

# Attitude and Willingness to Use mHealth by Antenatal Care Patients in Ilorin, North Central Nigeria

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## ABSTRACT

In a preceding paper, the authors studied the perception of pregnant women in Ilorin, Nigeria on the use of mobile health (mHealth) system, especially telephones, to access antenatal care treatments. In the present paper, using the same study population and procedure, focus is placed on the attitude and willingness to use mHealth by antenatal care patients in the same Ilorin metropolis, North Central Nigeria. In line with the preceding paper, a descriptive cross-sectional study was carried out to assess the attitude and willingness to use mHealth among women attending antenatal clinics in Ilorin Metropolis, Kwara State. This involved 450 respondents using multi-stage sampling technique. The age of the respondents ranges between 18 - 47 years with a mean age of  $29.70 \pm 5.56$  years. Slightly more than half of the respondents 252(56.0%) had secondary education, while 27(6.0%) of respondents had no formal education. Majority of the respondents (80.2%) possessed mobile phone during the course of the study. Majority of the respondents (68.0%) had heard about mHealth. Regarding the attitudinal disposition of the respondents towards mHealth, 78.4% of the respondents had and positive attitude towards mHealth using Likert's scoring scale. Most of the respondents (83.3%) were willing to use mobile device for diagnostic process, 67.1% of the respondents were also willing to be receiving antenatal tips by phone while 248 (55.1%) of the respondents were not willing to use mHealth service as the fees gets higher This study showed that mobile phones would be an acceptable approach to provide pregnancy and delivery support to women attending antenatal clinics in Ilorin Metropolis since the vast majority of the pregnant women had mobile phones, had positive attitude about mHealth and were willing to use mHealth service.

**Keywords:** Antenatal care, Pregnancy, Childbirth, mHealth, Women, Questionnaire, Mobile phone, Clinics

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## 1. INTRODUCTION

In a preceding paper, the authors studied the perception of pregnant women in Ilorin, Nigeria on the use of mobile health (mHealth) system, especially telephones, to access antenatal care treatments. In the present paper, using the same study population and procedure, focus is placed on the attitude and willingness to use mHealth by antenatal care patients in the same Ilorin metropolis.

### 1.1 Research Questions

- i. Are women attending antenatal clinics in Ilorin Metropolis aware of mHealth?
- ii. What is the attitude of women attending antenatal clinics in Ilorin Metropolis about mHealth?
- iii. Are women attending antenatal clinics in Ilorin Metropolis willing to use mHealth?
- iv. What are the factors that influence women attending antenatal clinics in Ilorin Metropolis to use mHealth?
- v. What are the benefits of mHealth among women attending antenatal clinics in Ilorin Metropolis?

### 1.2 Research Hypothesis

#### Null Hypothesis ( $H_0$ )

1. There was no association between monthly expenditure and access to mHealth among women attending ANC in Ilorin Metropolis.
2. There was no association between frequency of healthcare service seeking and use of mHealth as a source of health information among women attending ANC in Ilorin Metropolis.
3. There was no association between frequency of m-health use and comfort in expressing health needs on mHealth among women attending ANC in Ilorin Metropolis.

#### Alternative Hypothesis ( $H_1$ )

1. There was an association between monthly expenditure and access to mHealth among women attending ANC in Ilorin Metropolis.
2. There was an association between frequency of healthcare service seeking and use of mHealth as a source of health information among women attending ANC in Ilorin Metropolis.

3. There was an association between frequency of mHealth use and comfort in expressing health needs on mHealth among women attending ANC in Ilorin Metropolis.

### 1.3 Objectives of the Study

#### General Objective

To assess the attitude and willingness to use mHealth among women attending antenatal clinics in Ilorin Metropolis

#### Specific Objectives

This research aims to:

- i. To determine the attitude of women attending antenatal clinics in Ilorin Metropolis towards the use of mHealth.
- ii. To determine the willingness to the use of mHealth by the women attending antenatal clinic in Ilorin Metropolis.
- iii. To identify the factors that influence the attitude and willingness to use mHealth among women attending antenatal clinic in Ilorin Metropolis.

