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AN ASSESSMENT OF COMMUNITY READINESS FOR MHEALTH IN RURAL DARFUR SUDAN

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ABSTRACT

Introduction: There are increasing numbers of mHealth initiatives in middle and low income countries aimed at improving health outcomes. Arecent study in Sudan examined community readiness for mHealth using a framework based on quantitative data. Given the importance of a framework and the complementary role of qualitative exploration, this paper presents data from a qualitative study which complements findings from the quantitative study. **Methods:** The study was conducted in Abwaejura, Hamaraia, and Tono in the south-western direction of the city of Nyala in Sudan. Indepth Interviews were conducted between December 2017 and March 2018 for 30 participants. Participants are from general public, students, community leaders, school teachers, and formal and informal healthcare providers. Thematic analysis was used to create an appropriate and logical framework to examine community readiness. As in the quantitative investigation, this study approached the investigation with four types of readiness in mind: core readiness, technological readiness, human resource readiness and motivational readiness. **Results:** Community members, community leaders and health care providers expressed their interest in the use of mHealth in rural Sudan. Awareness of mHealth and its advantages was low among uneducated people. Participants who have used mHealth were attracted to the speed of access to qualified healthcare providers, time savings and low cost. In contrast some participants do not see the value of using mobile phones for healthcare compared to a face to face consultation. Illiteracy, lack of trust, technological incapability and Heath care providers do not receive messages and calls from this segment of the commuity were identified as barriers to mHealth use. However, positive awareness, asense of ownership, the humbleness of health service providers, and the future outlook for mobile health are the driving force behind this program. **Conclusions:** This study reaffirmed the mHealth readiness conceptual framework with different dimensions of readiness and identified potential constraints and possible solutions for mHealth. In order to improve mobile health, emphasis shoud be placed on training adopters, providing less costly services and providing adegree of trust.

KEYWORDS: Mhealth (mobile health), eHealth (electron health), readiness.

1. INTRODUCTION

It is well know that mobile phones play an important role in improving access to healthcare service delivery in rural and remote settings. Mobile health is still a new concept in Sudan, there are 61 health facilities using mobile health apps in South Sudan.[1] Worldwide, numerous mobile health (mHealth) projects are being implemented for healthcare delivery, disease surveillance, health education and health promotion behaviour change communication, and training of the health workforce.[2-7] With the penetration of telephones in large numbers of communities and the weak health workforce, mHealth has emerged as a possible viable solution forhealthcare delivery in developing countries including Sudan.[1,8] There are many ongoing health projects based on the mobile health system in many developing countries but in Sudan it is almost negligible

and it is not well written to be published in international journals in order to contribute to solving it.[9-11] For mHealth to be effective, end-users need to find mHealthservices useful and easy to access and be ready to accept them. Community engagement with eHealth services depend on several factors such as characteristics of end users, technological issues, type of eHealth services and social aspects of eHealth use.[12] Alack of pre-implementation evaluation and formative research to identify community needs and readiness are critical factors in the failure of up to 30% of telehealth projects globally.[13-15] Readiness is an integral and preliminary step in the successful adoption of an innovation.[16] Thus, it is important to know how a community is reacting to new technology and their beliefs about mHealth to determine the best way for stakeholders to prepare for mHealth services to ensure better uptake. Based on a

review of the published eHealth literature and considerations of the context of developing countries,[17-19] aconceptual model to assess the readiness for mHealth in a rural community of Sudan we have suggested it in our work. Three high-level dimensions of readiness were identified: technological readiness, human resource readiness and motivational readiness. These three dimensions of readiness are embedded in mHealth core readiness. To understand the readiness of the community for mHealth within the constructs of this conceptual model, a mixed methods study was conducted including a quantitative household survey and qualitative in-depth interviews. Results of the survey have been reported elsewhere. The quantitative study was notable to provide an in-depth description of community readiness or community and healthcare provider perceptions of mHealth. Therefore, a qualitative exploration was warranted to explore the community's readiness, based on how the community uses existing mHealth services and what community members understand regarding mHealth. Interviews with community members and healthcare providers were conducted to further understand community perceptions, motivations and knowledge of m Healthservices. Chances and challenges for mHealth services were also explored. Given the importance of a framework and the complementary role of qualitative exploration, this paper presents data from a qualitative study which complements findings from the quantitative study. A mHealth readiness framework will help to facilitate the design and planning of effective mHealth interventions in Sudan and other similar developing country settings.

2. MATERIAL AND METHODS
In-depth interviews we have chosen because they are considered to be a method for understanding perceptions among participants.[21] The study aimed to understand the different dimensions of readiness and an interview guide was developed accordingly.

