Degree Thesis

Master's level (Second cycle)

WOMEN'S EXPERIENCES WITH DIGITAL HEALTH SERVICE AS A TOOL FOR IMPROVING AWARENESS AND PERCEPTION ON SEXUAL REPRODUCTIVE HEALTH AND CONTRACEPTION. A PHENOMENOGRAPHY QUALITATIVE STUDY

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ABSTRACT

BACKGROUND: Most women within reproductive ages living in Low- and Middle-Income Countries, have limited or no access to education on sexual and reproductive health and contraception, yet about 1.9 billon women in LMICs own a mobile phone. The exposure to digital health services has the potential to contribute to improving awareness, influencing positive perceptions, beliefs and promoting SRH and contraception.

AIM: To explore user views and perceptions on the Grace Health's (a digital health service) ability to improve awareness on sexual reproductive health and contraception among Ghanaian, Nigerian and Kenyan women aged 18-35.

METHODOLOGY: A qualitative design using phenomenography to interview women remotely on women's perception of digital health services through their own experience with using the Grace health chat bot and app. Also, their views were sought on how other women are gaining awareness and impacts on sexual reproductive health and contraception from the digital health services.

RESULTS: Seven categories on digital health services emerged, with key findings presented as Safe days, ovulation as contraception, impacts on SRH, Avoiding or seeking pregnancy and influence on perception.

CONCLUSION: This qualitative study gives insight for research community, public health professionals, app designers, health care providers, stakeholders and civil society organisations in making decisions regarding the use of digital health service as strategic, innovative instruments for interventions in major key indicators of Sexual Reproductive Health and Rights.

Keywords: Contraception, Chat bot, Unintended Pregnancy, Menstrual tracking, Period tracking.

KEYWORDS AND ABBREVIATIONS

SRHR: Sexual and Reproductive Health Rights

SRH: Sexual and Reproductive Health

GH: Grace Health

DHS: Digital Health Services

APP: Application

mHealth: mobile Health

LMICs: Low- and Middle-Income Countries

HICs: High Income Countries

CSE: Comprehensive Sexual Education

Contents

INTRODUCTION

The use of digital services to promote sexual and reproductive health over the years has seen significant development in improving the knowledge, awareness, views and perceptions of women regarding their reproductive health. Health apps are seen to be useful tools because they address a large audience including individuals, healthcare providers, medical students and patients. As they become more popular to the masses, medical and public health institutions are utilizing these health applications to provide education and create awareness on key areas of health. Despite their increased popularity, less scholarly attention has been given to these digital health services most especially in the Sub-Saharan African countries like Ghana, Nigeria and Kenya. This study seeks to find out women's experiences with the Grace Health, a digital health service ability to improve awareness on sexual reproductive health and contraception. As a Registered Nurse with four years clinical experience, the masters programme Global Sexual Reproductive Health at Dalarna University has further developed my passion as an SRHR advocate, an interest springing from previous experiences of working with organizations providing women with SRHR services.

DEFINITIONS

Sexual and Reproductive Health and Rights (SRHR) is defined as aims to promote maternal, new-born health and eliminate preventable maternal and neonatal mortality and morbidity, to promote quality sexual and reproductive health services, including contraception services, and to fight against sexually transmitted infections (STI) and cervical cancer, abortion care, violence against women and girls, and adolescents sexual and reproductive health needs. Universal access to sexual and reproductive health is vital not only to achieve sustainable development but also to ensure that this new framework attends to the needs and aspirations of people around the world and leads to realization of their health and human rights (WHO, 2014).

Contraception can define as the intentional prevention of conception through the use of various devices, sexual practices, chemicals, drugs or surgical procedures. An effective contraception allows a physical relationship without any fear of unwanted pregnancy (Rakhi J et al, 2014).

Conception is defined as the onset of pregnancy, marked by fertilization also termed as becoming pregnant (Charles Davis, 2021).

BACKGROUND

Globally, modern method of contraceptive use is fast increasing 63% in High Income Countries (HICs) but continues to be low in Africa. According to The World Health Organization (2017) an estimate of 214 million women of reproductive age in Low- and Middle-Income Countries (LMICs) who want to avoid pregnancy are not using a modern contraceptive method. Factors contributing to this trend includes the lack of community awareness on contraception, public misconceptions surrounding the use of contraception, social stigma, religious beliefs inhibiting provision of comprehensive sexual education, contraception and abortion services to young women (Feroz et al, 2021). This goes to show that the unmet need for contraception can be related to the factors reducing the uptake of SRH and contraception services. This indicates that demand for contraception services exists but are not being met. The burden of unsafe abortions usually lies in low- and middle-income countries like Ghana, Nigeria and Kenya where contraceptive prevalence on using a modern method among women within the ages of 15-49 is extremely as low as 17% (Djibril M. Ba, 2019).

Worldwide, the time spent on digital devices is increasing dramatically. Smartphone usage and internet access are growing all around the world with over 3.6 billion people estimated to own a smartphone or accessing the internet at least occasionally (Oberlo, 2020). Digital technologies can deliver reliable information to a person. Having information accessible through software apps can also minimize the time and expense of seeking or receiving information through more conventional means, such as print or oral contact (High Impact Practices, 2020). Digital Health Services (DHS) through inventions like software applications has the potential to provide accurate information to individuals when and where they want it, with careful attention paid to design, may offer the added benefit of confidentiality, privacy and anonymity issues that are critically important to young people. Moreover, studies are showing that DHS are effective regarding their ability to induce a positive change in health behavior and users' perceptions on health (Lupton et al, 2016). In 2016, the download volume for digital menstrual supported applications (apps) by women were estimated to have reached 200 million (levy et al, 2017).

Diverse DHS have been used to connect the young population on Sexual Reproductive Health (SRH) information and services. In efforts to understand the potential of DHS for young people SRH services, there has been a rise in the amount of research in HICs in recent years. Reducing unintended pregnancy is a compelling and complex public health challenge and a worldwide public health goal. The US Department of Health and Human Services'(DHHS). Healthy

People 2020 campaign aimed to reduce unintended pregnancy by 10% by 2020. One way that they did this was supporting evidence-based family planning programs, those that leverage smartphones to deliver reproductive health information (DHHS, 2020).

