

A Rural Community-Based Investigation To Assess Mobile Health (mhealth) For Family Planning Advice In District Multan

Naveen Farooq¹, Nadia Rehman Alvi², Sana Mangrio³, Syed Aftab Rahim⁴, Zunaira Riaz⁵

¹ Assistant Professor HBS Medical & Dental College, Islamabad.

³ MSPH Department of Community Medicine, Shifa Tameer e Millat University, Islamabad.

^{2,4,5} MSPH, Department of Public Health, Health Services Academy, Islamabad.

Author's Contribution

¹ Conception of study

^{1,2,3} Experimentation/Study Conduction

^{1,4} Analysis/Interpretation/Discussion

¹ Manuscript Writing

⁵ Critical Review

¹ Facilitation and Material analysis

Corresponding Author

Dr. Naveen Farooq

Assistant Professor

HBS Medical & Dental College

Islamabad.

Email: dr.naveenwajid@gmail.com

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Abstract

Background: Globally, Pakistan is the 5th populous country. To increase the use of family planning services by public-private business model, the Punjab Population Innovation Fund selected the "Connect4fp" project implemented by the International Rescue Committee organization. The purpose of this research was to determine the impact of mobile health(mHealth) advice on family planning in the project area. This project was implemented in 9 Union councils of district Multan, Pakistan. The innovative idea of this project was the use of mobile phones to spread family planning knowledge among the community in the form of Interactive Voice Response (IVR) as well as Short Message Service (SMS) (i.e., text messages).

Methods: A cross-sectional study targeted 197 men as well as women (mostly married women of reproductive age) receiving mobile messages or recorded robocalls from the project area. The purpose was to assess their family planning knowledge and awareness by using a structured Likert scale questionnaire. Secondly, the viewpoint about mHealth and its effect on family planning was determined from 40 private providers and 27 Family planning Champions (who were part of the project) through telephonic interviews. Their response was quantified by using the Likert scale. Descriptive statistics were calculated for the study's main variables. The association of family planning knowledge of community members was determined to their contraceptive use by using Chi-square.

Results: The results specified that 60% of community members included in this study told that their family planning knowledge is increased due to this mHealth program. 36% of Private providers while 75% FP Champions agreed that family planning patients are increased due to this mHealth program.

Conclusion: Mobile messages and robocalls about family planning sent in the local language positively contributed to increasing FP knowledge and awareness in the community. This may trigger communication about family planning within couples, as a result increasing the use of family planning services.

Keywords: Family planning, mHealth, Private providers, Family planning champions

Introduction

Globally, Pakistan is the 5th populous country⁽¹⁾. The total population of Pakistan is approximately 207.7 million with a 2.4 growth rate according to the last census in 2017⁽¹⁾ which is two-fold more than other countries in the Southern region of Asia like Bangladesh, Sri Lanka, and India⁽²⁾. In Pakistan, the fertility rate is 3.6 according to Pakistan Demographic and Health Survey (PDHS) in 2017-18, which indicates that a married woman has almost four kids during her reproductive life. For Pakistan, overpopulation is alarming as economic growth is very low⁽³⁾. Family Planning (FP) has an important role not only to reduce fertility rates but also to reduce infant and maternal mortality⁽⁴⁾. FP interventions encourage healthy birth spacing and lessen pregnancy-related morbidity and mortality⁽⁵⁾.

The estimated contraceptive prevalence rate (CPR) in Pakistan is 35%, which is very low compared to other countries in the South Asia region that is 53% in 2013⁽⁶⁾. The use of contraceptives in rural areas is lower than in built-up areas which are 23%⁽⁷⁾. The modern contraceptive prevalence rate (mCPR) was 25% in 2018⁽⁸⁾, which was further lower in the neglected areas that were less than 20 percent⁽⁹⁾. SDGs propose a significant relationship between maternal health improvement and the increased use of Family planning services⁽¹⁰⁾. To decrease MMR (maternal mortality rate), the Safe Motherhood Initiative which is a main component of RHC has recognized FP as an important component accompanied by prenatal care, perinatal care, and harmless delivery⁽¹¹⁾.