## 2. LITERATURE REVIEW

### 2.1 Adoption of mHealth in Maternal Health Care

mHealth remains one of the biggest technology breakthroughs to address health as was revealed during the 2011 annual mHealth Summit in the Washington, DC area. Worldwide, the technology and its promise have moved up the healthcare agenda. Increasingly ubiquitous and powerful mobile technology holds the potential to address long-standing issues in healthcare provision. However, there are only a few proven business models of implementing this technology. A global survey of 114 nations undertaken by the World Health Organization found that mHealth initiatives have been established in many countries, but there is variation in adoption levels. The most common activity was the creation of health call centres, which respond to patient inquiries. This was followed by using SMS for appointment reminders, using telemedicine, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients, and physician decision support (Hall and Khan, 2002).

## 2.2 Knowledge and mHealth in maternal health care

In education and awareness applications, SMS messages are sent directly to users' phones to offer information about testing and treatment methods, availability of health services, and disease management. Formal studies and anecdotal evidence demonstrate that SMS alerts have a measurable impact on and a greater ability to influence behaviour than radio and television campaigns (Assael, 2005). SMS alerts provide the further advantage of being relatively unobtrusive, offering recipients confidentiality in environments where disease (especially HIV/AIDS) is often taboo. In the developing world, SMS alerts have proven particularly effective in targeting hard-to-reach populations and rural areas, where the absence of clinics, lack of healthcare workers, and limited access to health-related information all too often prevent people from making informed decisions about their health. SMS message campaigns can be set up either as one-way alerts or interactive tools used for health-related education and communication.

## 2.3 Technology and mHealth in maternal health care

Despite the high level of penetration of mobile telephony technology, penetration of mHealth has been picking at a slow rate. The field of technology also changes very rapidly because of innovation, therefore if technological innovations do not work out as planned, the risks to human health could be substantial and difficult to foresee (Economic Intelligence Unit, 2012). A study revealed that more than 70 percent of the world's population and more than 80 percent of people living in developing countries do not have internet access yet and even fewer have access to broadband internet. In many developing countries, therefore, schools, hospitals, other institutions and households located outside major urban centres do not have access to high-speed internet services. Despite the spectacular growth in mobile technology, access to wireless internet via mobile phones has remained limited notwithstanding, the fact that most mobile operators in Africa have introduced broadband services, including 3G and 3.5G (Calendro et. al., 2010).

## 2.4 Cost and mHealth in maternal health care

Acquisition and ownership costs refer to the risks and costs associated with purchasing mHealth solutions and operating or maintaining them, respectively. A risk inherent to the adoption of solutions built on continuously evolving technologies is obsolescence. One aspect of

obsolescence is the need to periodically upgrade a solution, which can be costly (both in terms of direct upgrade costs and indirect costs associated with integration and/or training). Tied to this hurdle is the increasing cost of maintenance, since older technologies are less readily supported. Another aspect of obsolescence can be even more costly.

## 2.5 Perception, Attitude and Willingness of Pregnant woman to use mHealth

From a study conducted in Argentina on the interest of pregnant women in the use SMS for the improvement of perinatal & postnatal care, it was discovered that the vast majority of the interviewed women had access to and were open to receive SMS text messages and cell phone calls with educational information regarding pregnancy and infant health. According to the findings in the study, women would be willing to be enrolled in a mHealth one-way text-messaging program at their antenatal visit and receive information via text message regarding everything from prenatal/infant diet, to lactation information, to infant skin care. The most preferred approach was text messages sent out one or three times a week. Ideally, women should be able to choose when and how frequently they would receive text messages. Since a majority of women own cell phones, and report to be interested in receiving educational information via SMS text message, pregnant women could benefit from a mHealth program (Gabriela et. al., 2012).

