Awareness Index for both control and treatment group is lying within the range of 0-13 and 0-19 respectively which indicates that people are aware of the importance of both maternal health services and child immunization services.

Discussion

The findings showed that interventions through the KB components like NFC based Health card for the beneficiaries, mobile application for ANM for recording data, automated voice calls for beneficiaries for reminding MCHN days are not influencing significantly on the outcomes of the maternal and child health services. There is not a huge difference in the results seen between control and treatment group.

In some indicators, the outcome is slightly more in the control as compared to the treatment. For example, the attendance record for the MCHN day for the utilization of ANC services is more in the control group that is 97 percent as compared to treatment group which is 94 percent. Consumption of 100 IFA tablets during pregnancy is less than 50 percent in both the groups, 25 percent in the control and 21 percent in the treatment. Lastly, women received TT vaccines is more in control group as compared to the treatment (99 percent and 96 percent respectively).

While in other indicators, the outcome is slightly better in the treatment group. For example, 35 percent women were undergone four ANC visits in the treatment group which is 31 percent in the treatment group. Women received IFA tablets during pregnancy period is more in treatment as compared to control (92 percent and 94 percent respectively). The institutional delivery rate is slightly more in the treatment (84 percent) area as compared to the control area (82 percent).

If we look into the awareness score between the two groups, the values of the awareness index are lying within the normal range which indicates in both the groups, the people are aware of the importance of maternal and child health and the level of awareness for maternal and child health is almost same in both the groups.

The reason for this outcome can be associated with small sample size, which is due to the following reasons:

1. Returning to the household after 2 years comes with field-level challenges of identifying the household and obtaining a meaningful sample after loss-to-follow-up takes place (due to migration or death).
2. Most of the villages are situated in the hilly area of Udaipur and are very remote, that's why the surveyors face problems in finding the households.
3. Due to lockdown announced on 21st March 2020, field activities have been completely halted.

Another reason can be due to low adaptability of using digital platform by end users. Some

end users are not expert enough to operate the application comfortably as they are habitual of the previous paperwork system, due to which they used to spend more time in their normal daily activities. Those who had prior experience of using android phone previously, they were complete the steps easily comparatively those with no such experience.

Conclusion

On reviewing Rajasthan's MCH systems, we found that the indicators for Maternal and Child Health have improved from NFHS-3(2006) to NFHS-4(2016) but there is still much work to be done. ANC checkups are crucial for a pregnant woman but only 38.5% women got their 4 ANC checkups indicating more than 65% dropouts. Only 54.8% full immunizations were done for children 12-23 months of age. Rajasthan still falls under the category of High Focus State.

While understanding the role of Khushi Baby in MCH, they are trying to improve the monitoring process of antenatal and neonatal care as according to UNICEF study, majority of newborn deaths in India is due to premature or preterm pregnancies. Tracking maternal and child health by four main elements which are NFC based health card for beneficiaries, Mobile application for frontline health workers, analytics dashboard for health officials and targeted automated voice call reminders for beneficiaries.

Finally, comparing the outcomes of the indicators between treatment group (using KB mHealth system) and control group (not using KB mHealth system), I found that there was no significant difference in the results seen, only 2-3 percentile improvement in the treatment group was observed.

It can be concluded that if there will be adequate supportive supervision by government as well as change in management system, KB mHealth system can improve the coverage of MCH services, specially in the remote areas.

Involving the other health domains in this current system can help in expanding this intervention in a progressive way. They need to understand the functions of new technology and relate them to the previous methods which can be done by regular and adequate training to the end users.

Another step to improve the delivery process is to take feedbacks from the ANM/end users, understanding their problems and making the technology user friendly.

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