

Research Article

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mHealth Technologies Leading to Better Maternal Health in Bihar, India

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ABSTRACT

In an underdeveloped state like Bihar, women face double jeopardy because of poor health status and lower literacy rate. Hence, in this state maternal mortality is very high which affect overall societal status of women. This study focus on exploring the role of health informatics tools such as mobile phone, also known as mHealth, in improving the maternal health scenario of Bihar, which in turn can lead to women empowerment. In developing countries like India mobile phones are serving as an excellent medium for establishing health communication. Most importantly, literacy does not seem to be a barrier in the use of mobile phone. So it has the potential to address the issue of health inequalities in remote locations where there is shortage of medical resources. Health information propagated through mobile phone can improve knowledge which is an important tool for generating women empowerment.

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Received: June 07, 2024; **Accepted:** June 14, 2024; **Published:** June 20, 2024**Introduction**

In an underdeveloped state like Bihar, women face double jeopardy because of poor health status and lower literacy rate. Hence, in this state maternal mortality is very high which affect overall societal status of women. This study was on exploring the role of health informatics tools such as mobile phone, also known as mHealth, in improving the maternal health scenario of Bihar, which in turn can lead to women empowerment. In developing countries like India mobile phones are serving as an excellent medium for establishing health communication. Most importantly, literacy does not seem to be a barrier in the use of mobile phone. So, it has the potential to address the issue of health inequalities in remote locations where there is shortage of medical resources. Health information propagated through mobile phone can improve knowledge which is an important tool for generating women empowerment.

Literature Review

An extensive review of literature was conducted including but not limited to reports, documents, unpublished manuscripts, articles, and websites. To make the review more inclusive combination of different keywords were used, some of the main keyword combinations are mHealth and women and India; mHealth and women and Bihar; mHealth and women and empowerment; Maternal health and India; Maternal health and Bihar; Women autonomy and India; Women autonomy and Bihar; Women's autonomy and mhealth; and women position and mhealth. Literature was screened at two levels, first the title of the paper was considered and secondly the abstract was taken into consideration. Using combination of these stated keywords, a total of 72 articles have been extracted. The search engines used to download the articles include Google scholar, PubMed, Sciencedirect etc. Online database and digital libraries like JSTOR, Elsevier, Springer,

BMC, PLOS have been referred. Articles from open journals and networking sites like Researchgate, Taylor and Francis Online, Sage have also been extracted for reviews. The articles considered for reviews comprise both national and international journals. Out of 72 papers, 70% of them are extracted from international journals or publishing houses. The rest 30% papers are national journals. 49 out of 72 literatures incorporate studies of pan-India regions, including 15 Bihar-based studies and only 3 papers that specifically focused on Patna. The remaining 23 articles include studies of developing or middle-and -low income countries. Some of the major findings from the literature review are discussed for better comprehension of the situation.

This systematic review of literature suggests that emphasis has been given only on providers' perspective and there is dearth of research on the demand side of maternal health care comprising of women service users who are the ultimate recipient of any mHealth initiative with respect to Bihar. Also, literatures have largely come from developed nations and those conducted in India (except the study by Shristi and Raj, 2018) have focused only on pilot initiatives. Moreover, the social science perspective of health informatics and mHealth has not been discussed in any of the studies reviewed either in India or abroad.

Aims & Objectives

The aim of the study is to address health issues from perspectives of service users and provide a road map for policy makers to develop women-oriented agenda which will lead to women empowerment through use of mHealth technologies. Also, the study attempts to understand the cultural acceptability of specific media tools for implementing policies.

Field work

Primary data was used in the study based on extensive fieldwork. Given the nature of the topic, mixed method approach was adopted for both data collection and data analysis. For a holistic understanding of how mHealth technologies could act as a facilitator of women empowerment in Bihar, study population samples were selected from demand side as well as supply side of various mHealth services and/facilities available in the area. From demand side samples were recruited from women who are either pregnant or has given birth in three years preceding the survey. While those from the supply side included Medical Officers, Frontline Workers, such as ASHAs, Anganwadi Workers, Auxiliary Nurse Midwife. In the first phase quantitative methods were adopted and survey was conducted at the households, Village Sub-Centers, Primary Health Centers (PHC), and Anganwadi Centers. These surveys were conducted in-person through various rounds of field visits by the research associate as well as the project director (self). Data generated from these surveys were coded and analysed using SPSS. From these analysis broad themes were identified that were addressed through qualitative methods, such as in-depth interviews and focus group discussions (FGDs).

