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Women's Use of Information and Communication Technology in Accessing Maternal and Child Health Information in Nigeria

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Abstract

This study investigated the use of information and communication technology (ICT) by women in Nigeria to access maternal and child health (MCH) information, as well as the influence of its use on their health practices. As the relevance of ICT increases as a vital tool for communicating MCH information, an understanding of its use by women to access such information becomes pertinent. A total enumeration of health facilities in Nigeria with the ongoing e-health projects was conducted. A short questionnaire was completed by 1001 women selected out of 4975 registered mothers at these health facilities, using the convenience sampling technique. Nine focus group discussion sessions were also conducted with 30 mothers. MCH information was accessed through mobile phones (76.0%), radio (66.9%), television (55.1%), the Internet (27.3%), and the public address system/projector (2.5%). The MCH information themes accessed were on: appointment reminders (45.0%), emotional changes (39.5%), family planning (34.0%), nutrition (32.8%), medication (30.6%), and breastfeeding (26.0%). Constraints such as unreliable power supply, cost and poor mobile phone network limited the use of ICT. This study has identified the mobile phone as an important ICT tool used in accessing MCH information. It also showed that the use of ICT tools to access MCH information can influence the health practices of women, either positively or negatively. This has implications for policy formulation and design of ICT-powered MCH intervention programmes.

Keywords: Women, Maternal and Child Health Information, ICT Use, Nigeria

Background

Maternal health, defined as the well-being of women during pregnancy, childbirth and the postpartum period, is a very important issue that relates to a critical period in a woman's life (WHO, 2012; WHO, 2016; Adamu 2012). The reproductive years are the most productive for a woman, in which she strives to utilise her potential and contribute economically as a citizen of a nation. Unfortunately, in Nigeria, this period has been associated with many complications and, in some cases, deaths (Adamu, 2011; WHO, 2012; WHO, UNFPA, and The World Bank, 2012; Victora, Requejo, Barros, Berman, Bhutta, Boerma, Chopra, de Francisco, Daelmans, Hazel, Lawn, Maliqi, Newby, and Bryce, 2016). In 2010, about 40,000 Nigerian women died in pregnancy, while 1 to 1.6 million suffered from serious complications of pregnancy and childbirth, including

severe bleeding after childbirth, infections, hypertensive disorders, and unsafe abortion (USAID, 2012; WHO and UNICEF, 2012; WHO, UNICEF, UNFPA, and The World Bank, 2012).

Most of the complications that women encounter in pregnancy and childbirth significantly contribute to the high morbidity and mortality for women of reproductive age in Nigeria (Adamu, 2011; Cooke and Tahir, 2013). These complications have been linked to the unhealthy practices women adopt during pregnancy because of misinformation or inadequate information about available health services. Women also lack awareness on the symptoms of complications in pregnancy; consequently, many of them engage in unhealthy practices during pregnancy (Federal Ministry of Health Nigeria, 2011; Doctor, Bairagi, Findley, Helleringer and Dahiru, 2011). At the micro level, high maternal mortality has underlying consequences on the survival of children under the age of five, and on the social and economic welfare of families. At the macro level, high maternal and child mortality has been linked to low productivity level in many countries, resulting in a loss of about $15 billion globally (USAID, 2001; Joshi, 2012).

ICT has been identified as an important tool which can be integrated into health systems to accelerate the desired progress toward reducing maternal and child health mortality (Yamuah, 2005). This recognition has led to the development of several ICT-based (e-health) projects for promoting MCH in developing nations, to improve MCH outcomes (Victoria and Nicogossian, 2011). As a result, more women are increasingly embracing the use of ICT tools to access health information to meet their health information needs (Gao, Larsson, and Luo, 2012).They no longer rely solely on books or health talks during antenatal clinics. According to Lagan, Sinclair and Kernohan (2010), the use of ICT tools, such as the Internet, mobile phones, radio and television, to access health information most of the time gives women more control over decisions affecting their pregnancy, unlike when they relied solely on other sources. Another reason indicated by women for turning to ICT tools for accessing health information is inadequate access to professionals who can meet their health information needs (Sacks and Abenhaim, 2013).

