

Going the extra mile: Developing an interactive mobile application for maternal and infant care for tribal birth attendants

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ABSTRACT

Background: Mobile health applications are an established tool for healthcare management, patient education, and even capacity building for healthcare providers. However, its use among traditional birth attendants (TBAs) is limited. The aim of this study is to explore the needs and bottlenecks of developing an interactive mobile application for maternal and infant care (MAI) of TBAs. **Materials and Methods:** It is a qualitative study having in-depth interviews (face-to-face approach) conducted among the seekers of MAI services. **Setting:** This study is conducted in tribal and rural locations in the district Sirohi, Rajasthan. **Participants:** TBAs and tribal females of reproductive age in tribal-dominated areas have participated. The development of an interactive mobile application MAI has three phases: (1) a need-based approach to identify the needs on the ground; (2) identifying intervention bottlenecks and possible solutions; (3) design and development of the mobile application. **Results:** Ninety-six tribal females of reproductive age participated in the needs assessment. Eighty percent of them were ≤ 30 years of age and 40% of them were uneducated. Most participants informed that lack of information (culturally/locally appropriate content), peer advocacy, affordability, lack of transportation, and the influence of TBAs are the significant factors for less uptake of maternity and child health services in the tribal and rural areas. **Conclusion:** The MAI app has culturally/locally appropriate content and is prepared by the local TBAs and Accredited Social Health Activists, with full local character and clothing. MAI app has videos and audio in the local language (Marwari) with pictorial quizzes. Using the MAI app, TBAs may self-educate and guide tribal pregnant women about maternal hygiene and infant healthcare as needed at various stages of pregnancy and childbirth.

Keywords: Maternal and infant health services, mobile health application, tribal birth attendant, tribal pregnant women

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Introduction

Maternal and infant mortality remains a pressing global health concern, with disparities in care and outcomes often observed

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between urban and rural populations and between mainstream and tribal populations. According to the World Health Organization, approximately 295,000 women died during and following pregnancy and childbirth in 2017, most of which occurred in low-resource settings. Most of these deaths could have been prevented.^[1] Concurrently, the global infant mortality rate was estimated at 28.9 deaths per 1,000 live births in 2019.^[2] Tribal communities, often residing in remote and hard-to-reach areas, face unique challenges that exacerbate these statistics, including limited access to healthcare facilities, cultural barriers, and a lack of trained birth attendants.^[3]

Tribal birth attendants are pivotal in maternal and infant care (MAI) within these communities. However, they often need more formal training and access to up-to-date information and resources, hindering their ability to provide optimal care.^[4] The rapid proliferation of mobile technology offers a unique opportunity to bridge this knowledge gap. Mobile health (mHealth) interventions have demonstrated efficacy in improving health outcomes in various settings by providing timely information, facilitating communication, and supporting decision-making.

There is a pressing need for innovative solutions tailored to the unique needs and challenges faced by tribal birth attendants. Interactive mobile applications can serve as valuable tools, offering culturally appropriate educational content, real-time guidance, and a platform for collaboration among birth attendants and healthcare professionals. These can be beneficial in an assortment of ways for the rural population. Mobile health applications can provide health education, such as information on preventive care, healthy lifestyle choices, and illness management. Mobile health applications can assist rural residents in staying informed about their health and making sound decisions.^[5] Remote monitoring of vital indicators such as blood pressure, heart rate, and blood glucose levels is possible using mobile health applications.^[6]