The study site chosen for the pilot survey was Amhara village of Bihta block, Patna district. This village was chosen mainly due to ease of accessibility as it is an adjoining village of the Indian Institute of Technology Patna campus at Bihta. Pilot was conducted for 20 respondents over a span of two weeks in January, 2020. After this survey minor adjustments were incorporated in the questionnaire, mainly sequencing of the questions and adding more options to some of the multiple choice-based questions. However, no major changes were required in the questionnaire.

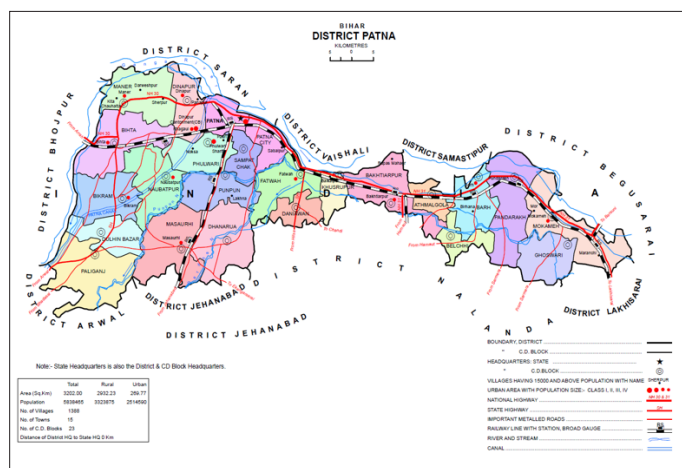
After the survey was completed, there was the outbreak of Covid-19 pandemic which posed various restrictions on physical mobility, especially visit to the field sites due to lockdown norms. It posed a major challenge for collecting data from a population who were not very well-versed with internet technology and also due to poor economic condition did not always have balance in their mobile phones. So, field visits were conducted as and when the lock-down was relaxed and it was ensured that Covid protocol was maintained during fieldwork. We also took this opportunity to provide masks and sanitisers to our research participants and educated them about healthy habits to combat the Covid pandemic. Since it was not possible to complete the entire fieldwork by physical field visits, many interviews were conducted over phone. As a gesture of appreciation, their phone was recharged with a balance of Rs.100 each. Also, those research participants who had access to android phones with internet facilities, online FGDs were conducted with them and their data pack was recharged to participate in our research. The second phase of data collection was qualitative in nature, including in-depth interviews. The process took longer than it was

anticipated and we were not able to conduct participant observation. Also, in the course of the interviews due to poor connectivity issues and lack of voice clarity over phone, the flow of the interviews got disrupted and it affected the quality of data. Participants were anxious about the Covid pandemic and many-a-times they wanted information about how to deal with this unprecedented situation rather than talking about other issues. They mentioned that at such time when their physical mobility was restricted, mobile phone was the only way to get the required health related information. It reaffirmed our contention that mHealth technology is one of the most important tools for empowerment of women in remote rural areas where it is difficult to disseminate information through other modes of communication.

Study Area

For this project, given the time and funding constraint since it is not possible to conduct survey in entire Bihar, Patna district was chosen for conducting the fieldwork. Patna being the state capital is most representative of the scenario at the state. Even in Patna two blocks were selected for conducting the fieldwork- Bihta block and Dinapur-cum-Khagaul block. This choice was made based on census data considering various socio-demographic profiles that are most representative of Patna district. One village was chosen from each block- Dilawarpur village (Bihta block) and Jamsaut village Dinapur-cum-Khagaul block.

An intensive field work has been carried out in these two villages. In the first phase total 68 interviews have been conducted from both the villages, while in the second phase there were 44 interviews. Jamsaut is the first village visited for field study. Dilawarpur is another small village with around 2500 population. The majority of the population in the village are Yadavs by caste. In the duration of field work, around 42 women were interviewed.



Source: District Census Handbook, 2011: series 11

Table 1: Socio-Demographic Profiles of Jamsaut Village and Dilawarpur Village

Village	Total population	Male	Female	Literates	Sched-uled caste	Scheduled Tribe	Total Workers
Jamsaut	11,196	5,906 (52.8%)	5,290 (47.2%)	5,444 (48.6%)	2,710 (22.4%)	02	3,668 (32.7%)
Dilawarpur	2,179	1,169 (53.6%)	1,010 (46.4%)	1,302 (59.8%)	357 (16.4%)	0	995 (45.7%)

Source: District Census Handbook, 2011: series 11

Findings from the Study

The findings from the study are thematically categorised for both the villages. They are listed as follows:

Sociodemographic Profile

Most of the respondents (60%) in Jamsaut belonged to the age group of 25-29 years. The other 25% belonged to 20-24 years, while only 15% were found in the age group of 30-34 years. 70% of the respondents were Hindu by religion, and 30% of them were Muslims. Majority of the people belonged to Scheduled Caste (SC) which comprised 90% of the respondents, and only 10% belonged to Other Backward Class (OBC). Half of the respondents (50%) in the study were found illiterate, while 20% in each category of primary and high school. In Dilawarpur 68% of the respondents belonged to the age group of 20-24 years, while 13% of them fell in each category of 15-19 years and 25-29 years. 97% of the respondents were Hindu by religion, and 3% were Muslims. Majority of the respondents belonged to OBC which comprised 71% of the respondents, and 29% of them belonged to SC category. About 68% of the respondents were illiterate, whereas 16% of them had education till primary level.

Household Characteristics

In Jamsuit 60% of the households had less than five members in the family, while 40% of them had 5 to 10 members. Majority of the respondents (90%) did not have any health insurance/scheme coverage, while 10% of them did not know about it. Only 50% of the respondents in the village had BPL card ownership. In 90% of the cases, respondents had toilet facility at home. On the contrary, in Dilawarpur 81% of the households had 5 to 10 members in the family, while 16% had 11 to 15 members. Though 90% of the respondents did not have any health insurance/scheme coverage, only 7% of them had. The rest 3% did not know about it. 60% of the respondents had BPL card ownership. Toilet facility was available in 55% of the household in the village.

Status of Maternal Healthcare

In Jamsaut, 60% of the women had earlier given birth to a child. 50% of them had given birth 2-3 years ago, 33% of them around 12-24 months ago, and 17% had last given birth more than three years ago. Of women who gave birth, all had up to two children. 90% of the women were pregnant at the time of interview, of which approximately 33%, 44% and 22% were in their first, second and third trimester respectively. Birth order of all the pregnant women fell between 2 and 4. About 40% of the currently pregnant women had a gap of above 24 months, with another 40% between 18-24 months, and the rest 20% had a gap of 6-12 months between the last child and current pregnancy. While in Dilawarpur, 93% of the women had earlier given birth to a child. About 41% of them had given birth less than six months ago, 27% of them around 12-24 months ago, 17% of them around 6-12 months ago, and the rest 13% had last given birth 2-3 years ago. Of women who gave birth, around 48% had up to two children. The other 48% had 3-4 children, and the rest 4% had 5-6 children. None of them gave birth to twins. A small 3% of the women in the village had a history of infant mortality (child born alive but later died). 13% of the women were found pregnant at the time of interview, of which approximately 25% were in their first and second trimester each, and 50% were in their third trimester.

Antenatal Care for Women Who are Currently Pregnant

Among women who were pregnant and seeking antenatal care in Jamsaut village, around 70% reported having an ultrasound test during pregnancy; had their pregnancy registered with ANM. Out of this 70% had received a card from ANM. All currently pregnant

women reported having sought antenatal care for their pregnancy. As high as 60% of the respondents were told where to go in case of pregnancy-related complications. In this case, 33% of them were advised by doctors, 17% from ASHA, 17% from Anganwadi/ICDS workers during complications. The remaining 33% of the respondents received advice from some other sources. 50% of the respondents revealed the presence of their husbands during check-ups. Reportedly, 80% of the respondents seeking antenatal care had received tetanus injection, of which 75% were injected once, while 25% were injected twice. Regarding the distribution of Iron and Folic Acid (IFA) tablets to women, 50% of them said yes, 30% said no, whereas 20% had said to have bought these tablets on their own. 70% of the respondents were consuming IFA tablets for less than three months, while 30% of them have been consuming them for 3-6 months. Regarding the procurement of nutritious diet from AWW and ASHA, 30% said Yes, 40% said No, whereas the remaining 30% reported receiving it sometimes. 60% of the respondents had met ANM/ASHA/health workers in the last 3 months of pregnancy, while 40% did not have any meet during this time. Of women who met ANM/ASHA, 30% received advice on more than one aspect that included breastfeeding, family planning, cleanliness during delivery, and keeping the baby warm. 20% of respondents received some other advice, while 50% of them could not correctly remember the advice given to them. In 66% of the cases, women were advised by Anganwadi workers, while 17% of them in each case were advised by the doctor, and ASHA worker separately. Of all respondents, 30% were intended to give birth at parent's home, 30% at the government hospital, whereas the other 30% wished to deliver at a private hospital/maternity clinic. The remaining 10% of the respondents intended to deliver at their own place/home. Regarding the reasons behind choosing a particular place of delivery, 40% of respondents cited satisfaction and trust base, 30% economic causes, while 20% cited multiple reasons behind it. 10% of the respondents had some other reasons behind the choice made.