2.1. Participants and study site: The National public Health Laboratory Sudan (NPHL) has been maintaining a Health and Demo-graphic Surveillance System (HDSS) in South Darfur.[22] Marilyn Organization also conducted the same surveys in South Darfur State. Abwaejura, Alhamaraia and Tono families account for about approximated 15% of the families in South Darfur. The main languages spoken are Arabic and afew of them are local jargon. The sub-district is covered by a mobile network operated by the major mobile phone operators of the country. To find out the availability and ownership of the phones, we conducted some surveys and found them to be approximately around 96% in this work. The respondents for the in-depth interviews were purposively selected mobile phone owners from the general adult population, and formal and informal healthcare providers. The Marilyn office manager invited the potential participants and explained study objectives and procedures. Those who were interested in participating and who provided written consent were included in the study. Participants were purposively selected to include a range of viewpoints including participants of different ages, genders, occupations and levels of community involvement. These included community members such as housewives, farmers, small business owners, students and young adults, community opinion leaders such as teachers, community leaders, member of local government; and healthcare providers (qualified healthcare providers [MBBS] and informal healthcare providers).

2.2. Data collection: An interview was conducted in Arabic, where all contributers speak. The development of the interview guide was informed by published readiness models.[17,23] The interview guide was field tested with two participants (one male and one female) from the study site, who were not included in the final sample. After field testing of the interview guide, necessary changes were made. The final interview guide covered sociodemographic characteristics; experiences with mobile phone usage and operation; experiences with healthcare seeking; knowledge, perceptions and practice of mHealth; and experiences with mHealth. In addition, participants were also asked about their role in future mHealth programs. Aseparate interview guide was developed for healthcare providers which covered their views, experiences and perceptions regarding mHealth and their role in mHealth in the future. The interviews were conducted by the investigator and Marilyn officer with a social science background, speak arabic language, and experience with qualitative research and data collection. Interviews were conducted between Decembers 2017and March 2018. The interviews were audio taped with prior consent from the participants. The period between each interview ranged between 15 and 30 minutes. The interview guide was used flexibly in response to how the participants responded in the interview. Reflexivity in the research process and attention to new cases was ensured during the data collection procedure. Coding uncertainty due to uncertain interpretation of the local dialect was clarified over the phone by the investigator.

2.3. Data analysis: Data were analysed according to the data analysis methods of Holstein and Gubriam et al.[24] All interviews were transcribed verbatim and then translated into English. Colloquial terms and local dialects were interpreted with the guidance of Marilyn manager who are native to the study area. Ten percent of the translations and transcriptions were rechecked for quality assurance. All transcripts were entered into NVivo Version 10.0 for coding. Coded data were analysed thematically. When a new theme arose, the transcripts were reread and cooded by the investigator several times to categorise the theme into the different dimensions of the mHealth readiness framework. During data analysis, codes and themes, we were discussed and themes finalized. After the final themes were determined, all transcripts were re-read to ensure that all had been coded correctly. In total, 30 in depth interviews were

conducted, but two interviews were of very low quality and did not provide information about mHealth so were excluded from the analysis and reporting.

3. RESULT

A total of 28 in depth interviews were included in the final analysis. The age range of the respondents was 17–62 years. Participants were from the general population and included representatives of different occupational groups, such as housewife (3), farmer (7), small businessman (2), driver and factory worker.

(2), student (4), teacher (2), community leader (4) and healthcare provider (4). The details of the respondents are shown in Table 1. Based on the data collected during in depth interviews with 28 respondents and a thematic analysis of their responses, community readiness in the context of rural Sudan was assessed. Four types of readiness were identified: (a) core readiness; (b) technological readiness; (c) human resource readiness; and (d) motivational readiness

Table 1:

Group	Number	Age(years) range	Gender (number	Occupation (number)	Education
General population	14	17-50	Male(10)female(4)	Housewife (3) Farmer (7) Small businessman (2) Driver, factory worker (2)	Ranged from no schooling to high school graduate
Student	4	11-22	Male(2)female(2)	Student	Undergraduate student
Healthcare providers	4	22-34	Male(3)female(1)	MBBS(1) Paramedic (1) Informal healthcare provider (2)	MBBS Paramedic (diploma)
Community Opinion leaders	8	29-62	Male(5)female(3)	Community Leader (4) Teacher (2) Member of local government (2)	Ranged from 7 years of schooling to Masters degree

4. DISCUSSION

This study gave us information on the preparedness of rural communities in Sudan for mobility. The study is novel in that it provides an in-depth description of community views on mHealth services within a readiness framework. An exploration of why people are using mHealth and the ways in which they use it, and what they see as the key benefits and the most persistent barriers, are useful in informing mHealth services. Our study suggests that stakeholders such as community opinion leaders and health-care providers are beginning to understand the ubiquitous nature of mHealth and the benefits of mHealth services. However, poor knowledge of mHealth among community members needs to be addressed to utilise the full potential of mHealth. Participants with an awareness of or prior experience with mHealth were positive about its utility in reducing costs and saving time and its ease of access, particularly during emergencies. mHealth services are being introduced in Sudan with the intention of improving the access of healthcare to all citizens [(Yugi, 2016), Zeshan,(2012)]. Inspite of the large entry in to the community of mobile phones, the knowledge of mobile health for the participants in the study was sub-optimal. In Sudan the average rate of phone ownership is 82.5% in urban areas while 69.8% in rural areas in 2012(Stockwell, 2012) and now the percentage is increasing significantly. According to the interviews we conducted almost telephone for every one 2018 (in this work). Quick and easy access to informal healthcare providers in the study area facilitates seeking healthcare from unqualified providers. However, community members recognise their unmet need and believe that for complicated diseases when they need to consult with qualified healthcare providers, and mHealth could be an easy and handy solution.