Mobile health applications benefit people with chronic diseases who require regular monitoring but may have limited access to healthcare facilities.^[7] Telemedicine consultations are facilitated through mobile applications, which allow rural populations to connect with healthcare providers remotely. These teleconsultations are beneficial for people who trouble themselves by traveling considerable distances to seek medical help from a doctor or an expert.^[8] Mobile health applications are valuable tools for educating patients about various health conditions, treatment options, and self-care practices. They can provide interactive modules, videos, and informative articles to enhance patients' understanding of their health and empower them to make informed decisions, particularly in remote or underserved areas.^[6] These applications also provide easy access to healthcare services, allowing individuals in rural and urban areas to consult with doctors and specialists remotely. Mobile health applications mainly benefit those with limited access to healthcare facilities or who live in remote areas.^[9] Despite these benefits, why is it not

utilized to improve the health status of the tribal community? One of the reasons is limited access to technology; tribal people frequently lack access to smartphones and internet connectivity, both of which are required for mobile health applications. In isolated tribal regions, a lack of infrastructure and resources may limit the availability and affordability of cell phones and internet services.^[10] Many tribes may have lower levels of digital literacy and technological familiarity. Adopting mobile health applications necessitates a certain level of technological expertise, which often these groups lack. Low adoption rates are attributed to a lack of exposure to digital devices and instruction on how to use them.^[11] Mobile health applications are often developed in mainstream languages and may not be available in local tribal languages. This language barrier can make it difficult for tribal populations to understand and navigate the applications. Additionally, cultural beliefs and practices may influence the acceptance and adoption of new technologies, including mobile health applications.^[12] Building trust and raising awareness about the potential benefits of mobile health applications within tribal communities is crucial for their adoption. Considering these, we intend to develop a mobile health application that is simple to use among tribal populations to improve their health and provide exposure to digital technology.

The tribal communities of Rajasthan often use healthcare facilities inadequately due to social stigma and a lack of awareness regarding maternal and child healthcare. To optimize maternal and infant healthcare use, tribal birth attendants must reduce the social stigma in their community and encourage pregnant women to avail maternal and infant healthcare services. Tribal birth attendants can be vital in addressing this unique challenge of tribal communities. Tribal birth attendants, with their cultural understanding and familiarity with the community, can bridge the gap between healthcare providers and tribal women. These attendants possess valuable knowledge of traditional practices, customs, and beliefs, which can be integrated with modern healthcare approaches to provide culturally sensitive care.^[13,14] It was observed that digital interventions positively impacted various aspects of maternal and child health, including antenatal care utilization, immunization rates, breastfeeding practices, and postnatal care. Digital tools can enhance the reach and effectiveness of community health worker programs, particularly in resource-limited settings. By providing information, reminders, and personalized support, these applications can empower tribal women.^[15-17] Traditional birth attendants provide essential maternity care in tribal and remote locations.^[18] This overarching goal of developing interactive mobile applications for MAI is to provide technical support to traditional birth attendants who assist in home deliveries and may play an important role as educators among pregnant tribal women in improving maternal and infant healthcare status. Trained TBAs will liaise with tribal pregnant women and government healthcare providers such as Accredited Social Health Activists (ASHAs) and Auxiliary nurse midwife (ANMs). This study aims to design and develop an interactive health mobile application, MAI app for tribal birth attendants educating TBAs, educating tribal pregnant women,

and encouraging them to seek help from ASHAs/ANMs and utilize government healthcare services.

Materials and Methods

The design and development of an interactive mobile application (MAI) for maternal and infant care for tribal birth attendants of district Sirohi, Rajasthan, is part of a research work funded by the Ministry of Tribal Affairs, Government of India. The application was developed with experts from the Indian Institute of Technology, Jodhpur. The research work is approved by the Institutional Ethics Committee of AIIMS, Jodhpur, and is registered with the Clinical Trial Registry of India (registration number: CTRI/2023/02/049854).

The development of an interactive mobile application MAI has three phases: (1) a need-based approach to identify the needs at the ground; (2) identifying intervention bottlenecks and possible solutions; and (3) the design and development of the mobile application.