Similarly, DHS has be used in LMICs to reach out to the youth population and to engage them to provide acceptable, safe, cost-effective, and accurate SRH services. (Feroz et al, 2021) However, little evidence exists on the use of digital interventions for improving SRH among young people in LMICs. In Africa where the use of digital technology is increasing rapidly, more people especially young people are accessing the internet occasionally. DHS has been seen in recent times as a significant tool to utilize for public health interventions on women's health (Logie et al, 2020). Public health institutions are leveraging these smartphone services to promote SRH services like Contraception, abortion services for the prevention of unwanted pregnancies especially among the youth (Rokicki et al, 2017).

In Sub-Saharan countries such as Ghana, Nigeria and Kenya, the average woman owns a smartphone but lacks a basic understanding about sex, reproduction, and risks for unwanted pregnancy as well as limited awareness and information about sexual reproductive health including contraception. The exposure to DHS has the potential to contribute to improving awareness, influencing positive perceptions, beliefs and promoting SRH and contraception (Fayoyin, 2016). Most importantly, since most young girls aged 15–25 years, have no or limited access to sexual and reproductive health (SRH) education and services, mainly due to social stigma, lack of awareness, policies, procedures and religious beliefs inhibiting provision of contraception and abortion services to girls and judgmental attitudes of some healthcare professionals (Johnson et al, 2017). Thus, young people have SRH needs that remain unmet, and to address these specific SRH needs, the use of innovative approaches like DHS are needed to ensure access to safe, effective, and acceptable SRH services.

Grace Health App and Chat Bot

Grace Health (GH) is a digital platform functioning as smartphone application (App) that supports the self-care journey of women by giving them access to period tracking, fertility predictions, reminders, information on contraception and explores range of sexual reproductive health topics. It also has a chatting section where new users and old users are engaged in series of questions to understand their immediate reproductive health needs, how to help women answer all their questions while educating and providing them with all the relevant information they seek, through their application software and the use of social media pages like Facebook.

Digital health services like the GH are reaching millions of young women who are the most vulnerable group when it comes to issues regarding Sexual Reproductive Health (Grace Health).

Period tracking apps usually offer three features and functions: First, tracking of menstrual cycle-associated factors such as mood swings, pain, sleeping patterns, intake of medication and contraceptives, sex life, vaginal discharge, food cravings and exercise. Second, a menstrual calendar where period and ovulation dates as well as days on which additional data have been entered by users are highlighted in specific way. Third, an analysis screen with graphs, tables or numerical depictions that provide users with statistical information such as average cycle lengths or changes in body weight, mood, body temperature etc. Although almost all DHS have these similar functions only a few provide an additional service in the form of a chatbot feature that engage users in a live online chatting platform, having live interactions with the users. The Grace Health app offer this additional feature.

Review of the Field on Digital Health Services

The promotion of Sexual Reproductive Health and Rights (SRHR) among women in Africa has encountered several challenges and dilemmas especially when it comes to raising awareness, changing the negative perceptions and instilling positive attitudes on sexual and reproductive health among the young people. In Ghana, studies have identified that about 37% of all pregnancies are unintended, making up 23% unplanned and 14% unwanted pregnancies (Nyarko, 2019). The prevalence of contraception usage among Ghanaian women of reproductive ages was 22% (Aviisah et al, 2018). In Nigeria, an estimate rate of 59 per 1,000 unintended pregnancies occurred within women aged 15-49. Fifty-six of the unintended pregnancies resulted in abortion. The prevalence of conception use was 15% (Dambo et al, 2017). Reports from Kenya Demographic and Health Survey (2014) established that over 35% of the total pregnancies were unintended. However, in Kenya the prevalence of contraception use was higher than that of Ghana and Nigeria with an estimate rate of 39% (Lunani et al, 2018). Ghana Nigeria and Kenya are still struggling to fully implement Comprehensive Sexual Education (CSE) into their education system's curriculum. An initiative that aims to provide students, especially young female adolescents, the knowledge, attitude, skill and values to make appropriate and healthy choices in their sexual lives. The CSE was designed by the United Nations Population Fund (UNFPA) to work with governments to implement the CSE program with the intention of reducing the unplanned and unwanted pregnancies to teach students on

safe sex, contraception and abortion for their well-being and dignity. DHS are reaching out to millions of young women in Africa in efforts to bridge this gap and provide information and guidance to women on their sexual reproductive health (Wong et al 2020).

In 2017, over 325.000 health apps were available in majority of the app stores. The soaring numbers and recent annual growth rate of about 25%, goes to prove that DHS represent one of the most dynamic and rapidly growing technological developments in the areas of digital health care (Levy et al, 2019). The increase in popularity of DHS has drawn interest to research about health apps in the recent years. Among the existing studies on DHS. Epstein et al. conducted a study in 2017 that reports on practices of menstrual tracking in the US context highlighting the principal reasons why women track their cycles. There are studies on pregnancy and parenting apps which examine users' reasons for and expectations of engaging in self-tracking during pregnancy and early parenthood. A study conducted by Anna Nielsen et al. (2020) in Sweden, reported using a randomised controlled trail to evaluate the effect of smart phone application as an intervention on sexual health in youth. Also, there are some medical and computer science studies addressing the design and performance of pregnancy-related and fertility-tracking apps. Some investigates patient satisfaction and compliance with mobile app reporting on heavy menstrual bleeding while other studies dwell on menstrual and ovulation mobile phone apps to examine the relationship between menstrual cycles and the timing of ovulation.

A systematic review study by Feroz et al. (2021) presents identified barriers, facilitators, and range of Mobile Health solutions, with a focus on how mobile phones are used to improve young people sexual and reproductive health in low and middle-income countries. A study by Otu et al. (2021) also focused on Leveraging mobile health applications to improve sexual and reproductive health services in Nigeria, with a detail look into the implications for practice and policy on reproductive health.

This study focuses specifically on the DHS called Grace Health and users within the Sub-Saharan Africa. Given that Grace Health has over 800,000 subscribers with majority of their users located in these three countries Ghana, Nigeria and Kenya. Furthermore, most of the research carried out on digital apps does not provide a detailed analysis of women's experiences with digital services as a tool to improve on awareness and perception on contraception and SRH, our aim is to contribute to filling this gap and to identify how women experience with the apps improve upon women's awareness and perceptions on contraception.