A study carried in Ile-Ife on Childbearing women's perception about the use of mHealth for maternal health information in rural communities showed that the general perception of the benefits of mHealth for providing information was high among the respondents. Respondents who had a positive perception about use of mobile phone for disseminating maternal health information had higher odds of accessing a health institution for delivery compared to those who had poor perception about use of mobile health technology. Most women had a positive perception about using their mobile phones for receiving maternity care information from their healthcare providers and even though there was no service in place nearly half already used their phones to communicate with their maternal health providers. The high ownership of mobile phones and generally positive perception of mHealth use in pregnancy does not necessarily equate to subsequent use of mHealth, as 41% of respondents felt that mHealth technology will not reach rural women, 44% had concerns about confidentiality and privacy, and 32% felt that using mobile phones was not

cost effective (Odetola et. al., 2018). In a study at semi-urban hospital in Nigeria, doctors with a high level of knowledge, attitude and willingness to adopt mHealth, considered concerns about confidentiality and privacy as a major constraint to mHealth (Adebara et. al., 2017).

Also, in a study in urban-rural communities in Argentina, 91% of women were interested in receiving educational information via text based messages and 87% showed interest in receiving phone calls with similar prenatal and postnatal educational information. More people in our study had no schooling 34% than in the Argentinian study 17.1% and lack of education influenced perception (Cormick et. al., 2012). A study done in Oyo State showed that the majority of the health workers had poor knowledge of mHealth and that very few of them were aware of mobile health being pilot-tested in Nigeria. From this perspective, understanding women's perceptions about the strategy will help in designing and implementing of mHealth interventions in communities. Those implementing mHealth solutions should facilitate training and retraining of health workforce and enlighten the populace on the benefits of mHealth (Odetola and Okanlawon, 2014).

## **2.6 Factors that contribute to the acceptance and willingness to use mHealth**

Access to antenatal healthcare is still limited for many women in Nigeria, while it remains an important determinant of maternal mortality and morbidity. Information and communication technologies (ICTs), such as mHealth can help to facilitate this access by acting on the various obstacles encountered by women which are the socio-cultural, economic, geographical or organizational (Mohamed, 2017). However, various factors contribute to the success of mHealth implementation and use. The factors are categorized into 5: (i) technology, such as technical support to maintain, troubleshoot and train users, good network coverage, existence of a source of energy and user friendliness; (ii) user acceptance which is facilitated by factors such as unrestricted use of the device, perceived usefulness to the worker, adequate literacy, or previous experience of use; (iii) short –and long –term funding; (iv) organizational factors, such as the existence of a well organized health system and effective coordination of interventions; and (v) political or legislative aspects, in this case strong government support to deploy technology on a large scale (Broens, 2007).

## **2.7 Challenges to the adoption of m-Health in healthcare**

Health mobile information technologies, within the context of developing countries, are not without their challenges. Most of these countries are still grappling with high levels of illiteracy, moderate levels of technology use, language barriers and the general affordability of mobile phones (De Tolly, 2012; Chang, 2011). There are a lot of challenges to the adoption of Health Information Technology (HIT) in healthcare service delivery and such challenges provide information on some of the factors that are worth considering in building up framework for mobile health adoption.

The use of mHealth in developing countries can help in the provision of basic need by improving the quality of healthcare. However, the delivery and management of health services to deprive communities and regions is a truly difficult task (Braa, 2004). The four main challenges in HIT adoption are physical access due to expensive hardware, poor ICT skills, negative attitudes and highly technical context. In spite of the support for the exciting benefits of mHealth, a number of impediments continue to stand in the way of its widespread adoption by health organization and consumers. Most consumers are still not aware that they may access specialist knowledge online. It was also argued that mHealth has a numbers of challenges to overcome before it can be integrated into the overall fabric of healthcare (Granesh, 2004).

In developing countries, the public sector sinks in lots of challenges and health technologies have been suggested as a reasonable technological strategy that may offer a set of new and creative health solutions. It was advocated that, developments in communication technologies such as internet, 3G cell phones, cheaper and yet powerful hardware over the past decades have paved the way to the evolution of m-Health which uses internet oriented technologies to provide quality health service to people from remotely dispended sites. While research findings have reported a notable growth in the diffusion of internet in most developing countries, it is generally a known fact that most of the people in such countries, especially the part of rural Africa, which represent the majority of the African Populace, have limited info access, no electricity, no internet and most importantly are illiterate (Kreps, 2010).

## **3. METHODOLOGY**

In this section, the methodology used in the research reported in this paper is presented. Essentially, the methodology is same as that used in an earlier paper by the authors (Emma-Anyasodo and Ameen, 2020).