Need-based approach (Phase 1)

A qualitative assessment was conducted among 96 females from the tribal population to identify the gaps in the standard of care that the government provided to front-line workers and the implementation bottlenecks responsible for the gaps. Focus group discussions (FGDs) were held with women from the bheel/bhil and garasiya communities in the tribal sub-population blocks Abu Road and Pindwara in the district of Sirohi, Rajasthan, to learn about their experiences with maternity and newborn healthcare. Overall, eight focus groups with tribal community women of reproductive age were held. The participants were recruited through personal connections from both blocks based on tribal community and consent. The questions aimed to find women's experiences and thoughts on what may be done to improve maternal and child healthcare in indigenous groups and the general quality of maternity services in their community. After the sociodemographic information of the participants, the FGD includes that materials, in particular, were translated into local languages suited for the study sites and used with women groups who were illiterate in Hindi—analyzed with a thematic approach and codes by reading written transcripts to guarantee accuracy, completeness, and comprehension. Use these draught codes for further classification and sub-categorization.

Eighty-six tribal women were between the ages of 17 and 30 years. Twenty-three (23.9%) of the participants had married at less than 18 years of age. Forty-four (40.7%) were illiterate. Twenty-eight (29.2%) were underweight. All the participants voluntarily consented to the study, and there were no refusals or dropouts [Table 1].

Table 2 shared illustrative quotations from the participants to describe the major themes identified at each level. Four main themes describing tribal women's experience toward maternal and Infant healthcare services among the tribal populations were

Table 1: Demographic characteristics of tribal women (n=96)

Variables	N (%)
Age	
17–30	86 (89.6)
31–45	10 (10.4)
Age at the time of marriage	
Less than 18	23 (23.9)
More than 18	73 (76.1)
Body mass index (BMI)	
Below 18.5 (underweight)	27 (28.1)
18.5–24.9 (healthy weight)	57 (59.4)
25.0–29.9 overweight	10 (10.4)
30.0 and above obesity	2 (2.1)
Education status	
Uneducated	44 (40.7)
Primary	25 (23.1)
Secondary	23 (21.0)
Postgraduate and above	4 (15.2)
Husband's occupation	
Daily wage earner	61 (56.5)
Agriculture/Job	35 (43.5)
Type of family	
Nuclear	49 (51.1)
Joint	47 (48.9)
Type of house	
Kutchha	65 (60.2)
Pucca	31 (39.8)

information and communication, affordability and inaccessibility, barriers, and attitude or approach.

Objective definition

Societal stigma against government healthcare services, lack of awareness and acceptance of healthcare services, and inappropriate MAI practices lead to increased infant and maternal mortality rates among the tribal population. Most pregnant women consult traditional healers for their maternal and child health needs, as traditional birth attendants are the most popular and highly influential among tribal communities, so educating them and strengthening their referral toward government health services is necessary.

Identifying intervention bottlenecks and possible solutions (Phase 2)

After the need assessment, the intervention elements were searched by (1) looking for feasible solutions to circumvent the underlying implementation constraints responsible for the care mentioned above gaps, and (2) using the concept of functional design to develop solutions by focusing on activities and the demands of end-users (here, village-based TBA) using the ideas of implementation science, which investigates how to apply tried-and-true interventions in an actual situation. The underlying presumption is based on frequent interactions with tribal females and TBAs, which heavily influence pregnant tribal women. As a result, if they are given the necessary support and supervision

and when the project's goals align with their motivations, they will adhere to interventions and perform well. As a result, the following elements were added to the mobile phone application that TBA would utilize. The purview of the application included almost all MNCH services to be supplied at the community level through TBA, with a succinct explanation of implementation constraints and remedial measures [Table 3].

Design and development of maternal and infant healthcare application (Phase 3)

The process started with understanding the functional and non-functional requirements based on the user stories. Detailed

discussions were carried out by investigators and software architects to design the different modules of applications. Specific attention was given to user interface design to ensure minimum requirements of reading and writing skills for using the application, as many application users are illiterate. Another essential requirement that was considered was the availability of internet connectivity in rural areas. Local persistent storage was included in the mobile app with the ability to sync with cloud-based storage whenever internet connectivity was available. We also incorporated a few quizzes in the application that can help us track the knowledge gained by local healers after using the application content. All the contents were designed as

Table 2: Illustrative quotations from the participants to describe the major themes