PROBLEM STATEMENT

Unintended pregnancy is among the major sexual reproductive health issues worldwide with majority of them resulting in abortions, many of which are unsafe. Approximately 25 million unsafe abortions occur each year with 97% occurring in developing countries in Africa, Asia and Latin America, with death cases resulting from unsafe abortions contributing to about 13% of maternal mortality. An estimate of 4 million unsafe abortions occurs every year in Africa (WHO, 2017). About 214 million women of reproductive age in developing regions in Sub-Saharan Africa, who want to avoid pregnancy are not using a modern contraceptive method (Djibril M. Ba, 2019). Some major contributing factors to this trend include unintended pregnancies due to low community awareness, lack of knowledge on the use of contraceptives, difficulty with adhering to the usage, social stigma, religious beliefs inhibiting provision of comprehensive sexual education, contraception and abortion services to young women. Moreover, more than half of the women living in regions within Sub-Saharan Africa lack access to essential reproductive health services. Surprisingly, about 1.9 billon women in low- and middle-income countries own a mobile phone.

DHS can be utilized to promote contraception usage among women. The provision of essential information about SRH and contraception can present as contributions to increase the uptake of SRH and contraception services, hereby helping to reduce unintended pregnancies that results in unsafe abortions. The focus of this study is to further understand how DHS can be used as tool to improve perception and awareness on contraception and SRH.

AIM AND RESEARCH QUESTIONS

To explore user views and perceptions on the Grace Health's (a digital health service) ability to improve awareness on sexual and reproductive health and contraception among Ghanaian, Nigerian and Kenyan women aged 18 to 35.

- What are the perceptions of women about digital health services ability to improve awareness on sexual reproductive health and contraception?
- How is the Grace Health app digital health service helping to improve on women's perception while promoting contraception?

METHODOLOGY

Phenomenography is a qualitative research approach from science educational research used to explore the second order perspective, peoples experience about something. It is an approach to educational research which appeared in publications in the early 1980s (Marton & Säljö). This methodology is used in research to explore people's perceptions about a phenomenon and since the objective is to explore women's perception of `how other women are using digital health services through their own experience with using the Grace health chat bot and app, it was ideal to use phenomenography.

Phenomenography studies usually involve conceptual understanding of a phenomenon from a group of people and data collection involves individual description of understanding, usually through interviews. A phenomenography data analysis sorts perception which are gathered from data collected into specific concepts of descriptions. These concepts are grouped into categories that logically related to one another and become the essence of the phenomenon (Marton & Säljö, 2000). Hence, this method supports the inquisition of women's experiences with digital health service as a tool for improving awareness and perception on SRH and contraception.

In phenomenology research, data collection is carried out through open questions to explore participants' experiences of a phenomenon, not the researchers' perception. Rather than asking questions about why something happens, questions focus on how and what the participants do, and their feelings. It is particularly useful for understanding how people learn and see knowledge in particular contexts and has been used increasingly in information literacy research (Yates et al, 2012). Typically, phenomenography involves interviewing individuals or groups. However, to capture the experiences of some app users, the researcher decided to undertake individual interviews.

Study Setting: The researcher focused on these three Sub Saharan African countries Ghana, Nigeria and Kenya because of the high prevalence rate of unintended or unwanted pregnancies 76% and low prevalence of contraception use 17% (WHO, 2018 cited in Djibril M. Ba, 2019). Also, because the Grace Health App and Chat bot have majority of their users or subscribers located within these three countries. Ghana and Nigeria located in the West African Region and Kenya located in the East African Region respectively. Ghana is a middle-income country along the Gulf of Guinea and the Atlantic Ocean with a population of about 31million people, Nigeria also a middle-income country along the Atlantic Ocean with a population of

approximately 201million people and Kenya a Lower- middle income country along the coastline of the Indian Ocean with a population of about 53million people. The combine population of these three countries is about 297 million with majority of population being women (World meter United Nations data, 2020).
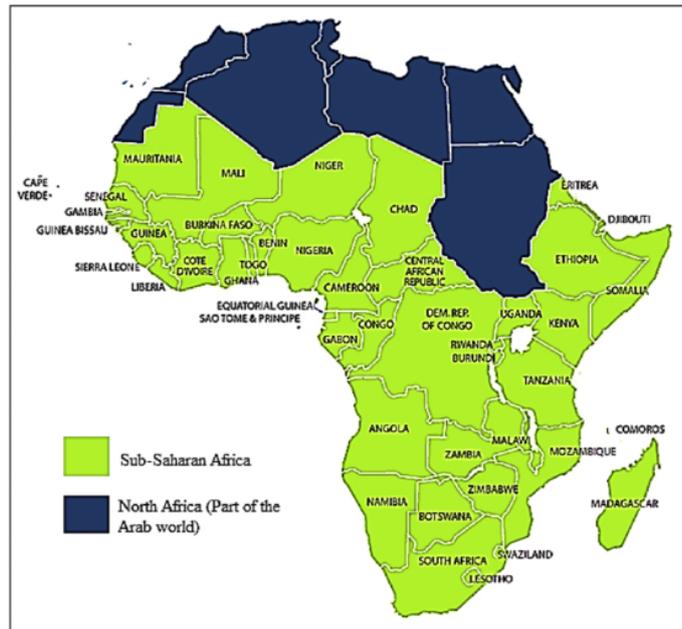
Selection/Population/Participants

Purposeful sampling was used for the selection participants for this study. Purposeful sampling is commonly used in qualitative research. It involves selecting research participants according to the needs of the study (Glaser & Strauss; Morse, 1991) in that researchers choose participants who give a richness of information that is suitable for detailed research (Patton, 1980).

Participants were purposefully selected after   posts were made on the Facebook page of Grace Health to solicit for users to partake in the study. The participants were selected based on three criteria. First, app users who had been using the GH app and chat bot feature for 3months and above. Second, participants living within the Sub-Saharan Region of Africa because the app is available for use worldwide. Thirdly, participants who fall within the age of 18-35. 20 participants were identified based on all these criteria. However, 10 out of these 20 participants showed interest and were willing to participate in the study.