That is, the study population comprised of women attending antenatal clinic in Ilorin Metropolis. A descriptive cross-sectional study was carried out to assess the attitude and willingness to use mHealth among women attending antenatal clinics in Ilorin Metropolis, Kwara State. This involved 450 respondents using multi-stage sampling technique. The age of the respondents ranges between 18 - 47 years with a mean age of 29.70 ±5.56 years. Slightly more than half of the respondents 252(56.0%) had secondary education, while 27(6.0%) of respondents had no formal education. Majority of the respondents (80.2%) possessed mobile phone during the course of the study. Majority of the respondents (68.0%) had heard about mHealth.

### 3.1 Inclusion and Exclusion Criteria

#### Inclusion Criteria

- Pregnant women that are above 15 years of age attending antenatal care service in Ilorin Metropolis were included in the study.
- Pregnant women that give consent to participate in the study were included in the study.

#### Exclusion Criteria

- Pregnant women that do not want to participate in the study were excluded in the study.
- Very sick women who are not strong or healthy enough to answer the questionnaire were excluded.

### 3.2 Sampling Technique

A multi-stage sampling technique was adopted as follows (Charan and Biswas, 2013; Jung, 2013):

#### Stage 1- Selection of health facilities

The 3 public secondary health facilities in the state were selected for the study, namely; General Hospital, Civil Service Hospital and Sobi Specialist Hospital. A proportionate allocation was used to determine the number of questionnaires that were administered in each hospital. It was calculated depending on the total number of registered women for antenatal in each hospital from January to June 2018. Total number of women registered

for ANC in General Hospital was 2552, 1134 women were registered in Civil Service Hospital and 1039 women registered for ANC in Sobi Specialist Hospital. The addition of the registered women for ANC in all the hospitals was 4725. After the calculation, 243 questionnaires were administered at General Hospital, 108 questionnaires in Civil Service Hospital and 99 questionnaires in Sobi Specialist Hospital.

#### Stage 2 – Selection of respondents

In each hospital, systematic random sampling technique was used to select respondents for the sample study using the total number of women who attend the antenatal clinic in each hospital at the time of the study as the sampling frame.

### 3.3 Preparation for Data Collection

Advocacy visits was paid to the Head of the Department of Obstetrics and Gynaecology of the selected hospitals in Ilorin metropolis, intimating them with the research and soliciting for their support. Four trained research assistants were employed to aid with the administration of questionnaires. The tool of data collection was pretested in Offa General Hospital, Offa. This was carried out using 10% of the sample size at Offa General Hospital, Offa to determine the validity of the questionnaires.

### 3.4 Data Collection Instrument

A semi – structured interviewer administered questionnaire was used to obtain information from the participants on the perception, attitude and willingness to use mHealth among women attending antenatal clinic in Ilorin Metropolis. The questionnaire was validated and adjusted to suite the environment where this study was carried out. The questionnaire was developed by the researcher and structured to have five sections: section 1, 2, 3, 4 and 5. Section 1 was for gathering respondent's socio-demographic data. Section 2 was used to collect data on the use of mobile phones and awareness of mHealth among women attending antenatal clinic in Ilorin Metropolis. Section 3 was used to collect data on the perception of women towards mHealth which was structured as a four –point, Likert's –type response format. Section 4 was used to collect data on the attitude of women towards mHealth which was structured as a four –point, Likert's –type response format. The four-point response format of “Strongly Agree”, “Agree”, “Disagree” and “Strongly Disagree” quantified as 3, 2, 1, and 0 respectively was used. Section 5 was used to collect

data on the willingness of women attending antenatal clinic to use mHealth.

### 3.5 Data Collection Procedure

Four trained research assistants participated in the data collection in the study after a detailed explanation as to the purpose of the study was given to all the eligible respondents. Data collection was done within three (3) weeks, each week for hospital. Data was collected with the use of the interviewer - administered questionnaire early in the morning before the commencement of lectures from 7:30am to 8:30am in their various units. The reason was due to transport issues they encounter going back home after their consultation in the afternoon.

