Diffusion of Innovation in Ghana: The Adoption of M Health Among Pregnant Women in Ayensu Ade Rural Community in the Gomoa West District

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ABSTRACT

This current study, using qualitative approach hinged on case study design, and Rogers' Diffusion of Innovation Theory, seeks to investigate how persuasion variables influence the adoption of mobile health (mHealth) among pregnant women and perception of community health nurses on mobile health intervention (mHealth) in the Ayensu Ade rural community of Gomoa west district in the central region of Ghana. The study is underpinned by two research questions. Thus, (a) what are the persuasion variables that influences the adoption of mHealth among pregnant women in Ayensu Ade community? (b) What are the perceptions of community health nurses in the Ayensu Ade community regarding the use of mHealth (MOTECH) in their community? Using interviews and focus group discussion as data collection instruments, the study revealed that persuasion variables such as relative advantage of an innovation, trialability and compatibility influences how pregnant women in the Ayensu Ade community adopted the implemented mHealth intervention project. Also, the study revealed that the ease of work was a perception held by the community health nurses in the community regarding how they perceived the implemented mHealth intervention project. The study concludes that, the efficient use of mHealth interventions as a health innovation in the rural community of Ayensu Ade has helped in expanding treatment outreach of pregnant women, assisting them to comply with medical schedules, and promoting behaviors that limits the spread of diseases.

INTRODUCTION

Health has a significant impact on both women and men due to the biological and gender related variations that exist between them. However, because women are disadvantaged by enormous discrimination in most areas of society, the health of women has become of keen interest. For instance, women, particularly young women, when compared to men, face increased vulnerability to diseases such as sexually transmitted infections (Sevidzem, Ako-Arrey, & Njukeng, 2019).Scholars such as Hampshire et al. (2015), Hartzler and Wetter (2014) and Mehl and Labrique (2014) asserted that, health delivery in low and middle-income nations is fraught with challenges, especially as rural and difficult-to reach areas, which often has limited healthcare services, infrastructure and personnel are marginalised. To deal with these challenges, most of these African countries have adopted mHealth-enabled interventions as one of the cost effective ways to mitigate healthcare systems challenge.

mHealth has been deployed by many healthcare systems a as a tool that could help in expanding treatment outreach, assisting patients to comply with medical schedules, creating epidemic awareness, and promoting behaviors that limits the spread of diseases (Sevidzem, Ako-Arrey, & Njukeng, 2019).However, Odigie et al. (2012) and Zurovac et al. (2012) indicated that, for mHealth-enabled interventions to be very effective in dealing with health challenges, they are to be adapted to the local context within which those health challenges exist. The widespread availability and usage of mobile phones has spawned a new wave of interventions that deploy mobile phones as platforms to engage in health service delivery. Based on the ubiquitous of mobile phones usage in facilitating health delivery globally, more than 100 countries both developed and developing,

have used mHealth interventions in their aspiration of making healthcare more inclusive and efficient (Haenssgen, Charoen boon, & Zanello, 2021). For instance, according to the National Communications Authority (2016), Ghana has mobile-cellular telephone subscription rate of about 140 per every 100 inhabitants with over 36.6 million subscribers which creates prospects for networking and communication through various social media platforms (Owusu, 2017).Odendaal and Lewin (2014) assert that, mHealth improves efficiency in healthcare delivery and indicated that, for instance, to healthcare workers such as community nurses, mHealth significantly reduces face-to-face contact hours and fuel costs and improve efficiency through reduced unnecessary travel (Mahmud et al., 2010).

Recognising the essence of innovation and technology in healthcare delivery, concerns have been raised regarding how innovation and technology can further increase the inequalities that already exist in society if not implemented well. For instance, the Director-General of the World Health Organization, Dr. Ghebreyesus in 2019 asserted that, the global community must make sure that innovation and technology introduced in healthcare delivery should help in reducing the inequalities that exist in our world, instead of becoming one of the reasons people, especially the marginalised in our society are left behind (WHO, 2019).

To revolutionise the healthcare system and make contributions to the achievement of universal healthcare coverage, mobile phones and other smart phone applications have received extensive attention as a healthcare delivery intervention tool. The use of the mobile phone and smart phone applications in healthcare has the potential to make transformation in the delivery of healthcare service across the globe as these innovations and technologies can be harnessed to improve the health of populations (WHO, 2011). Due to the ubiquitous use of mobile phones in healthcare delivery, the World Health Organization reported in 2016 that, globally 109 countries operated at least one government sanctioned phone-based healthcare service delivery and surveillance programme, usually by providing emergency hotlines and call centres (WHO, 2016).