In spite of women's adoption of ICT tools in accessing vital health information, Nigeria's maternal and child mortality rate remains unacceptable (Victora, et al. 2016). This is unlike success stories reported in other countries (Parker, R. M., Dmitrieva, E., Frolov, S. and Gazmararian, J. A. 2012; Musoke, 2002). To ensure effective use of ICT in accessing vital health information and maximise its gains in improving MCH practices; an understanding of women's use of ICT for accessing MCH information and its influence on health practices needs to be explored (Diaz et al., 2002; Rodger et. al.. 2013; Dalton et. al. 2014). Besides, there is a gap in the literature on comprehensive studies reporting the use of ICT by pregnant women and mothers in Nigeria. This study fills this gap and provides valuable information which could facilitate the effective adoption of ICT tools in ICT-based programmes for reaching more pregnant women and mothers in Nigeria.

Objectives of the Study

The objectives of the study were to:

- identify the types of MCH information Nigerian women accessed using ICT;
- determine the types of ICT Nigeria women use in accessing MCH information;
- identify the MCH practices mothers adopt after accessing MCH information using ICT; and
- find out the challenges encountered by mothers when accessing MCH information using ICT.

Review of Related Literature

Several studies have explored the use of ICT as an important tool for accessing health information by mothers in different settings (Jossefson and Hanseth, 2000; Lagan, Sinclair and Kernohan, 2010; Corker, 2010; Cooper, 2013; Ferraz, Almeida, and Matias, 2013; Familusi and Owoeye, 2014; Ezema, 2016). Lagan et al. (2010), in a descriptive survey exploring the use of an ICT platform (the Internet) by 613 women from 24 countries, discovered that a

significant proportion of women (94%) accessed information from ICT platforms to supplement the information previously provided by health professionals. Eighty-three percent of them stated that pregnancy-related information was accessed to improve their decision-making process on their health. This finding corroborates another (Ferraz, Almeida, and Matias, 2013) report in Portugal, which indicated that mothers are becoming increasingly informed through the use of ICT and are demanding more control over decisions that are related to maternity. Likewise, a study in Goteborg, Sweden (Jossefson and Hanseth, 2000) submitted that increased access to MCH information through the use of ICT platforms provided opportunities for patients to become well informed and to be actively involved in their own treatment.

In Africa, women were also able to regularly access MCH information through the use of ICT tools such as mobile phones (Corker, 2010; Cole-Ceesay, Cherian, Sonko, Shivute, Cham, Davis, Fatty, Wieteska, Baro, Watson, Phillips, MacDonald, Hayden and Southall, 2010;Grameen, 2011Fajembola, 2011; Onoriode , Otunomeruke, Ofuogbu, Mohammed and Anyanti , 2012 ; Cooper, 2013). For example, in the Republic of Congo, Corker (2010) reported that women accessed information on family planning from *the Ligne verte* hotlines using their mobile phones. Likewise in Malawi, Rwanda and Kenya, mothers were able to access messages on child nutrition and appointment reminders through ICT interventions, such as *Chipatal Chapa Foni*, RapidSMS and Every Child Counts in the three countries, respectively (Cole-Ceesay, Cherian, Sonko, Shivute, Cham, Davis, Fatty, Wieteska, Baro, Watson, Phillips, MacDonald, Hayden and Southall, 2010; Berg, M., Wairiero, J. and Modi, V. 2009; Corker, 2010; Innovation, 2012; Cooper, 2013). Mothers in Ghana, through the MoTECH project, accessed time-specific information and reminders each week in the local dialect for specific treatments. Educational information on foetal development, good health practices, breastfeeding and counsel on challenges during pregnancy was also accessed. In addition, tips for saving money for transportation to health facilities for delivery and requirement for birthing kits and nutritional information in pregnancy were received using the mobile phone (Obasola, Mabawonku and Lagunju, 2015).

The use of mobile phones for accessing vital health information was also confirmed by Fajembola (2011) and Onoriode, Otunomeruke, Ofuogbu, Mohammed and Anyanti (2012) in Ondo and Gombe States in Nigeria, where pregnant women accessed information on antenatal care, postnatal care, child immunisation, breastfeeding, nutrition in pregnancy, and family planning methods using mobile handsets. This finding, however, differs from Familusi and Owoeye's (2014) result in a study in Ekiti State, Nigeria. Their study indicated that women mostly access reproductive health information through the radio. A study in another state (Enugu) in Nigeria by Ezema (2016) revealed that, apart from friends, health centre, and churches/women organizations, women accessed reproductive health information from ICT platforms such as radio and television.