Themes	Subthemes	Comments
Information and communication	Social stigma toward healthcare services undermining health outcomes due to lack of awareness	A 35-year-old lady stated that in our community, various cultural practices are practiced such as performing prayer ceremonies to ward off evil spirits to protect the mothers during pregnancy and the postpartum period Fever in the postpartum period or swollen feet in the antepartum period are considered "small concerns" and are often neglected
Affordability and inaccessibility	Marginalized communities (hard to reach or having difficulty in access to healthcare services)	Another 26-year-old tribal women stated that visits to the healthcare facilities are quite difficult because they are at least 10–15 km away from our village. Also, there are no public transportation options available nearby. Our only options are to arrange for our own transportation or to contact a local shop or traditional birth attendant
Barriers	Barriers to behavioral change at the household level Lack of education Local language	Another 29-year-old tribal woman stated that they prefer home delivery through Bhopa (a local name of Traditional Birth Attendant) and other consultation because she is from our community and she understand about our culture, despite ASHAs and ANMs informing them
Attitude or approach	Lack of acceptance toward government healthcare services Poor acceptance, education levels. Ignorance and lack of understanding TBAs misguiding pregnant women not to avail government healthcare services; individuals were uninformed of the advantages of present healthcare services	Narratives from respondents indicated that individuals were uninformed of the advantages of present healthcare services While women were in their seventh month of pregnancy, a respondent by the name (Meera, age 23) lost their kid. For the first four months, they were unaware that she was pregnant. Following this, she visited a subcenter 13 km away from their home. As there was no medical staff on-site, she took herself to a traditional tribal healer after consulting with others. She reassured them that she did not need to take her nearby community health center because she would not require any precheckups. After three months, she gave birth to a boy on the way to the subcenter, but the child has since passed away. I now regret going to that traditional healer and placing my trust in her, and I am now suffering as a result. I could not make the decision myself and had to listen to other people due to my ignorance and lack of understanding

Table 3: Bottlenecks responsible for gaps in maternal and infant care services in tribal areas and their potential solutions

Bottlenecks	Solutions
(Responsible for gaps in healthcare services)	(Maternal and infant healthcare application targeting each implementation bottleneck)
A. Low coverage of maternal and infant healthcare services	
Social stigma toward healthcare services undermining health outcomes	Using a peer-group approach to minimize the social stigma
Marginalized communities (hard to reach or having difficulty in access to healthcare services)	MAI app has culturally/locally appropriate content, character, clothing, audio, and graphics Content videos and audio with pictorial quizzes
Barriers to behavioral change at the household level	Behavioral change communications (BCC) job-aid: eight mobile-based videos (2–3 min of picture storytelling) assisting TBAs to spread awareness/counsel about key health practices during their home visit of beneficiaries
B. Low care seeking from appropriate health personnel	
TBAs misguiding pregnant women not to avail government healthcare services	Videos created involving local village-based TBAs of district Sirohi and shown them guiding toward maternal and infant care services

infographics to ensure the least reading/writing skills requirement, as explained earlier. The process is explained in Figure 1. Using peer-group approach and following cultural adaptation, MAI (a mobile software application) app was developed by the experts from the Indian Institute of Technology Jodhpur. It was designed for individuals with limited literacy and is functional on low-cost mobile phones or Android-based smartphones; it also runs for free and has open-source applications with culturally/locally appropriate content. Texts, pictures, and voice prompts (in the user's native language) in interactive films with audio system enabled are used to give maternal health information to TBAs and pregnant women. This application is designed to educate

and empower traditional birth attendants to improve maternal and child healthcare services provided by the government by spreading awareness among pregnant tribal women through TBAs, as they are mostly the first contact point for health-related advice. This application is specially designed for illiterates (who are even unable to read). Community influencers (traditional birth attendants) are most likely to use this tool among tribal populations to promote maternal and infant healthcare awareness among pregnant women. This study's goal was to build the MAI application for community influencers of western Rajasthan. As most pregnant tribal women consult traditional healers for their maternal and child health needs and as these tribal healers