Albeit, the introduction of mobile health as an innovation in healthcare delivery is a welcoming news, there are views that suggest that the use of mobile health should not exclude the provision of quality non-digital services in places where people in target communities have no access to the digital technologies (WHO, 2019).

NEED FOR THE STUDY

Healthcare systems in most African countries are faced with challenges that affect delivery of healthcare. To deal with these challenges, most of these African countries have adopted mHealth-enabled interventions as one of the cost effective ways to mitigate healthcare systems challenge (Sevidzem, Ako-Arrey, &Njukeng, 2019).mHealth has been deployed by many healthcare systems a as a tool that could help in expanding treatment outreach, assisting patients to comply with medical schedules, creating epidemic awareness, and promoting behaviors that limits the spread of diseases (Sevidzem, Ako-Arrey, &Njukeng, 2019). However, Odigie et al. (2012) and Zurovac et al. (2012) indicated that, for mHealth-enabled interventions to be very effective in dealing with health challenges, they are to be adapted to the local context within which those health challenges exist.

Conducting a qualitative study that investigated how mobile phone use and social support networks influence treatment-seeking behavior among marginalised groups in rural areas of Thailand and Laos, Haenssgen, Charoen boon, and Zanello (2021), revealed that, resource constraints move marginalised groups in rural areas towards the use of informal healthcare access as mobile phone diffusion has a mildly positive connection with rural healthcare access although the use of mobile phone in this regard did not hinder social support. Also, Sevidzem, Ako-Arrey, and Njukeng (2019) conducted a review to evaluate the impact of mHealth interventions on the outcomes of health of women in Cameroon. The study revealed that, mHealth interventions such as the use of short messaging system (SMS) and mobile phones in providing healthcare related services to women patients in Cameroon have improved women's behavioral actions and adherence to treatment routines.

Ndayizigamiye and Maharaj (2017) in a quantitative inquiry investigated the factors that influences public health workers in Burundi to adopt mHealth in their health care practice. The study revealed that, the relative advantages connected with mHealth interventions are the factors that influence the adoption of mHealth by

public health workers in Burundi. Ndayizigamiye and Maharaj's (2017) study revealed that, although mHealth is a new concept within the Burundi healthcare system, the kind of experience public health workers have with mobile devices, trialability and observability, coupled with work-related factors are the main diffusion of innovation compatibility factors that influenced public health workers in Burundi to adopt mHealth.

Khatun et al. (2014) studied the local emergence of phone assisted healthcare access and the consequences of such technology on behavior, equity and health outcomes and indicated that, out of the surveyed 2,581 patients in Bangladesh, 1.9% contacted or sought the assistance of a health provider through the mobile phone. Hampshire et al. (2015), similarly, also conducted a study to look into how mobile phone diffusion is used in health-related care in Africa, and indicated that among the surveyed 4,626 youths across Ghana, South Africa and Malawi, about 1,542 survey respondents, representing 33% utilised a mobile phone to either seek their own health related information or someone else's illness information as the survey respondents indicated that, they used mobile phones, among others, to contact family members for assistance or to search for health related information online.

Analysing the treatment-seeking behaviors of patient who utilise mobile phone diffusion in healthcare access, Aker and Mbiti (2010) indicated that, the patterns or timelines of healthcare access between people who use mobile phones differ from those who do not use this technology to seek for health. Haenssgen (2018) quantitatively investigated the connection that exist between health-related mobile phone utilization and treatment-seeking behavior of patients in rural India. The study revealed that, between 2005 and 2012, the rural health system in India adapted to rapid mobile phone diffusion and increasingly excluded poor households who have no access to mobile phones from getting healthcare access.

Källander, Tibenderana, Akpogheneta, Strachan, Hill, Asbroek, Conteh, Kirkwood and Meek (2013) conducted a qualitative study that thematically reviewed how mHealth projects have approached the intersection of cellular technology and public health in low- and middle-income countries and identify the promising practices and experiences learned, as well as novel and innovative approaches of how mHealth can support community health workers. The study revealed that, in low-income countries, there exist few formal outcome evaluations of mHealth, although there exist numerous documentation of project process evaluations, with few studies demonstrating the impact of mHealth on clinical outcomes. The study also revealed that, there is a lack of mHealth applications and services that operates at scale in low and middle-income countries with the most commonly documented use of mHealth being 1-way text message and phone reminders to encourage follow-up appointments, healthy behaviors and gathering of data.