These studies indicate that women in Nigeria accessed MCH information using ICT tools such as mobile phones, radio and television. This improved women's access to MCH information without being limited by distance (Saleh and Lasisi, 2011; Innovations, 2012). It increased their awareness of health issues and encouraged them to use the available health resources to stay healthy throughout pregnancy and care for their children. Apart from increasing women's awareness about health issues surrounding pregnancy and childbirth, phone consultations equipped women with knowledge for making informed decisions about their health and that of their children. As a result, mothers were able to manage health issues before getting medical help (InterMedia, 2010; Cooper, 2013).

The benefits of ICT notwithstanding, some authors opine that increased access to health information via ICT platforms may pose some challenges (Rodger, Skuse, Wilmore, Humphreys, Dalton, Flabouris, and Clifton, 2013; Sacks and Abenhaim, 2013). The first is misinformation or information overload. The authors argue that information accessed through some ICT platforms

are unregulated and may be of low quality or out rightly erroneous. Users of such platforms may be ignorant of these facts. Another challenge is the effect that the use of ICT can have on doctor-patient relationship since patients may repeatedly turn to ICT platforms (the Internet, radio and television programmes) which may lead to misdiagnosis (Diaz, Griffith, Ng, Reinert, Friedmann, and Moulton, 2002; Dalton, Rodger, Wilmore, Skuse, Humphreys, Flabouris, and Clifton, 2014).

These studies stress the fact that for e-mediated health promotion to be successful, an understanding of ICT usage, content preference and its influence on health practices needs to be explored (Diaz et al., 2002; Rodger et. al. 2013; Dalton et. al. 2014;). This is to maximise its benefits, ensure proper coordination and regulation of its use, especially in a developing country, such as Nigeria, where its adoption for health promotion is still at the budding stage. Consequently, a study of this nature is pertinent, as it would provide information which could facilitate the proper positioning of ICT tools in the Nigerian health system, as well as ICT-based programmes for maternal and child health in the country.

Research Methodology

The study adopted the descriptive survey design. A short questionnaire and focus group discussion (FGD) were used for data collection. This approach was employed to provide a robust overall measure of how mothers use ICT to access MCH information, as well as its influence on their health practices (Tashakkori and Teddlie, 2010). An ethical approval was obtained from the University of Ibadan Ethics Committee before the initiation of data collection.

The total enumeration technique was used to cover all the nine public health facilities with on-going e-health projects in Nigeria at the time the study was conducted. The health facilities had on-going e-health project for MCH, which involved the use of ICT by health workers for communicating MCH information to mothers. Some ICT tools (mobile phones, laptops, TV/DVD and the Internet) were provided by state government, with support from funding agencies in the nine public health facilities in four states for MCH promotion. These projects were found in four states from four geo-political zones of Nigeria, namely North-East (Gombe), North-West (Kaduna), South-East (Imo) and South-West (Ondo).

In Ondo State, four health facilities were identified: Basic Health Centre, Molete; Basic Health Centre, Isarun; Basic Health Centre, Igbaraoke; and Basic Health Centre, Iloro from Ifedore Local Government Area (LGA). In Gombe State, two basic health facilities were involved in an ICT-based project: Wange Maternity Centre and Popandi Health Centre, in Kaltungo LGA. Two health facilities, namely Primary Health Centre, Baganje and Tudu Primary Health Centre, Zaria in Kaduna State were also involved in an ICT-based project for MCH. The only health facility in Imo State with an on-going e-health project, Federal Medical Centre Owerri, was also included in the study (See Table 1).