The usage of contraceptives is taken as a cost-effective intervention to complete the targets of SDGs⁽¹²⁾. Although the use of contraceptives is increased in Pakistan from 11.9% (1990) to 35% (2013) along with a reduction in the fertility rate from 5.4 births/woman to 3.8 births/woman in 2013⁽¹³⁾, that is approximately 3.2 for urban and 4.2 for suburban areas⁽¹⁴⁾. The prevalence of unmet need for FM services is still high that is 20%⁽¹³⁾. The WHO recommended that social franchising, voucher schemes, and contracting out are valuable methods to increase the use of

contraceptives⁽¹⁵⁾. Mobile use is increased extraordinarily due to its decreasing prices^{(16),(17)}. This increased use of mobile phones is taken as a facilitating factor for the launch of mHealth in countries with limited resources^{(18),(19)}.

To improve health and control diseases, mHealth has been taken as a very effective method^{(20),(21)}. This can be done by supplying info regarding health and healthcare services^{(22),(23)}. In Pakistan, mHealth is considered important in reducing maternal mortality by providing and spreading information⁽²⁴⁾. A review of previous literature about mHealth showed that many projects were finished after the pilot because of a lack of scaling policies and plans. The WHO endorses that the private sector should be engaged along with the government set up to enhance the use of Family Planning services⁽¹⁵⁾.

To increase the use of family planning services by public-private business model, Punjab Population Innovation Fund (PPIF), which is a public, non-profit company and provides monetary and technical support to inventive projects for population planning and improving access and generating demand for FP services⁽²⁵⁾, selected three inventive and possibly scalable pilot approaches to support, including Connect4fp.

This Connect4fp project (Fig i) was implemented by International Rescue Committee (IRC) along with the technical assistance of Viamo which used mobile technology to deliver both Interactive Voice Response (IVR) as well as Short Message Service (SMS) (i.e., text messages). The innovative ideas of this project were male involvement in the form of male FP Champions, whose purpose was to address and educate the males of the project area about family planning and use of mobile phones to spread FP knowledge. This mHealth was implemented by mobile telecommunication companies like Telenor, Jazz, Warid, etc.

This study overall determined the impact of mHealth on family planning advice and the use of family planning services in the project area that is Tehsil Jalalpur Pirwala whose 9 rural union councils (UCs) were selected for this business model intervention.

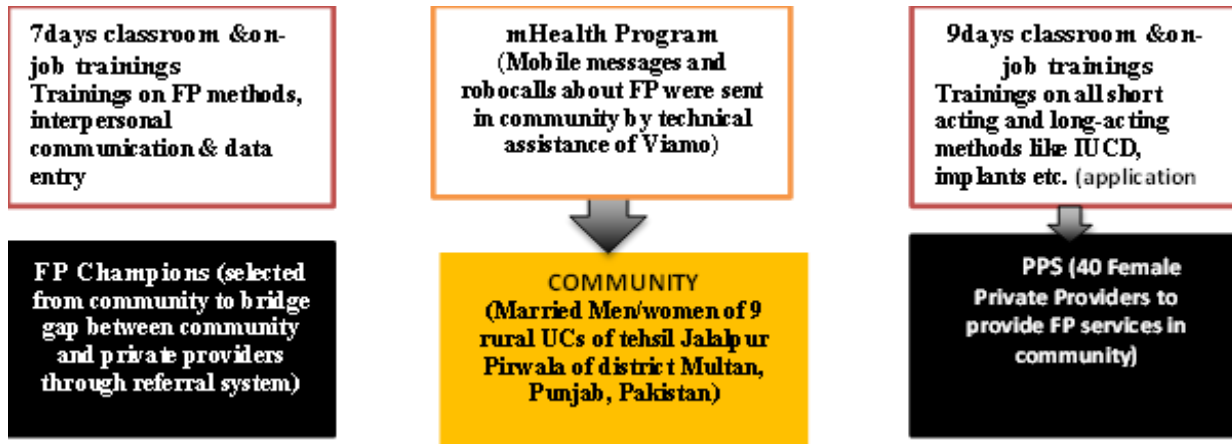


Fig i: Conceptual framework of “Connect4fp project” implemented by IRC.