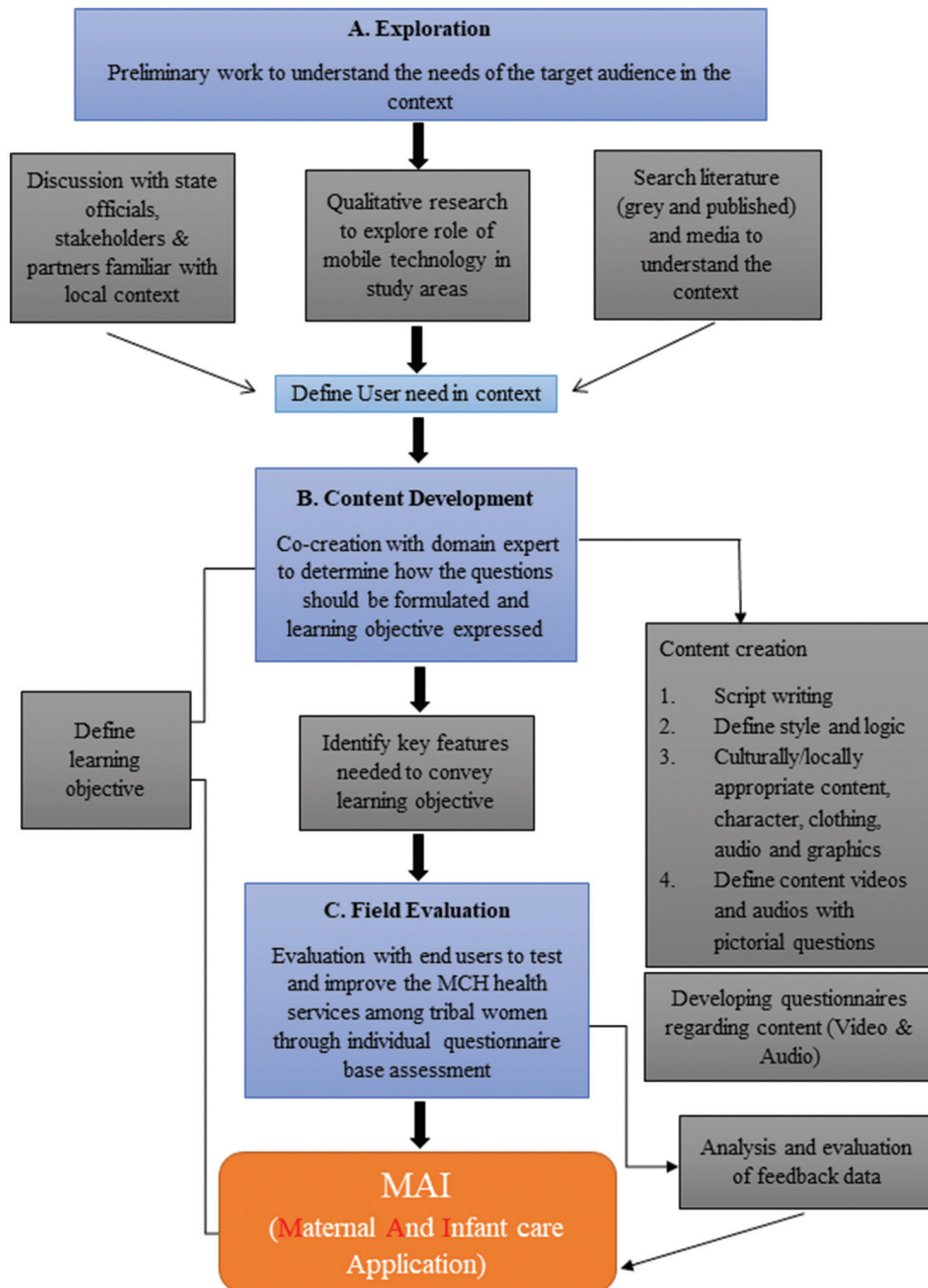


Figure 1: Mobile application development strategy



Figure 2: Using the MAI app, TBAs may guide/instruct expectant women on maternal and infant care as needed at various stages of pregnancy and childbirth

are high influencers among the tribal community, training TBAs for better uptake of MCH services is necessary. MAI app is designed to educate and empower traditional birth attendants to improve maternal and child healthcare services provided by the government and spread awareness among tribal pregnant women [Figure 2].