### 3.6 Ethical Consideration

Ethical approval was obtained from the Ethical Review Committee of Faculty of Clinical Sciences through Department of Epidemiology and Community Health with reference number UIL/UERC/16/68KF003. Verbal informed consent was sought and obtained from each of the participants with anonymity and confidentiality of the information obtained was assured and maintained.

### 3.7 Data Analysis

Data collected was checked daily for correctness and completeness. Then it was coded and analyzed using common tools for analysing statistical data. Inferential statistics to test for associations between categorical variables was done using Chi-square test for qualitative variables. Summary of the statistics was presented using frequency tables, charts, means and rates. Logistic regression analysis was done to identify independent factors for perception, attitude and willingness of pregnant women towards mHealth in Ilorin Metropolis. Level of statistical significance was set at  $p < 0.05$  at confidence level of 95% for all inferential analysis.

Also, Likert's -type response format was used in scoring the attitude of respondents towards mHealth.

Attitude of respondents about mHealth was graded and scored as follows (highest score was 18):

1. Positive attitude: 10-18
2. Negative attitude: 0-9

## 4. RESULTS

The age of the respondents ranges between 18 - 47 years

with a mean age of  $29.70 \pm 5.56$  years. Slightly more than one third of the respondents (32.7%) were between 25 - 29 years age group, Majority of the respondents 373 (82.9%) were Yoruba by tribe, 34 (7.6%) were Hausa, 34 (7.6%) were Igbo while the remaining 9(2.0%) belong to other ethnic groups such as Fulani and Nupe.

More than half (54.0%) of the respondents were of the Islamic faith while the remaining 207(46.0%) were Christians. Almost all of the respondents 429 (95.3%) were married, with 4.2% of the respondents single, while 2(0.4%) were widowed.

Slightly more than half of the respondents 252(56.0%) had secondary education, while 27(6.0%) of respondents had no formal education. Almost half of the respondents 229 (49.1%) were traders, while 18.7% were civil servants and 64(14.2%) of the respondents were unemployed. Slightly more than half of the respondents (51.8%) earned below ₦10,000 monthly with only 4.4% of the respondents earned more than ₦50,001 on monthly basis. Most of the respondents (62.7%) attended antenatal clinic twice with 12.7% attended three or more times on a monthly basis.

Majority of the respondents (81.5%) identified that they have the necessary resources to utilize mHealth, 76.0% had the necessary knowledge and skill to utilize mHealth while 48.0% and 36.3% disagreed that mHealth facilitates convenient doctor to patient collaboration and prevent delayed obstetric complications respectively.

In relation to the attitude of the respondents about mHealth, 353(78.4%) of the respondents had positive attitude towards mHealth while 97(21.6%) of the respondents had negative disposition about mHealth.

Most of the respondents (83.3%) were willing to use mobile device for diagnostic process, 67.1% of the respondents were also willing to be receiving antenatal tips by phone while 248 (55.1%) of the respondents were not willing to use mHealth service as the fees gets higher.

Many of the respondents (35.6%) were willing to commence receiving antenatal tips from month three gestation age of their pregnancy, 138(30.7%) were willing to start receiving antenatal tips from month one gestation age of their pregnancy while 21(4.7%) were not certain of when they should start receiving antenatal tips.

Many of the respondents (46.9%) preferred to be receiving the tips at anytime of the day, 112(24.9%) of the respondents preferred receiving the tips in the morning and 10.2% of them preferred evening time. Two hundred and five respondents (45.6%) were willing to be receiving 3 SMS tips on their phone weekly, while 25(5.6%) were not sure of the number of tips to be receiving weekly.

Majority of the respondents (72.7%) preferred to be receiving physical activities to be done during pregnancy, 69.8% preferred mental health tips, with 48.0% and 44.9% preferred to be receiving family information and appointment reminders during pregnancy respectively.

Most of the respondents (71.1%) believed mHealth enhanced privacy, 51.8% believed it is self efficient, 53.3% agreed mHealth was culturally accepted and 41.6% believed mHealth ensures proper time management. Majority of the respondents (53.8%) believed the adoption of mHealth for antenatal service would improve lifestyle intervention of pregnant women, 22.9% believed it would encourage early antenatal appointment, 16.7% and 6.7% of the respondents believed it would encourage medication adherence and helps in prevention of non communicable diseases respectively.