Materials and Methods

This study assessed the knowledge and perceptions of married men and women of reproductive age in the project area regarding mHealth and its effect on family planning with the help of a structured Likert scale questionnaire. This research also determined the perceptions and viewpoints of 40 private providers and 27FP Champions (who were part of the project) about mHealth through telephonic interviews with the help of a semi-structured guide and their response was quantified by using a Likert scale.

Sampling Technique: The sample size was 197 participants both males and females selected from 9 union councils of tehsil Jalalpur Pirwala of district Multan for cross sectional survey to assess their perceptions about mHealth. Consecutive sampling techniques were used to select the participants. The inclusion criteria were married men and women residing in that union council for at-least six months.

The data was collected by using a structured Likert scale questionnaire addressing the knowledge, attitudes and opinions regarding mHealth and its effect on family planning. The questionnaires were filled by principal investigator along with project data collectors by asking questions in local language from men/husbands and women living in project area. The data was collected on a regular basis until the sample size was achieved.

The data of female Private providers and FP champions was collected by principal investigator itself through telephonic interviews and their response was quantified and measured by Likert scale. A small pilot study was done with 20 participants. During the pilot testing, deficiencies in data collection were

recognized and modified as required for the final data collection. For analysis, SPSS version 21 was used. Descriptive statistics were done. Summary statistics for continuous variables and frequencies and percentages were calculated for categorical variables.

Results

mHealth assessment – Community members

Table-1 shows that 60.4% of community members agreed that their family planning knowledge is increased due to mobile msgs/robocalls. When it was asked from study participants that currently using any contraceptive method, 71.6% gave positive response.

Table-1 Descriptive statistics summary and Likert scale response of community members of project area about mHealth & its effect on Family planning.

Descriptive statistics	Median±SD
Age	3±1.279 ^a
Gender	2±0.365 ^b
No. of Kids	3±1.634
Currently using any contraceptive method	1±0.665 ^c

^a where 3 is the age range between (30-34) years,

^b 2= females, ^c where 1=yes, 2=No

<i>mHealth contents</i>	<i>Q-(25-75)th</i>	<i>Freq% (1, 2, 3)</i>
FP mobile msgs/robocalls bring positive change in my life	(1-1)	(84.8, 4.1, 11.2)
Awareness about FP methods increased due to mobile msgs/robocalls	(1-1)	(78.7, 4.6, 16.8)
I want to use contraceptive methods after hearing these robocalls	(1-1)	(79.7, 4.6, 15.7)
My FP knowledge is increased due to mobile msgs/robocalls	(1-3)	(65.0, 6.1, 28.9)
Discuss these mobile msgs/ robocalls with my husband/wife	(1-2)	(51.8, 30.5, 17.8)
Talk to my friends/relatives about FP	(1-2)	(57.9, 30.5, 11.7)
Share my FP knowledge with others	(1-1)	(85.8, 3.6, 10.7)
Misconceptions about FP reduced due to mobile msgs/recorded calls	(1-3)	(70.6, 3, 26.4)
My community has positive opinion about these mobile msgs/robocalls	(1-3)	(44.7, 12.2, 43)
This mHealth program should be continued in future	(1-1)	(95.9, 1.5, 2.5)

Note: Table 1 represents the contents related to the mobile health project (mHealth). The respective columns are Mean±SD shows the data spread, Q shows the location, and the freq. of responses is given in percentage where Likert scale response options were as follow 1= Agree, 2=Disagree, 3=Neutral

mHealth assessment - Private providers and Family planning Champions

Below table 2. shows that 72% Private providers and 87% FP champions were agree that “Knowledge of community members about FP is increased due to the m-Health program implemented in project area. 60% Private providers while 87.5% FP champions were agreed that this mHealth project is beneficial and should be continue in future.