Discussion

In the broader context of mHealth and public health, the exploratory research of this peer-group-based application for tribal communities serves as an example of designing and executing interventions to educate and empower the female traditional birth attendant among tribal communities. A study conducted in Guatemala demonstrated a statistically significant knowledge shift among traditional birth attendants (TBAs) after culturally responsive training. Before the training, a mere 50% of participants could identify emergencies, but after the training, that number rose to a staggering 85%.^[19] Furthermore, another study identified seven domains, including language, communication, and cultural differences, requiring a modified approach to handling pregnancy-related matters.^[20] Similarly, our pregnancy education application, “MAI,” takes a unique approach by being the first peer group-based, tribal native language digital strategy in India’s Rajasthan region. It aims to address the needs of a hard-to-reach and low-literacy tribal population by providing them with crucial information in their languages and connecting them to community resources. One quasi-controlled, cross-sectional study conducted in Jharkhand suggests that mobile health applications can increase public awareness of health issues. The intervention group, which received education through mHealth, outperformed the control group by a significant margin, with a 55% increase in awareness of tetanus

shots and a 58% increase in awareness of iron tablet use.^[21] Our application’s design interventions seem to have the potential to raise user literacy levels and improve maternal health knowledge among tribal pregnant women. One of the narrative reviews describes that similar pregnancy applications have huge potential for providing reliable, evidence-based health information.^[22] Innovative Mobile-phone Technology for Community Health Operations (ImTeCHO) was one of the studies conducted in Gujarat tribes concluded that the adoption of the mobile and web-based application as a job aid by government ASHAs and PHC personnel enhanced MNCH service coverage and quality in hard-to-reach locations.^[23] Similarly, in our study, this maternal and infant health application will be used in tribal hard-to-reach areas. Very few studies report using mobile applications for capacity building among frontline healthcare providers, mainly traditional birth attendants. This study’s novelty lies in its focus on linking traditional tribal birth attendants with digitalization to improve maternal and child healthcare among indigenous populations. The app covers various topics, including antenatal care, neonatal care, lactation, and post-delivery care for mothers, encompassing nutrition, low birth weight, and vaccination. Including local Marwari language videos featuring traditional birth attendants and ASHAs adds a touch of authenticity and relatability. Thus, there is a need to increase the implementation of such measures, optimize them for better healthcare access in marginalized communities, and achieve health equity.

Conclusion

If adopted, the MAI application has the potential to significantly increase reach, efficacy, and health equity for underserved populations. Providing information in Hindi and Marwari, the local languages, allows traditional birth attendants to use it

comfortably. The peer-group approach and cultural adaptation of this application help in its easy and wider uptake for maternal and child health services among tribals.

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Conflicts of interest

There are no conflicts of interest.