Association between socio-demographic characteristics and attitude of respondents about mHealth showed significant relationship with age group, level of education, occupation, monthly income and frequency of visit to health centre of the respondents while marital status of the respondents showed no significant difference ( $p=0.367$ ).

Association between socio-demographic characteristics and willingness of respondents to adopt mHealth showed significant relationship with age group, level of education, occupation, monthly income and frequency of visit to health centre of the respondents while marital status of the respondents showed no significant difference ( $p=0.716$ ).

The relationship between willingness to use mHealth with use of mobile phone showed significant difference with ownership of cellphone, correct definition of mHealth and awareness of mHealth among respondents.

## 5. DISCUSSION

This study showed that general awareness towards mHealth among women attending antenatal clinics in Ilorin Metropolis was high.

Attitude is described as a relatively enduring organization of beliefs, feelings and behavioral tendencies towards socially significant objects, groups, events or symbols (Braa, 2004). Attitude influences an individual's choice of action and responses to challenges, incentives and rewards (Lund et. al., 2014). The attitude of women attending antenatal clinics in Ilorin Metropolis was positive to most issues raised on mHealth. This was similar to the findings from a study conducted in Nigeria among Doctors and also a study conducted in India where a positive attitude was demonstrated and the opinions were similar across the various age group (Adebara et. al., 2017; Park et. al., 2009). In a study done in Peru, positive attitude was attributed to a higher level of skills and an increasing frequency of the use of ICT (Downer et. al., 2006). Age group of the respondents in this study was significantly associated with the attitude about mHealth. The observation from this study conforms largely to the well acclaimed general observation of life which is that the younger an individual is, the more receptive he/she to new ideas.

The vast majority of the interviewed women had access to and was open to receive SMS test messages with educational information regarding pregnancy and infant health. According to the findings in this study, majority of the women interviewed were willing to be enrolled in a mHealth one-way text-messaging program at their antenatal visit and receive information via text messages regarding everything from appointment reminders, to prenatal/infant diet, to pregnancy and delivery courses, to physical activities to be practiced during pregnancy. The most preferred approach was text messages sent out one or three times a week with many of the respondents were willing to be receiving the health tips from month three of their pregnancy. Ideally, women should be able to choose when and how frequently they would receive text messages, many of the respondents in this study preferred receiving the text message anytime of the day. This was similar to a study carried out in Argentina on the interest of pregnant women in the use of SMS text message for the improvement of perinatal and postnatal care where high percentage of women were willing to incorporate mHealth program (Cormick et. al., 2012). This study showed significant relationship with age group, level of education, occupation, monthly income and frequency of visit to health centre of the respondents with willingness of respondents to adopt mHealth while marital status of the respondents showed no significant difference ( $p=0.716$ ).

The factors that would influence the use of mHealth in maternal health care practice obtained in this study were identified to be due to the reason that it enhances privacy, self efficacy, culturally accepted, easy to use and affordable. In this study, it was discovered that mHealth program would be use to address irregular attendance to essential reproductive health services. Regular attendance to antenatal care throughout the pregnancy is important to identify complications for pregnancy and improve pregnancy outcomes for mother and child. The findings in this study is in line with the recent reviews concluding that there is moderate evidence that mobile phone text message reminders for health care appointments are more effective than no reminders and that text messaging can result in positive health behavior change (Car et. al., 2012; Guy, 2012). In 2013, Free et. al. assessed the effectiveness of mobile technology interventions delivered to health care consumers and found that text messaging interventions increased adherence to ART and smoking cessation and stated that high quality adequately powered trials are required to evaluate effects of objective outcomes (Free, 2013). The most robust evidence is on the effectiveness of Short Message Service reminders increasing attendance to health care services. Two recent reviews found that SMS reminders increase the likelihood of attending clinic appointments (Car et. al., 2012; Guy, 2012).

## 6. CONCLUSION

Just as with the findings in the authors' earlier paper (Anyasodo-Emma and Ameen, 2020), the present study showed that mobile phones would be an acceptable approach to provide pregnancy and delivery support to women attending antenatal clinics in Ilorin Metropolis since the vast majority of the pregnant women interviewed possessed a mobile phone and referred it as a desired and means of communication.