Table 2: Likert scale response of Private providers and Family planning Champions about mHealth & its effect on Family planning

<i>mHealth Contents</i>	<i>Q-(25-75)th</i>	<i>Freq. (%)</i>
Private Providers (PPs)		(1, 2, 3)
Know about m-Health program in community	(1-1)	(Y=84, N=16)
Knowledge about FP is increased due to this m-Health	(1-2)	(72, 12, 16)
Family planning services increased due to m-Health	(1-3)	(36, 24, 40)
No of patients increased due to m-Health	(1-3)	(36, 28, 36)
Overall positive opinion about m-Health in community	(1-3)	(44, 08, 48)
Should continue m-Health program in future	(1-3)	(60, 04, 36)
Family Planning Champions (FPCs)		
Know about m-Health program in community	(1-1)	(Y=93, N=6.3)
Knowledge about FP is increased due to this m-Health	(1-1)	(87.5, 6.3, 6.3)
Family planning services increased due to m-Health	(1-1)	(81.3, 12.5, 6.3)
No of patients increased due to m-Health	(1-1.75)	(75, 6.3, 18.8)
Overall positive opinion about m-Health in community	(1-2)	(56.3, 25, 18.8)
Should continue m-Health program in future	(1-1)	(87.5, 6.3, 6.3)

Note: Table 2. represents the contents related to mobile health (mHealth) and its effect on FP. The respective columns are Q shows the location and the freq. of responses of Private Providers and Family planning Champions in percentage where Likert scale response options were as follow, 1= Agree, 2=Disagree, 3=Neutral

Association of family planning knowledge to contraceptive use

The association of family planning knowledge of community members was determined to their contraceptives use by using Chi square. Cross tabulation was done of family planning knowledge to contraceptives use as shown in table 3. The Chi-Square statistic was calculated and compared it against the critical value from the Chi square distribution. The p value of the Chi square statistic was “.000”, which was less than 0.05(alpha level with 95% confidence level). On the basis of this, it was concluded that there is a statistical relationship between family planning knowledge and contraceptive use.

Table 3: Cross tabulation for family planning knowledge to contraceptive usage

				Family planning knowledge			Total	χ ² p-value
				1 Agree	2 Disagree	3 Neutral		
Currently using any contraceptive	1 yes			51.3%	2.5%	17.8%	71.6%	
	2 No			12.2%	1.5%	4.6%	18.3%	
	3 Do not disclose			1.5%	2.0%	6.6%	10.2%	
Total				65.0%	6.1%	28.9%	100.0%	.000

Note: The response of “Family planning Knowledge increased due to mHealth” was given as 1= agree, 2= disagree and 3= Neutral. While response of “using contraceptive method” was given as 1=yes, 2=No and 3= Do not disclose

Discussion

This research was conducted to determine the impact of mHealth advice for family planning in 9 UCs of tehsil Jalalpur Pirwala. This mHealth program was a part of this Connect4fp project implemented by IRC. It was based on the appropriate Behaviour Change Communication (BCC) strategy. This BCC strategy triggers the community to adopt positive and healthy behavioral practices. A mobile phone project was implemented within the Nouna Health District (NHD), in rural Burkina Faso to enhance better access to health information and care delivery for mothers, and people living with HIV⁽²⁶⁾. An interactive messaging and voice system were developed and incorporated major local languages to overcome literacy barrier. This study concluded that the use of mobile phones at community level could improve their access to health care. These findings are parallel to this present study.