Data Collection

Data was collected within a period of one month from 19th February 2021 to 20th March 2021. Data collection happened in two folds during the selection of participant, socio demographic data was collected via emails, WhatsApp messages and calls.

This was after participants had signed the informed consent form agreeing to partake in the study. Due to current situation (Covid-19 pandemic) the participants interviews were conducted and recorded over an encrypted Zoom Webinar and WhatsApp Messenger video calls. The interviews were conducted in English mainly because English language is the first and second official Languages used in these countries. Moreover, the Grace Health app software and Facebook chat operates with the English Language. Interviews were conducted on the weekends to enable participant to have time for one-on-one interaction with the researcher. Each interview lasted for about 30 to 45mins. The interviews were conducted using a semi structured questionnaire guide (Appendix1) to ask open-ended questions and follow up questions to the participants about their experiences and perceptions about the digital service as a tool for improving awareness on SRH and contraception. The equipment that was used for the interviews was personal computer and mobile phones.

Data Analysis

All the interviews were transcribed verbatim by the interviewer. General reading of the interview transcripts was carried out independently by the author. The analysis comprised of three stages of phenomenography research methods. First, the identification of the conceptions from each participant was gathered through the careful and repeated reading of transcripts. Consistent with phenomenography analysis techniques interview transcripts were analysed in their totality while exploring links between various statements from participants. The objective is to avoid the possibility of interpreting experiences and second order perspective out of context (Åkerlind et al, 2005). Second, transcripts were arranged according to the conceptions that emerged so that individuals with similar conceptions or perception from experiencing the phenomenon could be grouped together. Transcripts were re-read and compared within and across groups to check the allocation of transcripts to different groups. This was to verify the stability of the identified conceptions. The third stage involved exploring the links between the

different conceptions. It was at this phase of the analysis where the researchers' perspectives are used to interpret the logical relationships between the conceptions (Bowden, 2000). Following the recommendation of a number of phenomenographers, this step was undertaken only after the conceptions had been finalized to avoid imposing a biased structure on the data (Ashworth & Lucas, 2000). The concluding stage of analysis ended with the linking of the conceptions which were identified from the transcripts group into categories, logically presented set of the different ways of experiencing a phenomenon (Marton, 1981)

ETHICAL CONSIDERATIONS

The researcher completed and submitted the Dalarna University research ethics assessment checklist (Appendix 2) and from the assessment it was concluded that no additional ethical clearance was needed since the study will not focus on any sensitive issues with regards to the participants. Rather the study focused on using the second order perspective to explore women's experience and perception of digital health services as a tool for improving sexual reproductive health and contraception. The World Medical Association Declaration of Helsinki ethical principles involving human subject was used to guide the study during data collection as the study seeks to explores experiences of women (Jam. C. Dent, 2014). Approval was sought from participants to join the study; an informed consent form (Appendix 3) was signed by all participants. Participation in this study was voluntary and individuals were informed that they could withdraw at any point in time from the study. Also, study participants were guaranteed anonymity as the researcher was going to analyse content from interviews without using descriptions that could be easily traced back to the participants.

RESULTS

Table 1. Social demographic data

USAGE HISTORY OF PARTICIPANTS	AGE	NATIONALITY
3-11 months users	24	Ghanaian
	21	Ghanaian
	20	Kenyan
12months users	35	Nigerian
	26	Nigerian
	23	Nigerian
	23	Kenyan
Over a year or more users	25	Kenyan
	24	Nigerian
	27	Nigerian

Table 1 summarizes the social demographic data information of the 10 women who were interviewed. Participants were within the ages of 18-35 All participants were staying in major cities in their respective countries. The ten (10) women were app users who had been using the GH app and chat bot feature for 3 months and above. A total of two (2) participants from Ghana, three (3) participants from Kenya and five (5) participants from Nigeria were interviewed, respectively.

Seven categories were derived and presented as follows Tracking period irregularities, Conversations, Information on Contraception, Safe days, ovulation as contraception, impacts on SRH, Avoiding or seeking pregnancy and influence on perception.

Tracking period irregularities

When participants were asked to share their experiences with the app, all the women interviewed expressed that they primarily wanted to track their periods and the irregularities of it. Their main objective of using the app with it chat bot feature was to know when to expect their periods and the app was very helpful to achieve that purpose. The app provides them with the information on when expected to be their ovulation date and when to expect their flow.

"It has helped me in a calculating my period. I used to struggle with that because sometimes it's not regular, but grace app is helping me keep track of my period, it has really been of help." (Pt 1. 24y)

All interviewees stated that they entered their period dates, and most of them (7) compared past and current cycles expressing their need for the app supported period tracking was to know how irregular or regular their cycles were.

"I compared my previous cycle dates to know how regular or not regular my periods have been in some past months. Sometimes I have a 28day cycle sometimes 25days. It helps you have a fair knowledge of all that." (Pt 4. 35y)

Preparation of upcoming periods to know immediate period dates but also served as a reminder in general planning of future events such as travels, to get the necessary things needed to prepare for their period. as mentioned by another interviewee:

"I'm traveling somewhere I don't know that I'm going to have my period in the next two days. The best thing about the grace health app is that if I open the app and see that my periods are in two days, so I remember to carry my tampons my menstrual Cup and pantie liners you know." (Pt 3. 23y)

Conversations

Participants explained how the app works. They stated that the app and its chat bot feature provided women with the information they sought for. The feedbacks or responses were given to the question options selected or inputted. Conversation with the app and chatbot were

directed by the app users. A wide range of topics covering Sexual Reproductive health have been categorized by the app. Tailor-made questions with answer options for users to choose from to direct the sort of information the user wants, so the digital health service can provide it.

"When the chat box asked me questions then I answer and then it will give me back feedback and then per the info I give it also give me a response." (Pt 1. 24y)

Some participants also expressed that they saw the app as a peer to peer to be able to communicate their needs to for solutions or answers. They loved that they controlled the sort of conversations they wanted to have with the chat bot. The chat bot reminds them of the same information they gave previous times, to resume a new chat session.