References

- Yunida H. Saving of maternal and infant lives with sustainable midwifery services. *Int J Community Based Nurs Midwifery* 2022;10:313-4.
- <https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/infant-mortality>. [Last accessed on 2023 Aug 10].
- Deb Roy A, Das D, Mondal H. The tribal health system in India: Challenges in healthcare delivery in comparison to the global healthcare systems. *Cureus* 2023;15:e39867.
- Byrne A, Caulfield T, Onyo P, Nyagero J, Morgan A, Nduba J, *et al.* Community and provider perceptions of traditional and skilled birth attendants providing maternal health care for pastoralist communities in Kenya: A qualitative study. *BMC Pregnancy Childbirth* 2016;16:43.
- Ventola CL. Mobile devices and apps for health care professionals: Uses and benefits. *PT* 2014;39:356-64.
- Yin Z, Lesser J, Paiva KA, Zapata J Jr, Moreno-Vasquez A, Grigsby TJ, *et al.* Using mobile health tools to engage rural underserved individuals in a diabetes education program in South Texas: Feasibility study. *JMIR Mhealth Uhealth* 2020;8:e16683.
- Peyroteo M, Ferreira IA, Elvas LB, Ferreira JC, Lapão LV. Remote monitoring systems for patients with chronic diseases in primary health care: Systematic review. *JMIR Mhealth Uhealth* 2021;9:e28285.
- Haleem A, Javaid M, Singh RP, Suman R. Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sens Int* 2021;2:100117.
- Telehealth Use in Rural Healthcare Overview-Rural Health Information Hub. Available from: <https://www.ruralhealthinfo.org/topics/telehealth>. [Last accessed on 2023 Aug 4].
- Okano JT, Ponce J, Krönke M, Blower S. Lack of ownership of mobile phones could hinder the rollout of mHealth interventions in Africa. *Elife* 2022;11:e79615.
- Office of Educational Technology. Barriers and Strategies. Available from: <https://tech.ed.gov/advancing-digital-equity-for-all/barriers-and-strategies/>. [Last accessed on 2023 Aug 4].
- Zhou L, Bao J, Watzlaf V, Parmanto B. Barriers to and facilitators of the use of mobile health apps from a security perspective: Mixed-methods study. *JMIR Mhealth Uhealth* 2019;7:e11223.
- Contractor SQ, Das A, Dasgupta J, Van Belle S. Beyond the template: The needs of tribal women and their experiences with maternity services in Odisha, India. *Int J Equity Health* 2018;17:134.
- Yeboah-Antwi K, Hamer DH, Semrau K, Waltensperger KZ, Snetro-Plewman G, Kambikambi C, *et al.* Can a community health worker and a trained traditional birth attendant work as a team to deliver child health interventions in rural Zambia? *BMC Health Serv Res* 2014;14:516.
- Charanthimath U, Katageri G, Kinshella MW, Mallapur A, Goudar S, Ramadurg U, *et al.* Community health worker evaluation of implementing an mHealth application to support maternal health care in rural India. *Front Glob Womens Health* 2021;2:645690.
- Ilozumba O, Van Belle S, Dieleman M, Liem L, Choudhury M, Broerse JEW. The effect of a community health worker utilized mobile health application on maternal health knowledge and behavior: A quasi-experimental study. *Front Public Health* 2018;6:133.
- Muthelo L, Mbombi MO, Bopape MA, Mothiba TM, Densmore M, van Heerden A, *et al.* Reflections on digital maternal and child health support for mothers and community health workers in rural areas of Limpopo Province, South Africa. *Int J Environ Res Public Health* 2023;20:1842.
- Narain JP. Health of tribal populations in India: How long can we afford to neglect? *Indian J Med Res* 2019;149:313-6.
- Garcia K, Dowling D, Mettler G. Teaching Guatemalan traditional birth attendants about obstetrical emergencies. *Midwifery* 2018;61:36-8.
- Castillo AF, Davis AL, Krishnamurti T. Using implementation science frameworks to translate and adapt a pregnancy app for an emerging Latino community. *BMC Womens Health* 2022;22:386.
- Choudhury A, Asan O, Choudhury MM. Mobile health technology to improve maternal health awareness in tribal populations: Mobile for mothers. *J Am Med Inform Assoc* 2021;28:2467-74.
- Hughson JP, Daly JO, Woodward-Kron R, Hajek J, Story D. The rise of pregnancy apps and the implications for culturally and linguistically diverse women: Narrative review. *JMIR Mhealth Uhealth* 2018;6:e189.
- Modi D, Dholakia N, Gopalan R, Venkatraman S, Dave K, Shah S, *et al.* mHealth intervention "ImTeCHO" to improve delivery of maternal, neonatal, and child care services-A cluster-randomized trial in tribal areas of Gujarat, India. *PLoS Med* 2019;16:e1002939.