This present study delivered understanding of end-user’s viewpoints on a theory driven mHealth program used to increase knowledge and awareness regarding family planning. This study also highlighted the project approach which included men along with women of reproductive age in FP mHealth program. These conclusions are compatible with a study conducted in Kenya⁽²⁷⁾, who included men in family planning SMS intervention. Receiving SMS may trigger communication about postpartum FP within

couples and help them to choose contraceptive method of choice.

In the present study, 72% PPs and 88% FPCs agreed that these mobile messages and robocalls have an important role in increasing FP knowledge and awareness. 60 percent of PPs while 88 percent FPCs were willing that this mHealth program should be continued in community in future while 96% community members included in this study agreed with this. The baseline study of this Connect4fp project displayed that the majority of men participants (91%) had mobile phone in their use as compared to 21% of women respondents. A study was done in Burkina Faso (African country) to examine the association between cell phone ownership and modern contraceptive use⁽²⁸⁾. Women with cell phones had 68% higher odds of using a modern contraceptive compared to women with no cell phone, adjusting for sociodemographic characteristics. The results of this study can be compared with present study that mobile ownership is an important factor to make mHealth programs successful and this issue should be addressed in this Connect4fp project, where only 21% of females have their own mobile.

In Pakistan, a research was conducted by Umaira U at el.⁽²⁹⁾ to explore the use of a mobile application, Baby+, designed to support pregnant women. The results exposed that most of the users of mobile application were very positive about the functionality. The study participants mentioned that this application will

increase their awareness and information about adopting a healthy life during their pregnancy.

A review (63 articles comprising 53 studies) reveals⁽³⁰⁾ that mHealth studies in developing countries tend to concentrate on specific stages, principally on pilot projects that adopt a deterministic approach to technological inputs (n = 32). There were some studies with proper research designs that establish evidence of outputs (n = 15), such as improvements in healthcare processes and public health indicators. This review⁽³⁰⁾ also demonstrated that there is a lack of dominant theory mainly from social logical perspectives along with info technology. This lack of theoretical framework behind technology identified in this review is compensated in project of present study where mHealth is designed on the basis of BCC strategy.

Another Literature review of mHealth in developing countries suggest⁽³¹⁾ that individually, each mHealth project looks very impressive, but they do not contribute to a significant rise in the adoption of mHealth. Review of literature was done by Siddique L et al in Pakistan⁽³¹⁾ that identified the issues and barriers in the way of successful mHealth projects in developing countries were lack of sustainability, scalability and private public partnerships. This review concluded that mHealth should be incorporated in National healthcare programs and policies of developing countries and sustainability & scalability are important key solutions for their effectiveness.

These findings are consistent with the present study that this mHealth program implemented in Connect4fp project should be continued in future to gain its long-term effects and benefits on family planning. This mHealth program was designed on the basis of BCC strategy and behavior change is a complicated and time required process, even more than predicted. It required continuous fostering for new, healthy actions. In this context, sustainability and scalability of this mHealth program is the key to gaining its maximum benefits on family planning. That will increase the use of contraceptive methods and as result, increase in CPR (Contraceptive Prevalence rate) & decrease in TFR (Total fertility rate).

Conclusion

In conclusion, mobile messages and robocalls about family planning sent in local language positively contributed to increase family knowledge and

awareness in community and may trigger communication about family planning within couples, as a result increase use of family planning services in the community.