"I really think of this app as a peer-to-peer kind of an app because let's say it normally gives me the information that I feed it, reminds you of the same information that you gave it. So, I'll say it's just whatever the information you provide to the app is what answers it gives you." (Pt 3. 23y)

Information on Contraception

All the women interviewed stated that they had seen some information on contraception from the DHS. The information was received from the app during the data collection phase of using the app or chatbot. After receiving demographic data from the women, they were asked if they use any modern method of contraception with the options of the various methods of contraception as an answer to click on. Users then decides to click on an option of information on what they want to be informed about, the chat bot would provide that information. Women already on method of contraception will key in their details for the app to provide more education on the particular type they are using. Also, Grace Health set a reminder for them, for those on the short-acting contraceptives like the daily pills, patches or monthly injectables. Those not on any method are directed to learn about the different methods, types and options available for their use.

"I remember the first time it asked me if I have use any of these contraceptives like condoms, copper IUD and then I think morning after pill, implant, injection and then the calendar method

and I said I use the calendar method. then it gives you information on it and those other methods if I am interested to know." (Pt 3. 23y)

"Yes, On the app on contraception, she talked about injection then patches, emergency pills, condoms those are the ones I can remember. I can't really remember all but she mentioned a lot" (Pt 2. 21y)

Safe days, Ovulation as Contraception

All women were asked if they think other women were using the app as a (conception) contraception. Some thought women were using it as a contraception other had opinions and perceptions contrary to this. Some agreed expressing that mainly because the app was providing women with information on their safe days, when they are expected to have their ovulation, when to have sex and when not to have sex, in line with this, they were of the view that other women were indeed using the app as contraception.

"I'll say yes and no because you know it tells you when you are low chance of getting pregnant, high chance of getting pregnant and your ovulation. Normally everybody knows about their safe days mostly if you have a regular cycle you know your safe days so some people would you really use it as a contraception." (Pt 3. 23y)

Those with contrary opinions to this also expressed that the irregularities of women's period would not allow the app to accurately predict the right dates although the predictions are mostly right, but it was not 100% effective to use the app as a contraception. Hence, they believe women were not relying or using the digital health service as a contraception.

"I really don't think so because it can really go wrong it can't be 100% right it is not 100% right, just like a statistic because sometimes they predict your period, it comes 2 or more days late so you cannot use it as contraception" (Pt 3. 23y)

Although several participants reported that they were tracking periods and ovulation, and thought other women were doing the same, three (3) of the interviewees mentioned women relying on the apps' calculations as a method of contraception. Nevertheless, some stated that they used their apps' predictions as a guideline and not thinking of it as a contraception. Also,

adding that sometimes the prediction for their next period could be some days late so it wouldn't be prudent to rely on the app as a contraception. Another participant pointed out that some women would use the app as a calendar method of contraception.

"Some women will use it as a calendar method. The app is providing them with information about their safe dates when to expect their ovulation and their free period days."

Impacts on SRH

Participants agreed that the digital health service and its chat bot were promoting sexual reproductive health and contraception to women and explained how they thought app was doing that. All interviewees revealed that the GH app was greatly impacting the lives of women helping them to know about the bodies, the provision of resources material on Sexual Reproductive Health with content meant to educate women on all the key indicates of SRHR including Safe sex, menstrual health, contraception, abortion, adolescent sexuality, Sexual Transmitted Infections, and the various cancers that affect women, for example cervical cancer and breast cancer.

"It is one of the best things for your sexual life and if someone has not used the app before and the person got to use it, the person gets to see that it's very helpful like maybe the person don't know anything about contraceptives your sex life, tracking your period and menstrual hygiene, you become aware" (Pt 6. 25y)

"If you didn't know a lot of things about being a woman practising safe sex and you use this GH app you get to understand a lot about your body and how to take care of yourself. The app answers all the questions you have about sex, contraceptive and your well-being as a woman." (Pt 1. 24y)

Another aspect of the importance for DHS menstrual tracking raised by several of our participants was the desire to explore their bodies and selves. For instance, an interviewee pointed out how menstrual tracking is enabling women to understand their bodies and womanhood in itself:

"I think it gives a lot of knowledge makes you to understand yourself, your body. It makes you to understand a little bit more about your womanhood in general. You become very much aware when and when is my ovulation and my flow, you are able to track your mood too." (Pt 4. 35y)

Avoiding or Seeking Pregnancy

Most interviewee accorded that the digital health service was a great tool for helping women especially providing them with information that is geared towards improving upon their sexual reproductive health. More so creating a sense of awareness about contraception. Guiding women in ways to avoid pregnancy and to have a safe sexual life. DHS helps women to avoid unintended pregnancies as they become so aware and know of the different ways to avoid pregnancies when they are not ready to conceive. Participants also expressed that women also looking to conceive also used the app to identify when is their fertile window, when to have sex to conceive.

"I believe it has impacted and helped some people and because it helped me also. So, I didn't know that if you are avoiding pregnancy, if you are ovulating you have to avoid sex or you have to use protection or anything to avoid pregnancy. We learn of the many ways to avoid pregnancy through using the Grace Health app." (Pt 2. 21y)

"Even if you are looking for a child the app can also help. It gives you so much information on your fertile window and tells you when it is appropriate to meet your husband and all" (Pt 4. 35y)

As is evident from the preceding statements, the tracking of ovulation and safe days, serve as a means to avoid pregnancy. Nevertheless, other women were also using the information provided as a guide to become pregnant because they wanted to conceive.

Influence on Perceptions

Participants stated that the information women received on contraception had the tendency to influence women's perception about contraception. Especially those with a lot of misconceptions about contraception would have a different views or attitude towards the use of

contraception. Especially those who want to prevent pregnancy would get to understand that contraception is a better option for the prevention of unwanted pregnancies.

"I think the information it gives on contraception helps you to understand how contraception works. You discover that contraception is not bad and that they help you not to find yourself in any situation where you are not ready for a child." (Pt 7. 26y)

DISCUSSION

In recent years, DHS have received some scholarly attention, due to their contributions towards the promotion of Sexual Reproductive Health and Rights (SRHR). Addressing the lack of information dissemination while combating the stigma surrounding SRH services. Nevertheless, given that low reproductive health literacy is commonly understood as a public health problem due to its negative effect on people's access to understanding and use of health information. DHS have often been conceptualized as revolutionary tools to bridge this divide through patient empowerment and education. Findings from this study goes a long way to demonstrate that digital health services can be used as tools for improving awareness and providing knowledge especially on sexual reproductive health including contraception that majority of people especially women in LMICs lack awareness on. Therefore, DHS like the Grace Health represents a promising educational tool for user empowerment and for the improvement of SRH literacy. This qualitative interview study identified seven characteristics, many of the emphasis on menstrual apps' our participants mentioned being, the ability to track period irregularities, knowing their periods, to better prepare for future activities, learning to know more about their bodies and womanhood. Participants also expressed their views on how they thought other women are using the digital service. Highlighting how they thought other women's perception on SRH and contraception are being improved.