In Dilawarpur, all the women who were pregnant reported having an ultrasound test during pregnancy. 100% of the women had their pregnancy registered with ANM, and each of them had received a card from ANM. All women under study reported having sought antenatal care during their pregnancy. 75% of the respondents have reportedly visited ANM/ASHA workers, while 25% of them have seen a doctor for the care. Only 25% of the respondents were told where to go in case of pregnancy-related complications. However, none of them received any information regarding the complication. Reportedly, all the respondents seeking antenatal care had received tetanus injection, of which 75% were injected once, while 25% were injected twice. Regarding the distribution of Iron and Folic Acid (IFA) tablets to pregnant women, 100% of them said to have received these tablets from Anganwadi centers. 50% of the respondents were consuming IFA tablets for less than three months, 25% of them for 3-6 months, whereas the remaining 25% had not yet started taking the tablets. Regarding the procurement of a nutritious diet from AWW and ASHA, 100% of them said Yes, and all of them had met ANM/ASHA/health workers in the last 3 months of pregnancy. Of women who met ANM/ASHA, 25% received advice on more than one aspect that included breast-feeding, family planning, cleanliness during delivery, and keeping the baby warm. 50% of respondents received advice regarding cleanliness during delivery, while 25% of them regarding family planning or delaying the next child. In all these cases, women received advice from ANM/Nurse/Midwife/LHV. Of all respondents, 50% were intended to give birth at a government hospital, whereas the other 50% wished to deliver at a private hospital/maternity clinic. Regarding the reasons behind

choosing a particular place of delivery, 50% of respondents cited the family decision as a cause, 25% mentioned economic causes, while the other 25% cited satisfaction and trust base as a potential cause behind it.

Role of Media in Dissemination of Health-Related Information

Questions related to media and health were asked to both the first-time pregnant women as well as women who gave birth earlier. Findings from Jamsaut indicate that 20% of women listened to the radio, of which 50% listened to it every day, whereas the others listen to it less than once a week. While 70% of them watched television. 50% of women revealed that they receive maternal health information from family members, 30% from the doctor, and 10% from health workers and Anganwadi/SC/PHC/CHC. 70% of women reported having faced difficulty in fetching maternal health-related information through ASHA/Anganwadi workers/ANM/doctors, of which 71% could not get in touch with any of them, and 29% said that none of the service providers repeat the information. All women admitted to having a mobile phone at home. Interestingly, there was a variety in the type of mobile phone that was available to the respondents. 60% of women had an android mobile at home, 20% had CDMA, 10% had GSM, whereas the other 10% had more than one kind of mobile phones at home. Irrespective of such differences, all women reported that they get a chance to use mobile in a day. There was also variation in the use of mobile phones. 50% of them used the calling feature, while the rest used mostly used the video feature. 80% of them considered a mobile phone to be the best way of communication related to any matter. As they believe that mobile phone has the potential to change people's lives. Only 10% of women admitted the use of the mobile phone just in an emergency situation at home. 90% of women revealed that they use mobile phones on daily basis. Despite frequent use of mobile phones, the majority of these women (90%) were not aware of mobile phone interventions for maternal health, such as Mobile kunji or Kilkari. Only 10% of them have only heard the names of these interventions, and through ASHA. But they stated that these were not used by the service providers. Women reported that information imparted through mobile phones were easy to understand and they were satisfied with it. However, they listed the specific features of mobile phone that were proffered for such information. A majority of them (60%) preferred the calling feature, for another 30% video feature topped the list, while the other 10% shared their preference for multiple features of the mobile phones. 80% of women thought that mobile phones can be a good medium for receiving maternal health-related information and wished to receive the same over mobile phone, while the other 20% were indifferent. Approximately 44% of women wanted to receive multiple information related to maternal health care including nutrition and hygiene, medication, vaccination, and breastfeeding on mobile phones. 11% of them wanted information related to nutrition and hygiene. Women wanted this information on regular basis- daily (25%), every alternate day (25%), twice a week (25%), once in a week (12.5%). The remaining 12.5% of them did not have any opinion on this. 37.5% wanted to receive the information directly, whereas 25% of them wanted it through indirect means, and the rest 37.5% of them did not have an issue in either case. Regarding the duration of the information to be provided via mobile phone, 75% of them were okay with any duration, while 25% wanted it to be within 10 minutes. 37.5% of women found evening time suitable for receiving information, 25% wanted it in the afternoon, while 12.5% wanted it during the night. To the rest 25%, time did not matter for receiving the information. 56% of the women wanted the information in their native language, while 44% wanted it in Hindi. 70% of

women wanted multiple information on maternal health care to be delivered on their mobile, whereas 10% wanted information on medicine dosage, and 20% wanted information on other than these issues.