References

1. Brief on Census -2017 | Pakistan Bureau of Statistics [Internet]. Pbs.gov.pk. 2017. Available from: <https://www.pbs.gov.pk/content/brief-census->
2. CONTRACEPTIVE PERFORMANCE REPORT 2018-19 PAKISTAN... - Google Scholar [Internet]. [cited 2021 Mar 10].
3. Khan K, Sathar Z. Population Council Population Council Knowledge Commons Knowledge Commons Best Bets for Accelerating Family Planning in Pakistan: Inducting Best Bets for Accelerating Family Planning in Pakistan: Inducting men, sharing responsibility men, sharing responsibility [Internet]. Reproductive Health Social and Behavioral Science Research. 2020 [cited 2021 Mar 10]. doi: 10.31899/rh14.1045
4. Ali M, Azmat SK, Hamza H Bin, Rahman MM, Hameed W. Are family planning vouchers effective in increasing use, improving equity and reaching the underserved? An evaluation of a voucher program in Pakistan. BMC Health Serv Res [Internet]. 2019 Dec 29 [cited 2021 Feb 28];19(1):200. doi: <https://doi.org/10.1186/s12913-019-4027-z>
5. Yeakey MP, Muntifering CJ, Ramachandran D V., Myint YM, Creanga AA, Tsui AO. How contraceptive use affects birth intervals: Results of a literature review. Stud Fam Plann. 2009;40(3):205–14. doi: <https://doi.org/10.1111/j.1728-4465.2009.00203.x>
6. The little data book 2015. Washington, DC: World... - Google Scholar [Internet]. [cited 2021 Mar 10].
7. Zaidi B, Hussain S. Reasons for low modern contraceptive use—Insights from Pakistan and neighboring countries [Internet]. Reproductive Health Social and Behavioral Science Research. 2015 Jan [cited 2021 Mar 10]. doi: 10.31899/rh9.1080
8. National Institute of Population Studies, The DHS... - Google Scholar [Internet]. [cited 2021 Mar 10].
9. Dhs M. Preliminary Report [Internet]. dhsprogram.com. [cited 2021 Mar 10]. Available from: www.nips.org.pk
10. Goli S, Moradhvaj, James KS, Singh D, Srinivasan V. Road to family planning and RMNCHN related SDGs: Tracing the role of public health spending in India. <https://doi.org/101080/1744169220201809692> [Internet]. 2020 [cited 2022 Oct 11];16(4):546–62.
11. Ahmed S, Li Q, Liu L, Lancet AT-T, 2012 undefined. Maternal deaths averted by contraceptive use: an analysis of 172 countries. Elsevier [Internet]. [cited 2021 Mar 10]; doi: [https://doi.org/10.1016/s0140-6736\(12\)60478-4](https://doi.org/10.1016/s0140-6736(12)60478-4)
12. Starbird E, Norton M, Marcus R. Investing in Family Planning: Key to Achieving the Sustainable Development Goals. Glob Heal Sci Pract [Internet]. 2016 Jun 20 [cited 2021 Mar 10];4(2):191–210. doi: <https://doi.org/10.9745%2FGHSP-D-15-00374>
13. National Institute of Population Studies & MEASURE... - Google Scholar [Internet]. [cited 2021 Mar 10].
14. Amjad A, Amjad U, Zakar R, Usman A, Zakar MZ, Fischer F. Factors associated with caesarean deliveries among child-bearing women in Pakistan: Secondary analysis of data from the Demographic and Health Survey, 2012-13. BMC Pregnancy Childbirth. 2018 Apr 23;18(1). doi: <https://doi.org/10.1186/s12884-018-1743-z>