Summary of Main Results

Digital health services app-supported tracking of period cycles and associated factors has an impact on women's experiences and understanding of menstrual cycles, contraception, sex life, and their bodies. They influence the interactions between health promoters and patients. As illustrated in this study, experiences similar and perceptions are almost the same between users.

The key findings that emerged from conceptions from the interviews depicts that digital services have indeed positive impacts in the promotion of contraception and SRH as a whole. The following categories emerged Tracking period irregularities, conversations, information on contraception, safe periods, ovulation as contraception, Impact on SRH, avoiding or seeking pregnancy and influence on perception.

Results Discussion

Impacts on Sexual Reproductive Health

The study results report evidence of DHS ability to promote, improve awareness and perceptions on SRH. The importance of DHS cannot be overlooked as they can be used as promising instruments for the improvement of SRH literacy, most importantly in low- and middle-income settings. The study shows indeed how useful and feasible the Grace Health app has been for women providing information and support about on key indicators of women's SRH. Participants pointed out that women's experiences with the DHS have grately impacted their lives, they believe that women using the app would testify to the positive repercussions of DHS on their sexual and reproductive health. A study by Sarah Timmons et al in 2018 also highlighted the impact of digital services on adolescence usage of smartphone apps to support the use of long-lasting reversible contraception, with finding showing that MyLARC a digital service has been a great tool for providing information and support about LARC to adolescents. Further proving that women are open to seeking and receiving sexual reproductive health services from mobile devices. Similarly, findings from another randomized control trail study by Rokicki et al. (2017) on assessing the reach and effectiveness of mHealth evidence from a reproductive health program for adolescent girls in Ghana, revealed that mHealth program was effective at significantly increasing knowledge for every subgroup at both 3 and 15 months. The influence of DHS on women's sexual reproductive health cannot be over-emphasized.

Implications on Awareness and perception on Contraception

Globally, the promotion of modern method of contraception use among women of reproductive ages has contributed to the fast increasing in usage 63%. However, the situation in Sub Saharan Africa is the complete opposite as the uptake of modern contraception used is extremely low 29.4% (UN, 2019). Some factors contributing to this low uptake includes social stigma, lack of

awareness, misconceptions about contraception mostly based on hearsays and religious beliefs inhibiting provision of contraception services to women. Digital health services can be used as dynamic educational tools to empower women with the right information on contraception, committed to changing all negatives narratives about the use of contraception. In this study, the findings further revealed the potential of digital health services to influence perceptions and improvements of contraception literacy. Participants mentioned that, the information given on contraception helps women to understand how contraception works. They discover that contraception is not bad and that they help you not to find yourself in any situation where you are not ready for a child. Educating women on contraception, getting them to understand the importance of contraception by providing all relevant information and awareness would clear out misconceptions. In line with a randomized control trail survey study by Douglas Johnson et al in 2014 conducted in Kenya shows the impact of a family planning mHealth service on knowledge and use of contraception. The study presented finding that having full access to mobile for Reproductive Health (m4RH) increased consumers' knowledge of family planning and contraception. On average, they found out that group members with full-access to mHealth correctly answered 2.19 questions out of 5, while group members with limited-access correctly answered 1.92 questions (p<.001). The estimated impact of 0.27 more correct knowledge question thus represents a 14% improvement in knowledge score compared with the limited-access group. A scoping review study by Wong et al also highlighted the relevance of digital health technology to enhance adolescent and Young Adult Clinical Preventive Services. The study reported many digital services serve as tools that enable health-related behavior change, with encompasses domains, such as knowledge acquisition, skill building, and self-efficacy that reinforces new ideas and correct misconceptions for adolescents and young adults. Digital health services are effective and valuable tools to use to influence perceptions and create awareness.

Promotion of Contraception and reducing unintended pregnancies.

Almost all women are at risk for unintended pregnancy throughout their reproductive years. Adolescents, young women and even married women are all at risk for unintended pregnancies. In Sub Saharan Africa unintended pregnancy is among the major sexual reproductive health issues with majority of the resulting in unsafe abortions. DHS has the ability to enforce a change in the dynamics of this public health problem. Providing women with the services of been able to track their ovulation, know their safe days and when not to have sex or have sex. Women

become very conscious in trying to avoid pregnancies or trying to get pregnant. As illustrated in this study, participants agreed that women were using the app for various reasons. Some are seeking for pregnancies and while others were avoiding pregnancy and the DHS is assisting women with this service. Having the power to decide when you want to conceive and when not is one most empowering feeling for every woman also as it is a reproductive right. A qualitative content analysis study by Levy et al conducted in 2019 on users' experiences of app-supported menstrual tracking in Europe reported similar findings revealing that women were using menstrual tracking apps as contraception, relying on the apps' predictions, guidelines and calculations for contraception. Nevertheless, other women also revealed relying on the app to conceive. In a systematic review and content analysis study by Mangone et al in 2016 on mobile phone apps for the prevention of unintended pregnancy, findings presented show that mobile phone apps have rapidly expanded in scope, sophistication, and reach, presenting a unique opportunity as a tool for pregnancy prevention in the pockets of millions of Americans. Fertility mobile phone apps with Birth control reminders, extra features providing GPS of where to access contraception has been very instrumental in the prevention of unwanted pregnancies.

The influence of DHS on women's SRH has been illustrated in this study. In aims of promoting contraception and creating awareness for women on key indicators of women's health, digital health services can be effective tools to utilize for intervention strategies in Public health awareness and prevention services.

Methodological and Ethical Discussion

The study methodology helped to explore user insights in the interpretive approach. It allowed for women to present their perceptions because of their experiences with phenomenon in context which is the Grace Health a digital health service. Phenomenography methodology was most suitable method to use for this study that seeks to explore the second order perspective of the participants perceptions.