Mariwah, Abane, Owusu, Kasim, Robson, Castell, and Hampshire (2022) using a mixed method approach, explored strategies for integrating 'informal mHealth' in the healthcare delivery of Ghana, by highlighting some opportunities and challenges. Using purposive sampling, the study employed interviews, focus group discussions, and document analysis to select community health nurses and other stakeholders from the three ecological zones of Ghana. The study revealed that, almost all Community Health Nurses in the study were using their personal mobile phones in an informal way to bridge healthcare gaps, thereby promoting universal health coverage, in spite of the challenges such as economic, moral and socio-cultural that they faced in using their phones.

Albeit the extant literature indicates that, several studies have been conducted both qualitatively and quantitatively on the use of mobile health (mHealth) within the healthcare sector of developing countries, limited studies have investigated the impact of mobile health on the health-seeking behavior of pregnant women in rural communities. This qualitative study therefore seeks to fill this gap by investigating how mobile health utilization impacts on the health-seeking behavior of pregnant women in Ayensu Ade, a Ghanaian rural community in the central region of Ghana. The study uses the Diffusion of innovation theory propounded Rogers (1995) to answer the research question underpinning the study. The research question underlining this study is; (a) what are the persuasion variables that influences the adoption of mHealth among pregnant women in Ayensu Ade community?

It is expected that the findings that will come out of this study will facilitate the achievement of the sustainable development goals three (3) and ten (10) which seeks to achieve good health and wellbeing and reduce

inequalities respectively. Also, the findings will contribute to research in the area of health technology and diffusion of innovation in Ghana and help shape government's policy direction.

LITERATURE REVIEW

Healthcare access, Marginalisation and Technology

Social support networks and access to healthcare technology considers the potential utilization of available healthcare services as part of a spectrum that variously includes healthcare need and demands of people, treatment-seeking processes, access to and use of healthcare, which includes obstacles to healthcare access, and the resultant health outcomes and other socio-economic consequences (Bigdeli et al., 2012; Chuma, Okungu, &Molyneux, 2010; Levesque, Harris, & Russell, 2013).Factors such as the nature, sternness and a patient's sickness condition coupled with socio-economic background and health related beliefs, the kind of trust and perception patients or society at large have regarding health provider quality and health condition influences access to healthcare (Shaikh, Haran, & Hatcher, 2008; Nyamongo, 2002).

Scholars, in trying to investigate how healthcare access is influenced by certain social dimensions, a focus of literature has been on marginalisation and multidimensional poverty (Barbosa & Cookson, 2019; Dupas, 2011). Marginalisation has been conceptualised as the myriad dimensions of disadvantages that places people at social, economic and spatial margins of society (Barbosa & Cookson, 2019). The kind of Health care choices people in rural areas make are affected by social capital as rural people with extensive social networks have lower utilization of higher-tier formal healthcare providers (Herberholz &Phuntsho, 2018).

Studies have looked into how mobile phones can be utilised as platforms for health service delivery and for promoting healthy behavior especially among marginalised groups (Aranda-Jan, Mohutsiwa-Dibe, &Loukanova, 2014; Lee et al., 2016; Mbuagbaw et al., 2015).

In exploring how technology diffusion could affect social network and increase marginalisation, Ling (2008) asserts that, the use of mobile phone diffusion could subtly have effect on social support networks as mobile phone utilization can increase peoples' attention on their closest contacts which could bring about new divisions and exacerbate inequality that exist among rural poor folks.

Emerging body of literature have concentrated on the impact of mobile phone diffusion as a technology on access to healthcare outside of specific health interventions. Khatun et al. (2014) studied the local emergence of phone assisted healthcare access and the consequences of such technology on behavior, equity and health outcomes and indicated that, out of the surveyed 2,581 patients in Bangladesh, 1.9% contacted or sought the assistance of a health provider through the mobile phone.

Similar to the study of Khatun et al. (2014), Hampshire et al. (2015) also conducted a study to look into how mobile phone diffusion is used in health-related care in Africa, and indicated that among the surveyed 4,626 youths across Ghana, South Africa and Malawi, about 1,542 survey respondents, representing 33% utilised a mobile phone to either seek their own health related information or someone else's illness information as the survey respondents indicated that, they used mobile phones, among others, to contact family members for assistance or to search for health related information online.