15. Organization WH. Public Policy and Franchising Reproductive Health: Current Evidence and Future Directions Guidance from a technical consultation meeting [Internet]. 2007 [cited 2021 Mar 10].
16. Gul X, Hameed W, Hussain S, Sheikh I, Siddiqui JUR. A study protocol for an mHealth, multi-centre randomized control trial to promote use of postpartum contraception amongst rural women in Punjab, Pakistan. *BMC Pregnancy Childbirth*. 2019 Aug 8;19(1). doi: <https://doi.org/10.1186/s12884-019-2427-z>
17. Lewis T, Synowiec C, ... GL-... of the WH, 2012 undefined. E-health in low-and middle-income countries: findings from the Center for Health Market Innovations. *SciELO Public Heal* [Internet]. [cited 2021 Mar 10]; doi: <https://doi.org/10.2471%2FBLT.11.099820>
18. Lambert O, Littlefield E. Dial growth. *Finance Dev....* - Google Scholar [Internet]. [cited 2021 Mar 10].
19. Kay M, Santos J, Organization MT-WH, 2011 undefined. mHealth: New horizons for health through mobile technologies. *who.int* [Internet]. [cited 2021 Mar 10];
20. Kumar S, Nilsen W, Abernethy A, ... AA-A journal of, 2013 undefined. Mobile health technology evaluation: the mHealth evidence workshop. Elsevier [Internet]. [cited 2021 Mar 10]; doi: <https://doi.org/10.1016/j.amepre.2013.03.017>
21. Cole-Lewis H, reviews TK-E, 2010 undefined. Text messaging as a tool for behavior change in disease prevention and management. *academic.oup.com* [Internet]. [cited 2021 Mar 10];doi: <https://doi.org/10.1093/epirev/mxq004>
22. Klasnja P, informatics WP-J of biomedical, 2012 undefined. Healthcare in the pocket: mapping the space of mobile-phone health interventions. Elsevier [Internet]. [cited 2021 Mar 10]; doi: <https://doi.org/10.1016/j.jbi.2011.08.017>
23. Kreps GL, Neuhauser L. Author's personal copy New directions in eHealth communication: Opportunities and challenges. Elsevier [Internet]. [cited 2021 Mar 10];
24. Telenor Group. The socio-economic impact of mobile... - Google Scholar [Internet]. [cited 2021 Mar 10].
25. Punjab Population Innovation Fund: About | LinkedIn [Internet]. [cited 2021 Apr 30]. Available from: <https://www.linkedin.com/company/punjab-population-innovation-fund-lahore/about/>
26. Yé M, Bagagan C, Millogo O, Tinto I, Sié A, Vincent D, et al. Use of Mobile Phone to Promote Governance and Equity within the Health System: Experience of Rural Health District in Burkina Faso. *J Heal Commun* [Internet]. 2016 [cited 2021 Mar 29];1:3. doi: 10.4172/2472-1654.100017
27. Harrington, EK, McCoy, EE, Drake AL, Matemo D, John-Stewart G, Kinuthia J, et al. Engaging men in an mHealth approach to support postpartum family planning among couples in Kenya: A qualitative study. *Reprod Health*. 2019 Feb 11;16(1).doi: <https://doi.org/10.1186/s12978-019-0669-x>
28. Greenleaf A, Ahmed S, Moreau C, Guiella G, Contraception YC-, 2019 undefined. Cell phone ownership and modern contraceptive use in Burkina Faso: implications for research and interventions using mobile technology. Elsevier [Internet]. [cited 2021 Mar 29]; doi: <https://doi.org/10.1016/j.contraception.2018.11.006>
29. Sajjad UU, Shahid S. Baby+: A mobile application to support pregnant women in Pakistan. In: Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct, MobileHCI 2016 [Internet]. New York, NY, USA: Association for Computing Machinery, Inc; 2016 [cited 2021 Mar 29]. p. 667–74. doi: <https://doi.org/10.1145/2957265.2961856>
30. Chib A, Van Velthoven MH, Car J. MHealth adoption in low-resource environments: A review of the use of mobile healthcare in developing countries. *J Health Commun* [Internet]. 2015 Jan 2 [cited 2021 Mar 29];20(1):4–34. doi: <https://doi.org/10.1080/10810730.2013.864735>
31. Latif S, Rana R, Qadir J, Ali A, Imran MA, Younis MS. Mobile Health in the Developing World: Review of Literature and Lessons from a Case Study. Vol. 5, IEEE Access. Institute of Electrical and Electronics Engineers Inc.; 2017. p. 11540–56. doi: <https://doi.org/10.1109/ACCESS.2017.2710800>