The methodology used for this study could not allow the research to carry out in-depth interview with participants. This was a limitation for the study as women were only allowed to talk about their experiences with the digital health service with all other topics discussed in the second other perspective. Thus, it is not the true representative of the participants as app users but rather their views or perceptions of how they thought other women were using the app. Their

perception or view could be limited as they were not discussing the issues as pertaining to themselves.

This methodology could be exploited because it doesn't raise a lot of issues with regards to ethical concerns since all sensitive issues discussed are not about the participants but of other people. The study did not require getting ethical approval. However, participants still had to give their consent to take part in the study.

Credibility and Confirmability: The researcher confirms that findings are based on the participants' responses and not any potential bias or personal motivations of the researcher.

To further prove the validity of this study, finding from the study were presented to participants to provide feedback on the data analysis and interpretations to verify accuracy. Participants also verify their transcripts for accuracy prior to data analysis. The text transcripts of data were submitted for review by Grace Health.

Dependability: The study used up to date literature to support the study and the discussions session explored related relevant existing studies to further present key findings.

Transferability: Findings from this study can be applied in other similar study context. As discussions from the study included literature from other studies. This shows the potentials of this study as a literature for other study to utilize.

There are no conflicts of interest reported because the study was an individual effort and data was gathered from participants who willingly choose to partake in the study. There was however some support from Grace health to reach out to participants to join the study. The researcher takes full responsibility for the work and its implications.

CONCLUSION

This qualitative study gives insight for research community and public health professionals, app designers, health care providers, stakeholders and civil society organisations in making decisions regarding the use of innovative, engaging and effective mobile phone interventions to improve young women SRH outcomes, yet the room remains for additional evidence and innovation in overlooked areas. Furthermore, the results emerged informs, about users' experiences and consequences of app-supported period tracking on women's health. DHS can be utilized as strategic, innovative instruments for interventions in major key indicators of Sexual Reproductive Health and Rights. Moreover, the study also highlighted how women's experiences with DHS create awareness, aiding to improve perceptions while encouraging women to become very conscious about their health and well-being.

Clinical implications and suggestions for Future Research

The use of digital health apps for health and well-being has grown exponentially in the last decade. In general health apps offer a potential cost-effective solution for governments, civil society organisation and stakeholders to utilize as tool for the implementation of strategies and policies aimed to improve SRHR worldwide. This study provides suggestions for the integration of self-tracking technologies into existing healthcare procedures and for further development of period tracking app design. In order to obtain a more complete picture regarding the role of digital technologies within the healthcare context, future research should incorporate participants using varied digital health applications not just with focus on one particular App service, with more varied social backgrounds such as people with very limited digital literacy. The study for recommendations DHS would be to increase apps' inclusivity providing equal access to people who might otherwise be excluded or marginalized such as those in remote communities that have no or limited connectivity to the internet and to improve their usability and acceptance. Additionally, researchers should also investigate app developers' perceptions and objectives, and provide insight into healthcare professionals' opinions and experiences concerning the consequences of digital health services.

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Appendix 1,2,3:

APPENDIX 1

QUESTIONAIRE FOR INTERVIEW WITH GRACE HEALTH APP USERS

Questionnaire on the Women's experiences with using the grace health app as a tool for improving perception on sexual reproductive health and contraception.

The following questionnaire will be used to define women's experiences using digital services like the grace health contributed to improved awareness and their perception on contraception.

Demographic data

Today's date:

1. Age:
2. City:
3. Telephone number: _____
4. How long have you used the Grace Health App? ………….

Questions

- How would you describe your experience with using the grace health app?
  Follow up Questions
  Why is it good?
  What do you get from using the app?
  What do you get from using the app?
  Has the app helped you in any way?

- Explain to me how the app works?
    Follow up Questions
    How do you use it?
    Is it easy or hard to use?

- What kind of information does the app provide?

- Have you seen some information on contraception while using the app?
  Follow up Questions

- What information did you get from the app on contraception?

- Do you think women are using the GH app as a contraception?

- Do you think the app is promoting contraception?
  How is the app doing that?

- Do you think the app is creating awareness for women on SRH and contraception?
  Explain how you think the app is creating awareness on SRH and contraception?

- Do you think the app is impacting women's awareness on contraception?
  How has is the app impacting women's awareness?

- Do you think that women's experience with the app has or would improve their views and perceptions about contraception?

- Explain how you think the app improving perceptions on contraception?

APPENDIX 2

Form: Ethical Review of Degree Project Involving Humans

Use this form to help you, together with your supervisor, to reflect on issues relating to research ethics. In addition, use it to help you to determine the best way to approach the issue of research ethics and to decide whether you must apply to the Research Ethics Board (FEN) at Dalarna University or, alternatively, the Swedish Ethical Review Authority (EtikprövningsmyndighetenH).

You and your supervisor retain a copy of this form.

Title of Degree Project: Women's experiences with digital health service, as a tool for improving awareness and perception sexual reproductive health and contraception. A phenomenography qualitative study.

Student/Students: Rhoda Aduah

Supervisor: PhD Niklas Envall

		Yes	Hesitant/ uncertain	No
1	Is there any doubt about the participants' ability to consent voluntarily? (That is to say, does the study include participants who can be regarded as belonging to a vulnerable group: for example, children (under 18); people with cognitive impairment or lack of mental capacity; or individuals who are in a position of dependency in relation to the person conducting the study – e.g. patients or pupils of the person conducting the study?)			NO
2	Will informed consent NOT be obtained for this study (i.e. the research participants will not receive full information about the study and/or about the opportunity to withdraw from participation)?			NO
3	Does the study involve any form of physical procedure on the research participants?			NO
4	Can the study affect the research participants physically or mentally?			NO
5	Will you be using biological material (e.g. blood samples) that can be traceable to a living person or deceased person?			NO
6	Do you intend to process sensitive personal data, such as data related to ethnicity, political opinions, religious or philosophical beliefs, trade union membership, health or sex life?			NO

7	Do you intend to process personal data on legal offences, such as crime, judgements in criminal cases, coercive penal procedural measures or administrative deprivation of liberty?			NO
8	Do you intend to process personal data? Note that: • All data that is traceable to a living person is considered personal data, even if it is coded or encrypted. • If the degree project does NOT involve any sensitive data and does NOT involve participants who belong to a vulnerable group and does NOT involve participants in a position of dependency to the person conducting the study, an application to FEN at Dalarna University is NOT required. • However, upon the processing of personal data, an application must ALWAYS be made using the designated form, which must be sent to dataskydd@du.se.			NO

Approved by the Research Ethics Board (FEN) 2020-09-23

APPENDIX 3

This informed consent form is for Grace Health app users who we are inviting to participate in a research titled Women's experiences with digital services contributing to improve awareness and perceptions on contraception.