Analysing the treatment-seeking behaviors of patient who utilise mobile phone diffusion in healthcare access, Aker and Mbiti (2010) indicated that, the patterns or timelines of healthcare access between people who use mobile phones differ from those who do not use this technology to seek for health. The study, which surveyed patients infected with HIV in South Africa indicated that, when it comes to treatment-seeking behavior of these HIV patients, those who made use of the mobile phones to access healthcare constantly called their health providers to get more anti-retroviral drugs and abided by medication routine frequently as compared to those who have the mobile phones but did not use it to seek for healthcare.

Haenssgen (2018) quantitatively investigated the connection that exist between health-related mobile phone utilization and treatment-seeking behavior of patients in rural India. The study revealed that, between 2005 and

2012, the rural health system in India adapted to rapid mobile phone diffusion and increasingly excluded poor households who have no access to mobile phones from getting healthcare access.

Haenssgen, Charoenboon, and Zanello (2021), in a qualitative study investigated how mobile phone use and social support networks influence treatment-seeking behavior among marginalized groups in rural areas of Thailand and Laos. The study revealed that lack of resources forces marginalised groups in rural areas towards the use of informal healthcare access as mobile phone diffusion has a mildly positive connection with rural healthcare access although the use of mobile phone in this regard did not hinder social support. Haenssgen et al. (2021) further revealed that, health-related utilization of mobile phone facilitated in making individuals, who are not extremely marginalised to overcome constraints that debars people from healthcare access, thereby creating a broader set of treatment alternatives and sources of information.

The use of Mobile Health (mHealth) in healthcare delivery

There has been an increase in the demand for quality, yet affordable healthcare services which is in tandem with achieving the World Health Organisation's universal health coverage. Although developing countries such as Ghana, are faced with the challenges of dealing with certain diseases due to the unavailability of enough resources and budget constraints, many developing African countries such as Ghana has adopted mobile health (mHealth) enabled interventions as one of the means of addressing healthcare system challenges that hinders the effort to achieve universal healthcare dispensation as mHealth related intervention in healthcare delivery has proven to be cost-effective.

Mobile health (mHealth) has been utilised in myriad of ways such as using mHealth to assist in the expansion of treatment outreach, helping patients to comply with medical routines, creating awareness of epidemics, and promoting behaviors that limit the spread of diseases in society (Qiang et al., 2011).Although, mHealth related intervention has proven it success in facilitating healthcare delivery, scholars such as Odigie*et al*. (2012) and Zurovac*et al*. (2012) attest that mHealth-enabled interventions only become successful when they are adapted to suit the conditions of the local context in which they are implemented.

Scholars have asserted that, due to the interactive nature of mobile health communication, mHealth enable users of such technology to be able to self-monitor their health and other health-related knowledge (Bakshi et al. 2011; Sidney et al. 2011). Kahn, Yang and Kahn (2010) indicated that, mHealth applications in healthcare delivery does not only help to overcome the traditional geographical barrier such as the lack of physical access to public healthcare facilities that patients have to deal with, but also mHealth-enabled interventions have been successful in reducing the delays that exist in diagnosis, treatment and reporting on disease outbreak.

Sevidzem, Ako-Arrey, and Njukeng (2019) conducted a review to evaluate the impact of mHealth interventions on the outcomes of health of women in Cameroon. The study revealed that, mHealth interventions such as the use of short messaging system (SMS) and mobile phones in providing healthcare related services to women patients in Cameroon have improved women's behavioral actions and adherence to treatment routines. Similarly, Ndayizigamiye and Maharaj (2017) in a quantitative inquiry investigated the factors that influences public health workers in Burundi to adopt mHealth in their health care practice. The study revealed that, the relative advantages connected with mHealth interventions are the factors that influence the adoption of mHealth by public health workers in Burundi. Ndayizigamiye and Maharaj's (2017) study revealed that, although mHealth is a new concept within the Burundi healthcare system, the kind of experience public health workers have with mobile devices, trialability and observability, coupled with work-related factors are the main diffusion of innovation compatibility factors that influenced public health workers in Burundi to adopt mHealth.

Technologies in healthcare delivery such as mobiles can be utilised to provide training electronically to healthcare workers, thus helping to reduce the cost and time involved for healthcare workers to travel in order to access such health training (DeRenzi et al., 2012). Technologies used in healthcare services can also be uitlised in dissemination of healthcare information to people in rural communities (Chang et al., 2011). In support of the above positions taken by both DeRenzi et al. (2012) and Chang et al. (2011), Broens et al.