Through the convenience sampling technique, 1001 mothers involved in ICT-based (e-health) projects who were available and also showed interest were enrolled for the study out of 4975 mothers registered at the nine public health facilities. The researchers and the research assistants obtained informed consent from mothers before enrolling them for the study. Only mothers who gave their informed consent were enrolled for the study. A short questionnaire (with a Cronbach Alpha of 0.79 after pre-test) that focused on the use of ICT for accessing MCH information as well as its influence on their health practices was administered. Nine focus group discussion sessions (FGD) were also organised for 30 participants (10 in Ondo State, 8 in Imo State, and 6 each in Kaduna and Gombe States) who were willing to participate to further investigate the use of ICT for accessing MCH information. The data collection period was from September 2014 to June 2015. Out of the 1001 copies of the questionnaire administered, 931 were suitable for statistical analysis, making a response rate of 93%. Descriptive statistics, such as frequency counts and percentages, were used in analysing the data.

Table 1: Profile of Health Facilities Selected for the Study

State	E-Health Projects	Local Govt. Area(LGA)	Health Facilities	Total Number of Registered Mothers (N)	Sampled Mothers (n)
Ondo	Abiye Project Supported by Ondo State Government	Ifedore	4	4200	454
Gombe	Society for Family Health Maternal Neonatal Learning Health project.Funded by the USAID	Kaltungo	2	402	295
Kaduna	Mobile community-based Surveillance Project Supported by e-health Nigeria, MacArthur Foundation, Population and Reproductive Health Initiative and Population Council and Kaduna State	Zaria	2	147	98
Imo	Government mhealth services at Federal Medical Centre Funded by the Federal Government	Owerri Municipal, GA	1	226	154
Total			**9**	**4975**	**1001**

Source: Data were collected from the records of the selected health facilities in 2014

Findings of the Study

Demographic Characteristics of the Respondents

The background data collected from the respondents revealed that most them 893(95.9%)) were married, whereas 38 (4.1%) of them were single. A total of 167 (17.9%) of the respondents were within the age range of 20-25 years. Regarding age, about thirty percent (279, 29.9%) of them were within the age range of 26-30 years; 222 were within 31-35 years (23.8%); and 136 were within the age range of 36-40 years (14.6%). Seven percent of the respondents were within the age range of 41-45 years (7.1%); 12(1.3%). A significant proportion of the respondents – 755 (81.1%) – had a child or more, while only 176 (18.9%) were first-timers. The survey showed that 450 of the respondents were Christians (48.3%), 471 were Muslims (50.5%), while only 10 belonged to other religions (1.1%). See Table 2 for more information on the demographic details of the mothers.

Table 2: Distribution of the mothers by demographic characteristics (N=931)

S/N	Demographic Variables	Frequency (F)	Percentage (%)
1	Marital Status		
	Single	38	4.1
	Married	893	95.9
2	Religion		
	Christianity	450	48.4
	Islam	471	50.5
	Others	10	1.1
3	Education		
	< School Cert	557	56.9
	SSCE+	374	40.2
5	Income		
	< N20,000	321	34.5
	N20,001 - N50,000	316	33.9
	N50,001 - N100,000	103	11.1
	> N100,000	19	2.0
	No response	172	18.5
6	Age		
	< 20	48	5.2
	20-25	167	17.9
	26-30	279	30.0
	31-35	222	23.8
	36-40	136	14.6
	41-45	66	7.1
	46-50	12	1.3
	>50	1	0.1

Types of MCH Information Women Access through ICT

The study sought to establish the types of MCH information women accessed using ICT. The responses from the respondents in the affirmative indicated appointment reminders (45%) as the most common type of MCH information mothers obtain using ICT. This was followed by emotional changes in pregnancy (39.5%), with the least accessed being other types (2.1%) of MCH information, such as exercise in pregnancy and growth of the foetus. See Table 3 for more information.

Table 3: Types of MCH information women accessed through ICT from health workers (N=931)

Type of MCH information	Ondo	Kaduna	Imo	Gombe	Total F %
Nutrition during pregnancy	223	29	19	34	305 (32.8%)
Appointment reminders	266	45	42	66	419 (45.0%)
Family planning methods	217	45	18	37	317 (34.0%)
Disease prevention in pregnancy	200	35	15	22	272 (29.2%)
Breast feeding	177	35	11	19	242 (26.0%)
Medication in pregnancy	182	49	22	32	285 (30.6%)
Mental health and emotional changes in pregnancy	252	63	20	33	368 (39.5%)
Others (growth of the foetus, exercise)	2	7	5	6	20 (2.1%)

Table 4 presents a breakdown of the different formats of MCH information women received when accessing MCH information from health workers involved in the e-health projects. As shown by the results in Table 4, more than three quarters of the respondents (642) received MCH information in the voice format. The result revealed the voice format as the most popular.