[Name of Principle Investigator] Rhoda Aduah
[Name of Organization] Dalarna University
[Name of Sponsor] Rhoda Aduah
[Name of Project and Version] Women's experiences with digital services contributing to improve awareness and perception on contraception.

This Informed Consent Form has two parts:
- **Information Sheet (to share information about the study with you)**
- **Certificate of Consent (for signatures if you choose to participate)**

Part I: Information Sheet

Introduction

My name is Rhoda Aduah, a graduate student at Dalarna University and I am conducting a study to evaluate women's experiences with digital health service as a tool to improve awareness and perception on Sexual Reproductive Health (SRH) and contraception. I am inviting you to participate in this research by completing the attached interview questions. The study seeks to explore women's perceptions of the use of digital service as a tool to improve awareness on SRH and contraception. Sharing their own experience using the Grace Health app. I have enclosed an interview questionnaire which asks you to respond to a series of questions. The interview questions will require approximately 45mins to 1hour to complete. Please your participation in this study is voluntary and all efforts to protect your identity and keep the information confidential will be taken. Copies of the project will be submitted to my research supervisor, Dalarna University and Grace Health. If you choose to participate in this study, please answer all questions honestly and transparently during the digital interview sessions which will be recorded. Prior to the interview sessions consent forms will be sent to participants by mail.

I have enclosed a consent form for your review. Please read the form and feel free to contact me if you have any questions about the study. If you choose to participate, please sign, and date the consent information form and return it along with the completed demographic questionnaire

via mail. I look forward to hearing about your experiences with the digital service, whether users find the app to be supporting and contributing for users. Your participation will be greatly appreciated. If you require additional information or have questions, please contact me at the number listed below.

+46768487624
+233545051879
h20rhoad@du.se

Purpose of the research

This study is conducted to better explore women's experiences with a digital health service like the Grace Health and how it is contributing to improve awareness and views and perceptions on SRH and contraception. I am asking app user of Grace Health to participate. Your participation in this study is necessary for me to collect relevant and valid data to conduct my research on how women's experiences with digital services are indeed improving awareness and perception on contraception.

Please answer the following interview questions honestly and transparently. The questions will cover the following topics: describing your experiences with using the app, what kind of information does the app provide? Have you seen some information on contraception while using the app? Describe your experience with using the grace health app? Do you think other women are using the app as a contraception? Do you think women's experience with the app is improving their views and perceptions about SRH and contraception? Do you think Grace Health is promoting contraception?

Type of Research Intervention

This research will involve your participation in a one-on-one video or audio recorded interview discussion that will take about 45mins to one hour.

Participant Selection

You are being invited to take part in this research because we feel that your experience as a Grace Health app user can contribute much to our understanding of if you perceive that the digital health service has contributed to improve women's awareness and perception on contraception.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate all the services, you receive from the app will continue and nothing will change. You may change your mind later and stop participating at any time, even if you agreed earlier.

Procedures

We are asking you to help us learn more about the digital service the Grace Health app in Ghana Nigeria and Kenya. If you accept to participate, you will be asked questions about your experiences with the app. You will be asked on questions like What are your experience with the Grace Health App, do you think other women are using the app as a contraception? Do you think women's experience with the app is improving their views and perceptions about SRH and contraception? Do you think Grace Health is promoting contraception? During the interview, I will arrange a telephone call or video call via WhatsApp or zoom chat with you at the appropriate and comfortable time you will choose. If you do not wish to answer any of the questions during the interview, you may say so and the interviewer will move on to the next question. No one else but the interviewer will be present unless you would like someone else to be there. The information recorded is confidential, and no one else except [The researcher Rhoda Aduah and Supervisor Niklas Envall] will access to the information documented during your interview. The entire interview will be recorded, but no-one will be identified by name on the tape. The recordings will be kept [locked on the researcher's computer]. The information recorded is confidential, and no one else except the researcher and Supervisor will have access to the recording. The recordings will be destroyed 1month after submitting the study. I will be interviewing about -20 participants for this study. Findings from the study will be coded using numbers to keep the anonymity of the participants.

Duration

The research interview takes place over one months in total. During that time, we arrange the virtual meeting via zoom or WhatsApp video call with you. The interviews will be done on weekends in a within 1-2 months with all participants and each interview will last for about one hour each.

Risks

There will be no direct risk and benefit to you, but your participation is likely to help us find out more about digital health services and how they are improving women's perception on contraception in your community.

Reimbursements

You will not be any incentive provided to take part in the research. However, we will give you 50 Ghana Cedis /3,000 Naira/ 800ksh for your time, and Internet Data expenses. This small token of reimbursement is from the researcher and not from Grace Health.

Confidentiality

We will not be sharing information about you to anyone outside of the research team. The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is, we will lock that information confidential. It will not be shared with or given to anyone except the researcher and supervisor who will have access to the information.

Sharing the Results

Nothing that you tell us today will be shared with anybody outside the research team, and nothing will
be attributed to you by name. The knowledge that we get from this research will be shared with you before it is made widely available to the public. Each participant will receive a summary of the results.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so, choosing to participate will not affect you as a user of the Grace Health app. You may stop participating in the interview at any time that you wish it will not affect the services Grace Health provides to you.

Who to Contact?

If you wish to ask questions later, you may contact any of the following: [Rhoda Aduah, +46768487624/ h20rhoad@du.se]

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

_____

PART II Certificate of Consent

I have been invited to participate in research about women's experience with digital services

(This section is mandatory)
I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked, answered to my satisfaction. I consent voluntarily to be a participant in this study

Print Name of Participant_____
Signature of Participant _____
Date _____
        Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:
    1.
    2.
    3.
I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.
Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____
        Day/month/year