(2007) opines that, mHealth applications can be used by government departments to monitor the performance of implemented health programs in order to identify areas of such programs that need extra attention.

mHealth has facilitated in automating processes within healthcare services as Michael et al. (2010) acknowledged that, mHealth applications in the healthcare sector may be used to analyse data and quality checks, thus assisting to overcome shortcomings of the paper-based systems such as inaccuracy of data, duplication of data, and loss of critical data. Sinha (2010) in acknowledging the significance of the use of mHealth in healthcare delivery asserted that, mHealth can facilitate transparency and engender public confidence as aggregated data which is collected from the use of mHealth applications could be publicise. Buttressing Sinha (2010), Knight and Holt (2010) also indicated that, the use of mHealth through the collaboration of healthcare professionals allows for access to information and sharing of information that can be used to make decisions in the healthcare service.

Studies have investigated the performance of some implemented mHealth programs in African countries such as Kenya. A report by Vital Wave Consulting (2009) on mHealth implementation within the Eastern African countries indicated that mHealth application which used SMS-based quiz for HIV awareness was used in rural communities to get people tested and led to more 40% increase in people getting tested for HIV within the six weeks the mHealth program was implemented. The report of Vital Wave Consulting (2009) also discusses am Health program named Episurveyor which was implemented in both Uganda and Kenya for remote collection of data. It was observed that, the implemented mHealth program facilitated health professionals to get access to healthcare data in a timely manner, therefore making for instance, immunization programs and responses to outbreaks of disease more effectual. The mHealth program implemented in Burundi for instance, contributed to providing education to people on issues regarding the prevention and management of HIV/AIDS disease. Another mHealth implemented program in Rwanda that focused on infant and maternal healthcare, indicated that, the mHealth program contributed to more than 50% decrease in maternal and new born deaths (Burundi Ministry of Health, 2014).

The MOTECH programme (Mobile Technology for Community Health) in Ghana.

The MOTECH programme (Mobile Technology for Community Health) which was a health intervention aimed at improving uptake and quality of care of maternal, newborn and child health services (MNCH) through the use of low-cost mobile phone technology to capture, transmit and process health service data collected by Community Health Nurses was first implemented in Kassena-Nankana West in 2010 and subsequently was replicated in three additional Districts, thus, Gomoa West in Central region, Dangme East in Greater Accra region, South Tongu in the Volta region (LeFevre et al., 2017).After the implementation of this mHealth project in Ghana a decade ago, lapses remain in how such interventions impact the health-seeking behaviors of patients and thus, this study seeks to fill this gap by investigating how mobile health utilization impacts on the health-seeking behavior of pregnant women in Ayensu Ade, a Ghanaian rural community in the Gomoa west district of the central region of Ghana.

THEORETICAL FRAMEWORK

The Diffusion of Innovation Theory (Rogers, 1995).

This section of the study discusses the diffusion of innovation theory and how the persuasion factors of this theory determines how pregnant women in a Ghanaian rural community adapt to mobile health in their health-seeking behavior.

Rogers (1995) explains diffusion of technology as the process through which a technology spread among members of a social system via certain media in a period of time. The diffusion of technology or innovation postulates that people within a social system passes through five (5) stages that influences the kind of decision they make on whether to adopt or not to adopt an introduced technology or an existing technology. These five (5) stages of the diffusion process are the knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage. According to Rogers (1995), at the persuasion stage of the diffusion process, there are also five (5) attributes that may influence a person's persuasion to either adopt or to reject a

technology. Thefirst one, relative advantage, talks about the comparative advantage an introduced technology within a social system has over an existing one. Trialability looks at the ease with which individuals in a social system can easily try and test an innovation introduced to them in order to have experience of how the innovation works. The third factor, observability, makes reference to the ease with which the benefits that an innovation offers a person can be observed, imagined and perceived. Complexity that comes with an innovation is another factor that may affect the diffusion of that innovation or product. When there is easy understanding, use and purchase of an innovation or product, that innovation will be easily diffused within a social system. Compatibility, the final attribute or factor in the persuasion stage is compatibility of the innovation or product in relation to the background, behaviour and pattern of lifestyle of the people in a social system. Thus, how compatible an innovation or product is, measures how closely the innovation is related to needs, norms, lifestyle, culture and value systems of people.