Table 4: The format of MCH information mothers received by state (N= 931)

Format of MCH information	Ondo	Kaduna	Imo	Gombe	Total F %
Voice	283	69	122	168	642 (69%)
Picture	80	60	91	199	430 (46.2%)
Text	4	3	5	1	13 (1.4%)
Others (Songs and video, etc.)	154	11	47	59	271 (29.1%)

ICT Used by Women for Accessing MCH Information

Table 5 shows various ICT channels used by Nigerian mothers to access MCH information from health workers. A significant proportion of the respondents accessed MCH information provided by health workers involved in the e-health project using mobile phone –708 (76.0 %). This was followed by radio 623 (66.9%) and TV 513(55.1%), as some of the e-health projects also had supporting interactive programmes on radio and television. ICT tools, such as laptops, public address system and projector-22 (2.5%), were also used for health talks during antenatal/postnatal clinics.

Table 5: ICT used by women in accessing MCH information by state

ICT	Ondo	Kaduna	Imo	Gombe	Total F %
Mobile Phones	302	82	109	215	708 (76.0%)
DVD/TV	169	49	117	178	513 (55.1%)
Radio	220	80	111	212	623 (66.9%)
The Internet/Computer	79	26	43	106	254 (27.3%)
Others (Projector and Public Address System)	4	7	6	5	22 (2.5%)

To substantiate the results obtained from the questionnaire, focused group discussion (FGD) was also organised for 30 women (10 in Ondo State, 8 in Imo State, and 6 each in Kaduna and Gombe States) in the four states. The results obtained from the questionnaire confirmed the findings from the focus group discussions (FGD) conducted in the four states. Mothers who participated in the FGD sessions in the four states confirmed that they accessed MCH information from health workers using mobile phones.

In Ondo State, a nursing mother involved in the *Abiye* Project described the use of phone thus:

> *We were given phones, drugs and delivery kits when we registered so we can call the clinic when we need to talk to Mama (matron) or a health ranger (community health workers) about our health. The health ranger or Mama (matron) also calls to give us information and find out about our health.*

In Gombe State, a respondent said:

> *My first impression when we were given the phone was good. Many of us could not operate the phone, but we were later taught how to use it. I use it to call the nurse at the health centre. They can call or sometimes send information to us to come for immunization or check-up.*

Another respondent in Imo State also disclosed that:

> *With the phone, we can now access information on how to take care of ourselves during pregnancy, from the Internet, even when we cannot get to the hospital.*

In Kaduna State, a nursing mother stated thus:

> *I usually make phone calls to the nurse at the health facility to find out when the next injection for my baby will be available. This is because the vaccines are not always available at the health facility.*

Although findings from the FGD organised for mothers confirmed the popularity of mobile phones for accessing MCH information from health workers in the four states, mothers in Gombe and Ondo States also mentioned the frequent use of other ICT channels such as television and radio frequently, when accessing MCH information. A mother, during the FGD session in Ondo State, confirmed that she also accessed MCH information using radio, as some of the e-health projects also had supporting programmes involving health workers on radio and television:

> *I receive more information from the radio. I am a trader and I always put on my small radio when I'm in the shop. I always listen to the radio*

programme 'Mother and Child'. I like the programme.

Another mother in Gombe State asserted that:

I still use the television and radio a lot because I get more information and pictures. The information the matron gives during the clinic is not sufficient. When I call the nurse at the centre, we only talk for a short time because of airtime and sometimes nobody picks the call.

As regards the use of the Internet, a woman in Imo State stated that:

I get all the information I look for on the internet. I use the internet every day and I enjoy keeping up with tips concerning pregnancy and child care. I use this source for information that suits my immediate condition such as, why I see droplets of blood, how I can remain healthy, and how I should care for my unborn child. Sometimes, I try to find out how to determine the sex of my baby.