Findings from Dilawarpur in certain aspects were quite contrast. Unlike in Jamsaut, here none of the women listened to radio, whereas 77% of them watched television regularly. 48% of women revealed that they receive maternal health information from multiple sources, such as, family members, health workers, doctors, and Anganwadi/PHC/CHC. 28% received such information solely from family members, 30% from the doctor, and 10% from each of these doctors, and Anganwadi/SC/PHC/CHC. Only 3% of them received it from health workers. 26% of women reported having faced difficulty in fetching maternal health-related information through ASHA/Anganwadi workers/ANM/doctors, of which 43% could not get in touch with any of them, and 29% said they did not repeat the information. 14% of them said they did not get proper information, whereas another 14% cited some other reasons. All women admitted to having a mobile phone at home. 35% of women had an android mobile phone, 30% had GSM, 29% had more than one kind of mobile, whereas the other 6% had CDMA mobile phones at home. An overwhelming 97% of women got a chance to use mobile everyday. 53% of them used the calling feature, 40% used more than one feature, while the rest 7% used the video feature of the mobile. 95% of them considered a mobile phone to be the best way of communication. 89% of women believed that mobile phone has the potential to change people's lives while 11% did not have an opinion on it. 89% of women revealed that they use mobile phones on daily basis. Despite various dissimilarities, in Dilawarpur also majority of the women (97%) were not aware of mobile phone intervention like Mobile kunji or Kilkari. The preference of mobile features by respondents were similar to that of Jamsaut, as 67% preferred the calling feature, followed by the video feature (10%), and 23% of them opted for more than one feature of their mobile phones. 91% of women thought that mobile phones can be a good medium for receiving maternal health-related information. 98% of women wished to receive maternal health-related information on mobile phones. Approximately 57% of women wanted to receive multiple information related to maternal health care including nutrition and hygiene, medication, vaccination, and breastfeeding on mobile phones. 26% of them wanted information related to nutrition and hygiene, 9% wanted to know about breastfeeding, and the other 9% of them did not have an opinion on it. 32% of the women wanted to receive the information via video, 28% via call, whereas 36% preferred more than one mobile feature for receiving the information. Women wanted this information regularly: twice a week (32%), once in a week (24%), every alternate day (8%), and daily (4%). However, 32% of them did not have an opinion on it. About 90% of women wanted to receive the information directly, whereas 10% were not sure about it. Regarding the duration of the information to be provided via mobile phone, 36% of them were okay with any duration, while 32% wanted it to be 10 minutes long, 16% wanted it to be 5 minutes long, 12% for 6-7 minute, whereas 4% wanted it of 15 minutes and above duration. 42% of women found afternoon time suitable for receiving information, 25% wanted it in the evening, while 13% wanted it during the night. To the rest 21% time did not matter for receiving the information. 96% of the women wanted this information in their native language and only 4% wanted it in Hindi [1-10].

The findings of the study indicate that mobile phone is most preferred means of communication for women. Interestingly, it was noted that availability of mobile phones (either CDMA/ GSM/

smartphone/ android) in households is more common phenomena than that of television in both the villages. In fact, women in Dilawarpur has better and more access to mobile phones than television. Hence, the willingness regarding receiving maternal health information through mobile phone is very high in both the villages. It is most preferred because through mobile phone they can get all useful information at the privacy of their home and also in a personal space free from any expected social roles. Also, Since most of these women in villages are illiterate it is easy for them to comprehend information disseminated through mobile phones.

Recommendations for Policy Implications

Maternal health is a crucial component of public health, especially in developing countries like India. Unawareness among women about family planning, antenatal, and postnatal care results into their poor maternal health status. This study states that mHealth is the most accessible health informatics tool which can be useful in propagating necessary and need based information to rural women, thus, being instrumental for health promotion. Most of the public health policies, especially those focusing on women lack service users' perspective and hence are not very successful in meeting the desired objectives. This study addresses health issues from perspectives of service users and provides a road map for policy makers to develop service user-oriented agenda which will lead to women empowerment. Also this study provides a nuanced understanding of cultural acceptability of specific media tools, mobile phone in this case, for implementing policies.

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