In exploring the influence of mHealth in the Ghanaian healthcare sector, this paper seeks to investigate how mobile health utilization impacts on the health-seeking behavior of pregnant women in Ayensu Ade, a Ghanaian rural community in the central region of Ghana.

METHODOLOGY

As the focus of this study is to investigate how mobile health utilization impacts on the health-seeking behavior of pregnant women in a rural community, it is essential to use qualitative approach since the qualitative research approach allows researchers to deduce reasons behind the actions of individuals towards a phenomenon. The study employed a case study as a study design since the area the researcher seeks to investigate is bounded, thus studying the health seeking-behavior of pregnant women living in the Ayensu Ade community of the Gomoa central district (Creswell *et al.*, 2010).

Ayensu Ade community is a rural community in the Gomoa central district of the central region of Ghana with the inhabitants of that community being predominantly farmers. The community has a population of about 3,500 people with most of them being under the youth age bracket. The community has only one community health centre which serves all the community members. The community is one of the communities in Ghana where teenage pregnancy is prevalent. In a case study design, a vivid description is given about the case or cases (Creswell *et al*., 2010).

The study used both interviews and focus group discussion as data collection instruments and purposively selected six (6) pregnant women and two (2) community health nurses in the community since the use of purposive sampling helped the researcher to identify pregnant women who had used mobile health innovation in seeking for health and had enough knowledge and were willing to participate in the study (Creswell *et al*., 2010). Two focus group discussions were held with each FGD having 3 participants each. Six (6) interviews were conducted, with each of the interview with the respondents lasting 25 minutes which was enough to solicit the responses needed to make the data rich and detailed (Creswell *et al*., 2010). The data was analysed thematically and thoroughly to reflect the study objective and research question that underpinned the study.

FINDINGS AND DISCUSSIONS

The study's main objective is to investigate how mobile health utilization impacts on the health-seeking behavior of pregnant women in Ayensu Ade, a Ghanaian rural community in the central region of Ghana. The data was analysed thematically and thoroughly to reflect the study objective and research questions underpinning the study. The study uses the Diffusion of innovation theory propounded Rogers (1995) to answer the research questions underpinning the study. The study was underpinned by two research questions; (a) what are the persuasion variables that influences the adoption of mHealth among pregnant women in Ayensu Ade community? (b) What are the perceptions of community health nurses in the Ayensu Ade community regarding the use of mHealth in their community?

RQ1: what are the persuasion variables that influences the adoption of mHealth among pregnant women in Ayensu Ade community?

After thoroughly and carefully analysing the data, it was revealed that the mHealth project implemented within the Ayensu Ade community has an impact on the health seeking behavior of pregnant women in the community. Using the persuasion factor of the diffusion of innovation theory, the study revealed that pregnant women in the community utilised only three attributes of the persuasion stage in their decision to adopt or reject the mHealth project implemented in their community.

(a) Relative Advantage

the analysis of the data indicates that pregnant women in the Ayensu Ade community preferred to use the implemented mHealth project in seeking maternal healthcare due to the perceived advantages they saw in the innovation as compared to having physical visitations at the CHPS compound or the district health facilities within their district. The analysis shows that pregnant women had various reasons they assigned to their adoption of the mHealth intervention. The data excerpt below, for instance indicate the following;

"Going to the hospital is good for me as a pregnant women. I know it will help my baby but when you don't have enough money to do lab or scan, you don't think of going to the hospital. You go and get some herbs, which is also good. Now that we can call the nurses in this community and tell them how we feel, we don't spend a lot of money to get healthcare. I like to use the phone to call the nurse than to go there".

(Interview excerpt, Esi)

"Sometimes you need to wake up early in the morning and go to the hospital before they can care for you. And when we do that, it means, the whole day, we cannot go and work to feed our families. And sometimes too, when you go to the hospital, the nurses will say you are late so go and come back next time. Now, when they brought this phone thing, the nurses said we can call them anytime when we don't feel ok".

(FGD 1 with pregnant women)

"When he doctor or nurse is in front of you, you can tell them everything about how you feel. The time is not there. But when they brought the phone thing, we can now say things that we couldn't say when we visited the hospital. I believe the phone one gives more time to explain how I feel to the nurse".

(Interview, Ama).