Actions Taken after Accessing MCH Information through ICT

Table 6: Mothers' responses on actions taken after accessing MCH from health workers using ICT channel (N = 931)

Format	No F (%)	Yes F (%)	Ranking
Visited the clinic I'm registered for health care	158(17%)	773(83%)	1
Visited traditional birth attendant	859(92.3%)	72(7.7%)	2
Self-medication/patent medicine vendor	862(92.6%)	69(7.4%)	3
Confided in friends or family members	863(92.7%)	69(7.3%)	4
Did not do anything	880(94.5%)	51(5.5%)	5

Table 6 presents responses on actions taken after accessing MCH from health workers through ICT. While a significant proportion claimed that they visited the clinic where they were registered for health care (83%), 7.7% reported visiting traditional birth attendant (7.7%) and only 5.5% did not do anything after accessing MCH information from ICT channels.

The result in Table 5 does not align with some of the views expressed by the respondents during the focus group discussion (FGD) sessions. Responses from some of the respondents indicated that the use of ICT for accessing MCH information can result in low utilisation of health facilities; some of them reported not attending antenatal clinics because the use of ICT provides the opportunity to access MCH information without moving an inch.

A major challenge encountered by mothers when accessing MCH information through ICT channels was unreliable power supply (596, 64%). This was followed by poor network coverage (416, 44.7%) and low income (178, 19.1%). Details of the findings are presented in Table 7.

Challenges Encountered when Accessing MCH Information through ICT

Table 7: Challenges encountered by mothers when accessing MCH information through ICT

Challenges encountered	No F (%)	Yes F (%)	Ranking
Epileptic power supply	335(36.0%)	596 (64.0%)	1
My IT skill is low; I can't operate some of them.	830(89.2%)	101 (10.8%)	5
My income is low; I can't afford them	753(80.9%)	178 (19.1%)	3
Poor mobile phone network	515(55.3%)	416 (44.7%)	2
Language of content	805(86.5%)	126 (13.5%)	4
My husband does not support using such channels	853(91.6%)	78 (8.4%)	6
Others (unstable Internet connection, low bandwidth)	911(97.9%)	20 (2.1%)	7

The results from the focus group discussion sessions also confirmed unstable power supply as the most common problem mothers usually encounter when receiving MCH information from ICT channels. This challenge was mentioned by all the respondents during the FGDs in the four states.

Discussion

The mothers that participated in this study were from different ethnic and religious groups in Nigeria. They were within the age range of 26-40 years, which is within the median age range for mothers reported by the Nigeria Demographic and Health Survey (NDHS, 2008). Within this age range, a significant proportion of women are actively involved in reproduction. This is consistent with the World Development Indicators (World Bank, 2008) that women within the age range are at the peak of their reproductive years. By implication, women within this age category utilise antenatal services more than the other age groups.

The respondents (mothers) accessed a range of MCH information from health workers involved in the e-health projects through ICT. The information included appointment reminders, information on emotional changes, family planning, nutrition and medication in pregnancy, disease prevention, breastfeeding and consultations during emergencies (See Table 3). However, appointment reminder was the most common type of MCH information accessed by the respondents through ICT. This corroborates the findings of Evans, Abram, Poropatch, Nielsen, and Wallace (2012) in a study in the United States and the Motech Project in Ghana, where ICT was mostly used to confirm appointments for antenatal and postnatal visits by mothers (Grameen Foundation, 2011).

The MCH information accessed by mothers through ICT was in different formats, such as voice, text, picture and video. The voice format was the most used. This is in tandem with results from other studies conducted in other African countries which showed that mothers accessed MCH information in all the formats reported, with the voice format being the most popular (InterMedia, 2010; Cooper, 2013). This result implies that mothers probably prefer accessing MCH information in the voice format.

The findings revealed high prevalence (708, 76.0%) of the use of mobile phones by mothers to access MCH information from health workers involved in e-health projects in the four states (See Table 3). This report was confirmed by similar studies conducted in Nigeria where mobile phone was used for communicating MCH information (Castle, E., Thompson, A. and Karlyn, A. 2011; Onoriode, Otunomeruke, Ofuogbu, Mohammed, and Anyanti, 2012). The results obtained in the study revealed that

the mobile phone was commonly used probably because it reduces the barrier usually encountered by pregnant women as a result of distance (Innovations, 2012). Hence, this study finding has, in a way, identified the mobile phone as an important ICT tool for communicating vital health information when implementing e-health projects.