Majority of the women attending antenatal clinics in Ilorin Metropolis had positive attitude about mHealth, thus this will help to facilitate successful adoption of mHealth services and also help to identify potential obstacles of the program. Willingness to use mHealth service was high among women attending antenatal clinics in Ilorin Metropolis

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APPENDIX

Table 1 – Attitude of respondents towards the use of mHealth for maternal health information

Variables	Frequency (%)			
	Strongly Agreed	Agreed	Disagreed	Strongly Disagree
I have the necessary resource to utilize mHealth	73(16.2)	294(65.3)	75(16.7)	8(1.8)
I have the necessary knowledge and skill to utilize mHealth	141(31.3)	201(44.7)	80(17.8)	28(6.2)
Saving costs for patients and health care providers	183(40.7)	220(48.9)	38(8.4)	9(2.0)
Reducing the time and effort of healthcare professionals	208(46.2)	199(44.2)	43(9.6)	0(0.0)
Facilitates convenient doctor to patient collaboration	54(12.0)	180(40.0)	201(44.7)	15(3.3)
Prevent delayed obstetric complications	89(19.8)	198(44.0)	142(31.6)	21(4.7)

Table 2: Willingness to adopt mhealth among respondents

Variables	Yes (%)	No (%)
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Willing to use mobile device for diagnostic process	375 (83.3)	75 (16.7)
Willingness to be receiving antenatal tips by phone	302 (67.1)	148 (32.9)
Willingness to use health device as the fees gets higher	202 (44.9)	248 (55.1)

Table 3: Willingness of women attending antenatal clinic to use mhealth

Variables	Frequency	Percentage
<b>Time to begin receiving SMS</b>		
Before pregnancy	43	9.6
From month one	138	30.7
From month three	160	35.6
From month 6	61	13.6
From month 9	27	6.0
Don't know	21	4.7
<b>Preferred time</b>		
Morning	112	24.9
Afternoon	60	13.3
Evening	46	10.2
Anytime	211	46.9
Don't know	21	4.7
<b>Number of SMs per week</b>		
1 per week	126	28.0
3 per week	205	45.6
5 per week	45	10.0
7 per week	49	10.9
Don't know	25	5.6

Table 4: Preferred pregnancy tips by respondents

Tips	Frequency	Percentage
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Things to avoid	125	27.8
When to call a doctor	202	44.9
Diet	180	40.0
Appointment reminders	202	44.9
Family planning information	216	48.0
Mental health	314	69.8
Physical activities	327	72.7
Pregnancy and delivery courses	211	46.9
<b>Multiple response apply</b>		

Table 5: Factors influencing use of mHealth according to respondents

<b>Factors</b>	<b>Frequency</b>	<b>Percentage</b>
It enhances privacy	320	71.1
Cheap and affordable	189	42.0
Ease of use	190	42.2
Self efficacy	233	51.8
Facilitating condition	165	36.7
Time management	187	41.6
Social influence	129	28.7
Culturally accepted	240	53.3
<b>Multiple response apply</b>		

Table 6: Benefits of mHealth among the respondents

<b>Benefits</b>	<b>Frequency</b>	<b>Percentage</b>
It encourages medication adherence	75	16.7
It improves lifestyle intervention	242	53.8
It encourages early antenatal appointment	103	22.9
It helps in prevention of non communicable diseases	30	6.7

Table 7a: Association between socio-demographic characteristics and attitude of respondents towards mHealth