From the analysis of the above data excerpt, one can clearly see that, the pregnant women within the rural community of Ayensu Ade indicated several reasons they adopted the mHealth project. The study revealed that, the pregnant women touted economic reasons, lack of ample consultation time, and nearness of healthcare facilities as reasons that made them to adopt the mHealth project implemented in their community. This finding supports Rogers' (1995) relative advantage attribute of the diffusion of innovation theory, when she indicated that, the kind of advantages that an innovation may have on another within a social system determines how individuals within that social system adopt that innovation.

Also, the finding in dicate that, since the pregnant women in most cases did not have to physically visit the healthcare facilities to seek for health, they had time on their hands to do other economic activities such as going to their normal work, and spending less on their health needs as they did not need to pay for transportation to the healthcare facilities. This acknowledges Ndayizigamiye and Maharaj (2017) who indicated that, the relative advantages connected with mHealth interventions are the factors that influence the adoption of mHealth by both individuals and public health workers in a social system.

(b) Trialability

The analysis of the data shows that, one of the persuasion factors that influenced how pregnant women in the Ayensu Ade community adopted the implemented mHealth program was due to the innovation's trialability. The analysis indicates that, although the sampled pregnant women all had mobile telephones, they mostly were

not using smart phones and as the mHealth project supports mobile phones which are not smart, it made the usage of the technology very easy. The following data excerpt indicates this;

"…. For this program, I don't need to get and roid phone or iPhone. The small yam phone (analogue) phone I have can be used to call and send sms to the nurses about my health. It was easy and affordable to use after the nurses showed us how to use it".

(Interview, Ama)

"Sometimes when we visit the hospital, the nurses will take longer times to get your file for you. They will leave you there without saying anything and delay you. But as they brought this program, they told us to call or text them before we come to the hospital. And when we do call or text them, the moment we get to the hospital, we don't delay in getting our files to see the doctor. It has really helped to reduce the time we spend at the hospital".

(FGD 2 with pregnant women)

The analysis of the above data indicates that, the pregnant women in the rural community of Ayensu Ade were easily persuaded to use the mHealth project implemented in their community because they perceived the innovation to be easy to make use of. They indicated that after they were educated on the use of the mHealth project, for instance in scheduling their visitation to the healthcare facilities, they were able to make calls to the health facilities to schedule their visitation and by so doing reduced the number of hours they usually spend in the healthcare facilities.

The study also revealed that, the pregnant women find the use of the mHealth project very easy as they did not need to make use of smart phones which were difficult for them to use and came with high cost such as use of internet. This finding is buttressed by Rogers' (1995) when she indicated that, the ease with which individuals in a social system can easily try and test an innovation introduced to them in order to have experience of how the innovation works influences how they adopt the innovation. When the in dividuals perceive the use of the innovation to be difficult, there is a high chance that they will not adopt it and vice versa.

(c) Compatibility

The data analysis shows that the lifestyle, norms, culture, behavior and background of the pregnant women in the community of Ayensu Ade made them to easily adopt the mHealth project implemented in their community. The data excerpts below in dicates this;

"I have been using mobile phone to call and receive money from my son in Accra. The phone also allows the market women to reach me and buy my crops. So, using this phone to call or text the nurse to ask or complain about my sickness is not something I see as new. Today, the phone is used for everything"

(Interview, Adwoa)

"We all know we don't really have money like those in the big cities like cape coast. But almost all of us here use mobile phone. The phone has really helped us to do a lot of things. If not for the phone, getting all of us here would have been difficult for you. How we are now using the phone to get help from the nurses has really helped us. It has made it easy to get hospital date from the nurses. In the past, we go there and you meet a long queue but now that, we use the phone to book the appointment, we don't waste time when we go there".

(FGD 2 with pregnant women)

From the analysis of the data above, it is clear that, most people, especially the pregnant women in the rural community of Ayensu Ade, sampled for this study perceived the use of mobile phones to be part and parcel of their daily lifestyle as they indicated that, they do a lot of things with their phones ranging from financial transaction to using the phones to seek for health. The analysis shows that, the pregnant women had no difficulty adopting the mHealth intervention project implemented in their community because they have been

using mobile phones throughout their activities thereby making it a part of their lifestyle. This influenced their attitude to adopt the mHealth project implemented in their community to seek for health at the health facilities. This finding is in tandem with Rogers' (1995) assertion that, when persuading individuals in a social system to adopt an innovation, there must be a kind of compatibility between the patterns of lifestyle, background and norms of the people and the innovation being introduced to the individuals within that social system. As we can clearly see, because the use of mobile phones for general purposes was already a part of the lifestyle of the people of Ayensu Ade, the pregnant women in that community had no difficulty adopting the mHealth project thereby influencing their health-seeking behavior.