An underlying problem with mobile and telehealth is safety of care, which can be compromised by misdiagnoses and mismanagement of the condition being consulted about. Unlike the face-to-face consultation, mHealth depends on well-functioning communication infrastructure and well-trained healthcare providers and patients and carers. Global mHealth programs work best for primary healthcare, referral to the nearest hospital during emergency, real time diagnostic report sharing, appointment reminders, enhanced case detection, health education and reminders for immunization and medication [Zurovac *et al*, 2012., Prue *et al*, 2013., DC (PRWEB), 2012, and (Gomez & Tulum 2007)]. The community end-user of mHealth must be aware and informed in the use of mHealth that sometimes the clinical needs to see the patient to properly assess the patient's condition. With increasing band width at affordable prices, mHealth using videos may reduce the risks of misdiagnoses and mismanagement.

In terms of motivational readiness, unless motivation is activated, individuals will not use any innovation or may not show interest to use it in the future this agree with [(Hsiao & Chen, 2009) & (MAMA, 2012)]. Community members who are aware of and use mHealth were motivated to use it in future because they see it as easy access, low-cost and time-saving. Study participants have calculated mHealth to be an inexpensive way to consult a healthcare provider, as doctors' consultation fees and other indirect costs (e.g. travel, wages) were not involved. They also considered the time taken to reach a healthcare centre, the journey hassle and long waiting times for consultation.

Community opinion leaders (community leaders, teachers and members of local government) see mHealth as most beneficial for community members and are

willing to campaign for mHealth in future. Another construct of motivation is trust. Respondents expressed concerns about the quality of healthcare providers in mHealth services, as patients could not see the doctor over the phone. mHealth has the potential to enhance the quality of health services delivery. However, mHealth should be used with care for suitable health problems. mHealth is not simply a replacement for the face-to-face consultation. It complements and augments existing healthcare service delivery and, more importantly, requires a specific set of skills and judgment.

Illiteracy was a key issue in human resource readiness in this study. Because effective use of technology is related to the user's ability to understand instructions, mHealth users must be literate in Arabic. Alternatives to text messages, such as audio messages, were preferred in the study area. This finding is similar to observations in other developing countries [Narasimhan, Kottapalam, Macintyre & Ray, 2014]. In terms of technologica lreadiness, community members have expressed their inability to use the various functional programs available in phones, for example, they usually do not read text messages as they are unable to operate their phone options. Due to the educational background of this impoverished society, the mode ofmHealth program delivery should be user-friendly and easy. Drawing on the results of in-depth interviews with community members and healthcare providers, there is an expressed need for training in technological capabilities. The quantitative survey conducted as a part of this research showed that only 20% of participants had knowledge about receiving and sending text messages [in this work]. An mHealth program in India targeting tuberculosis patients was not successful due to technological incapability and lack of mobile phone ownership. Target participants could not enrol in the study as they did not have a mobile phone or, if they did, could not operate its functionalities [(Narasimhan, Kottapalam, Macintyre & Ray, 2014), & (Narasimhan, Kottaplam, Macintye, Bakshi, Mathai & Ray, 2013)]. The increasing number of mHealth programs in developing countries is an opportunity for health program planners and managers to design more accessible and cost-effective health programs. Community leaders and healthcare providers have influence over the decision of the community members to adopt mHealth. Community leaders and teachers expressed their interest in proactive participation in campaigns to promote mHealth programs, seeing it as their duty and obligation to their own community. Health-care providers, who are a key driving force for the community members for mHealth use, have also supported the mHealth intervention. Through the surveys we conducted in this study we wish the government of Sudan to develop mobile health programs with advanced plans in order to make maximum use of this programe. The strength of this study was using interviews that allowed attitudes and perceptions of community members and healthcare providers towards mHealth to be explored in greater depth. This study used a relatively small purposive sample, but included adiverse group of community members by age, sex, occupation and social status. The qualitative part of this research complements the quantitative survey data and provides in-depth data on mHealth readiness that was not attained through the survey. The study was conducted in three rural area of Sudan, so findings may not reflect all rural areas.

5. CONCLUSION
This study confirms the conceptual framework and the readiness of mobile health with different dimensions of readiness: core readiness, human resource readiness, technological readiness and motivational readiness. Potential barriers and possible solutions have been identified. Given the existence of several barriers, particularly technological incapability and illiteracy, establishing a supporting mHealth environment will be critical for successful mHealth adoption. Study findings clearly show that participants appreciated mHealth services and are willing to use mHealth in the future. Moving forward, further emphasis should be placed on training to operate mobile phones, providing low-cost services and earning trust.

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