Variables	Attitude		$\chi^2$	P
	Positive (%)	Negative (%)		
<b>Age Groups</b>			16.883	<b>0.001</b>
<20	4 (100.0)	0 (0.0)		
20 – 24	63 (78.8)	17 (21.3)		
25 – 29	127 (86.4)	20 (13.6)		
30 – 34	92 (69.2)	41 (30.8)		
35 – 39	43 (75.4)	14 (24.6)		
40 – 44	24 (88.9)	3 (11.1)		
45 – 49	0 (0.0)	2 (100.0)		
<b>Marital Status</b>			2.004	0.367
Married	334 (77.9)	95 (22.1)		
Single	17 (89.5)	2 (10.5)		
Widowed	2 (100.0)	0 (0.0)		
<b>Level of Education</b>			48.085	<b>&lt; 0.001</b>
None	13 (48.1)	14 (51.9)		
Primary	72 (92.3)	6 (7.7)		
Secondary	179 (71.0)	73 (29.0)		
Tertiary	89 (95.7)	4 (4.3)		
<b>Occupation</b>			21.474	<b>&lt; 0.001</b>
Artisan	68 (84.0)	13 (16.0)		
Civil Servants	66 (78.6)	18 (21.4)		
Trader	157 (71.0)	64 (29.0)		
Unemployed	62 (95.9)	2 (3.1)		

Table 7b: Association between socio-demographic characteristics and attitude of respondents towards mHealth

Variables	Attitude		$\chi^2$	P
	Positive (%)	Negative (%)		
<b>Average monthly income</b>			8.136	<b>0.017</b>
≤ 10,000	187 (80.3)	46 (19.7)		
10001 – 50000	146 (74.1)	51 (25.9)		

$\geq 50,001$	20 (100.0)	0 (0.0)	58.581	< 0.001
<b>Frequency of visit to health centre monthly</b>				
Once	107 (96.4)	4 (3.6)		
Twice	189 (67.0)	93 (33.3)		
Three or more times	57 (100.0)	0 (0.0)		

Table 8a: Association between socio-demographic characteristics and willingness of respondents to adopt mHealth

Variables	Willingness		$\chi^2$	P
	No (%)	Yes (%)		
<b>Age Groups</b>			22.214	<b>0.001</b>
<20	2 (50.0)	2 (50.0)		
20 – 24	16 (20.0)	64 (80.0)		
25 – 29	29 (19.7)	118 (80.3)		
30 – 34	11 (8.3)	122 (91.7)		
35 – 39	9 (15.8)	48 (84.2)		
40 – 44	6 (22.2)	21 (77.8)		
45 – 49	2 (100.0)	0 (0.0)		
<b>Marital Status</b>			0.667	0.716
Married	71 (16.6)	358 (83.4)		
Single	4 (21.1)	15 (78.9)		
Widowed	0 (0.0)	2 (100.0)		
<b>Level of Education</b>			13.855	<b>0.003</b>
None	4 (14.8)	23 (85.2)		
Primary	14 (17.9)	64 (82.1)		
Secondary	53 (21.0)	199 (79.0)		
Tertiary	4 (4.3)	89 (95.7)		
<b>Occupation</b>			36.342	< <b>0.001</b>
Artisan	10 (12.3)	71 (87.7)		
Civil Servants	31 (36.9)	53 (63.1)		
Trader	20 (9.0)	201 (91.0)		

Unemployed	14 (21.9)	50 (78.1)
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Table 8b: Association between socio-demographic characteristics and willingness of respondents to adopt mHealth

Variables	Willingness		$\chi^2$	P
	No (%)	Yes (%)		
<b>Average monthly income</b>			16.991	< 0.001
≤ 10,000	24 (10.3)	209 (89.7)		
10001 – 50000	49 (24.9)	148 (75.1)		
≥ 50,001	2 (10.0)	18 (90.0)		
<b>Frequency of visit to health centre monthly</b>			27.973	< 0.001
Once	4 (3.6)	107 (96.4)		
Twice	51 (18.1)	231 (81.9)		
Three or more times	20 (35.1)	37 (64.9)		

Table 9: Factors influencing respondents' willingness to use mHealth

Variables	Willingness to use mobile health		$\chi^2$	P
	No (%)	Yes (%)		
<b>Own a mobile phone</b>			11.835	0.001
Yes	71 (19.7)	290 (80.3)		
No	4 (4.5)	85 (95.5)		
<b>Awareness of mHealth</b>			7.353	0.007
Yes	61 (19.9)	245 (80.1)		
No	14 (9.7)	130 (90.3)		
<b>Right definition of mHealth</b>			11.268	0.001
Yes	36 (12.3)	256 (87.7)		
No	39 (24.7)	119 (75.3)		