RQ 2: What are the perceptions of community health nurses in the Ayensu Ade community regarding the use of mHealth (MOTECH) in their community?

The research question two (2) of this study sought to explore the perception community health nurses had regarding the mHealth intervention project implemented in the Ayensu Ade community. The data analysis indicates that, the community health nurses in the Ayensu Ade community held varied perceptions regarding the mHealth (MOTECH) intervention project. One of such perception was on the ease the mHealth project provided in their line of work.

(a) Ease of Duty

The analysis of the data indicates that, the community health nurses perceived the implementation of the mHealth project in the Ayensu Ade community as one that gave them some ease in their line of duty. The data excerpt below indicates the following;

"As a nurse here, we deal with a lot of things and at the same time there is pressure here. You cannot ignore the patient when they ask you something. If for instance, the patient wants to know when their time will come for them to see the doctor, you need to give an answer to that. But because there is pressure here, it is difficult. The mHealth has really helped in this regard because now the pregnant women don't just come here, they call for us to arrange a date to see the doctor. This has reduced our pressure small".

(Interview, Nurse Titi)

"In the past, you need to visit every home in this community to create awareness on a health meeting or even some health issues you want to discuss with the community members. We really suffered in doing that but now because of the mHealth project, we are able to organize community health meetings with ease. During COVID, we didn't suffer much in providing constant reminders to the people here. We used the phone to remind the people of the COVID protocols instead of going to their homes.

(Interview, Nurse Offei)

"Them Health has made it easy for us to get files of our patients easily. If you find any difficulty in getting some information, you only pick your phone and call the nurses manager instead of going all the way to her office. This has reduced the stress we have as nurses here."

(Interview, Nurse Clara)

The analysis of the above data excerpt indicates that, the community health nurses in the Ayensu Ade community perceive the mHealth intervention implemented in their community to have eased the pressure on them while providing healthcare services to the community. They indicated that the use of the mobile phone has reduced the load of their work as for instance, they no longer need to walk to the offices of the nursing manager to get information because they can use their mobile phones to seek for such information by making calls to the nursing manager.

The data analysis also shows that, the community health nurses perceived that the use of the mHealth has reduced their burden of going to almost every household in the community to create awareness on diseases and

even in organising community health meetings between the people of Ayensu Ade and healthcare workers has been made easy by the implemented mHealth project. This is in line with what Odendaal and Lewin (2014) asserted when they indicated that, mHealth improves efficiency in healthcare delivery and indicated that, for instance, to healthcare workers such as community nurses, mHealth significantly reduces face-to-face contact hours and fuel costs and improve efficiency through reduced unnecessary travel (Mahmud et al., 2010).

The community health nurses indicated that, the use of the mobile phones made their work a bit easy as for instance, during the COVID era, they did not need to visit homes of the community members to remind them of the COVID protocols as they used the mobile phones to sensitive and reinforce the use of the COVID protocols. This finding supports Sevidzem, Ako-Arrey, and Njukeng (2019) when they asserted that, the deployment of mHealth interventions in healthcare delivery could help expand treatment outreach and awareness creation, assist patients in sticking to medical routines, and promoting behaviors that minimizes the spread of diseases.

CONCLUSION

Due to the efficiency of mHealth interventions, these health innovations have been deployed by many healthcare systems a as a tool that could help in expanding treatment outreach, assisting patients to comply with medical schedules, creating epidemic awareness, and promoting behaviors that limits the spread of diseases (Sevidzem, Ako-Arrey, &Njukeng, 2019). The current study, which sought to investigate how persuasion variables influence the adoption of mHealth among pregnant women and perception of community health nurses on mHealth, concludes that, persuasion attributes such as the relative advantage of an innovation, trialability and compatibility influences how pregnant women in the Ayensu Ade community adopted the implemented mHealth intervention project. Also, the ease of work was a perception held by the community health nurses in the community regarding how they perceived the implemented mHealth intervention project.

RECOMMENDATION

With a focus oninvesti gating how mobile health utilization impacts on the health-seeking behavior of pregnant women in a rural community in Ghana, data collection for the current study was limited to the rural setting which has a relatively low population as compared to urban areas of Ghana. The study therefore recommends that, another study should investigate the phenomenon of mHealth and health-seeking behavior of residents of an urban area(s) with a cosmopolitan population using a different research design like ethnography.

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