The data presented in Table 6 on the usual health practice after accessing MCH information through ICT indicated an increase in the utilisation of health facilities by the respondents after accessing MCH information from ICT channels. However, the respondents' views during the FGD sessions indicated a contrary result, as some mothers reported that they avoided visiting health facilities once they could access the needed MCH information through ICT. This implies that the use of ICT as a channel for communicating MCH information could influence the health practices (regular antenatal/postnatal visits) of Nigerian mothers, either positively or negatively; mothers may become complacent about the use of health facilities once they are able to access the required health information through ICT channels. This indicates a need for a proper regulation of ICT to ensure effectiveness.

The respondents identified some of the constraints inhibiting the use of ICT by Nigerian mothers to access MCH information. A major issue raised by the respondents was the problem of unreliable power supply, which is a major problem encountered in developing countries (Corker, 2010; Innovation, 2012; Cooper, 2013). The respondents also complained of missing television programmes as a result of power failure. The result is in consonance with what was presented in similar studies in some African countries, such as Gambia, Congo, Malawi, and Kenya (Cole-Ceesay et. al. 2010; Corker, 2010; Innovation, 2012; Cooper, 2013,). This presupposes that, if power supply continues to pose a serious challenge to the use of ICT for MCH care, it is important that implementers of e-health project provide alternative power sources, such as portable power banks (for mothers), solar systems and inverters (for the health facilities), to ensure effective use of ICT for health promotion. Another constraint identified by the study participants (44.7%) was the poor mobile phone network, which has been linked to poor ICT infrastructure. This problem was also reported in an e-health project in Sierra Leone, where poor network coverage by mobile phone services providers was identified as a major challenge affecting the use of ICT by health workers and the mothers (Valliere, McAuliffe, Palmer, Maggity, Bangura, 2013).

In addition, some of the respondents with low income 178 (19.1%) mentioned cost as an issue, except in states or projects where the cost was largely subsidised by the government. This finding concurs with a previous study by Kaba, N'Da, and Mbarika(2008), where cost was identified as a major determinant of the use of ICT for accessing health information. It was only in Ondo State (*Abiye* Project) that the cost of using ICT was borne through a public-private arrangement. In the other states, after phones were given (free of charge to mothers), other evolving costs were sometimes borne by the mothers and health workers. To ensure effective use of ICT for receiving MCH information, it is important that an implementation model (maybe a public-private partnership model) that will alleviate the cost burden associated with the use of ICT channels be adapted to encourage the use of ICT platforms. Schweitzer and Synowiec (2012) in their study on the economics of e-health and m-health across the globe stressed the need to come up with a model that can absolve the costs of e-health at different levels of health delivery systems to encourage more investment in e-health and the use of ICT for health care. Otherwise, stakeholders may not totally embrace the use of ICT for MCH care.

Conclusion and Recommendations

Women are increasingly turning to ICT channels to access MCH information, in spite of the challenges associated with its use. The study indicated that the use of ICT by women in accessing MCH information could influence the health practices (regular antenatal/postnatal visits) of Nigerian mothers, either positively or negatively. Based on these findings, the following recommendations are made:

- Governments and other stakeholders involved in the promotion of MCH should ensure proper positioning and regulation of the use of ICT for health promotion for maternal and child health in Nigeria.
- Policies should target regulating the use of ICT to promote safe MCH practices by ensuring

that ICT-based projects for MCH meet the information needs of mothers at every stage along the continuum of care.

- Health policies should also target subsidising the costs associated with the use of ICT by women of reproductive age to increase their access to relevant maternal health information.
- Alternative power sources, such as portable power banks (for mothers), solar systems and inverters (for the health facilities), should be provided to ensure effective use of ICT for health promotion.
- More investment by governments and the private sector is needed for packaging health tips and MCH information content into acceptable products or formats (CDs/DVDs) that can easily be accessed by women.

To achieve these, further research is also required to assess the contents, as well as mothers' perception of information accessed from ICT. This is to ensure the effectiveness of the use of ICT for promoting safe MCH practices and to maximise its gains in improving maternal and child health outcomes in Nigeria. Therefore, to improve women's access to vital health information as well as the adoption of safe MCH practices, it is pertinent to scale up the use of ICT (mobile phones) for health promotion campaigns for maternal and child health in Nigeria.

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