

Mobile Health Information System Among Community Health Workers (CHWs) For Improved Contraceptive Method In Nigeria

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ABSTRACT: Decades of research reveal that community health workers CHWs play a very vital role in improving community health. However, the global rapid growth in mobile technology presents unique opportunities to support CHWs in providing health services. Mobile health information has the potential to overcome information barriers, augment factors, and can promote inclusive development efficiently and innovatively. It enables health workers to overcome lack of manpower, low physical connectivity, and geography barriers to deliver information and provide services to hitherto unreachable citizens, improving citizen health choices and participation. This research adopted an informative research technique in exploring how health workers in Nigerian Yobe State utilize the mobile information system to transform health care services, with specific reference to contraceptive services for sustainable and universal coverage. The study found majority of the CHWs express a positive opinion on the use of mobile devices for contraceptives. Although it was learned that both the manual and automated data collections are still in use. But more than 80% of the CHWs prepare to use mhealth or digital data collection. CHWs perceived mobile technology to increase knowledge and awareness of different contraceptive methods. It is also learned that there is high acceptability among CHWs, who noted improvement in data collection and management, as well as contentment by the real-time data reportage capability presented by the mobile health information system.

KEYWORDS: Mobile Information System, Mobile Health, Community Health Extension Workers, Contraceptives.

I. INTRODUCTION

Mobile health information system or mobile health system also referred to as mobile

health ('mHealth') is the use of mobile technology for reception, delivery, and management of healthcare services.

Recently, Mobile phones are used to implement a variety of healthcare services, it is the most promising and popular innovation in Middle and low-income countries. The mobile health initiatives has metamorphosed how health providers deliver services, such as point-of-care data collection, surveillance of disease, telemedicine, and health education/promotion to patient. It has been used in improving healthcare delivery in numerous countries. Although, data on the effects of mobile technology in transforming the delivery of healthcare services in resource constraints, such as Nigeria is scarce [1]. However, the unprecedented growth in internet technologies and the increasing number of mobile users, has presented an opportunity for Nigerians to utilize mobile technology for positive transformation and delivery of healthcare services.

Decades of research reveal that community health workers (CHWs) can play a very vital role in improving community health [2]. CHWs provide a robust connection between health systems and communities, linking people to resources, services, and information, regardless of the gap in training and supplies. CHWs are often well trained and positioned to tolerate cultural sensitivity [1, 3]. CHWs often use aids to assist in data collection, especially in the field, hitherto research submits that they face challenges with manual paperwork in diagnosis and treatment errors, as well as the compliance protocol [4]. Challenges for manual data collection include but are not limited to usability, portability, susceptibility to loss or damage. Furthermore, the collection, reporting, and management of data are time-consuming [5]. However, the global rapid growth in mobile

technology presents unique opportunities to support CHWs in providing contraceptives services [4, 5].

In addition, CHWs provide several health services with the help of mobile devices through decision support systems and reminder/alert tools. Investigation reveals that these mobile tools can encourage a standard of compliance [4] and increase inefficient delivery of health service [1]. In recent times, mobile devices have shown an increased indication in evidence for improving health outcomes, especially for tailored interventions. It plays a significant role in population health, even for resource constraint area [6, 7, 8]. Mobile devices can be used to collect, process, and even retrieve vital health data which can be converted into health information. It involves the use of tablets, mobile phones, and other wireless devices to support the capture and retrieval of health information [1].

Mobile health information has the potential to overcome information barriers, augment factors, and can promote inclusive development efficiently and innovatively. Mobile health technologies can enable health workers to overcome lack of manpower, low physical connectivity, and geography barriers to deliver information and provide services to hitherto unreachable citizens, improving citizen health choices and participation.

Therefore, the study is centered on how community health workers in Yobe State were exploiting the opportunity presented by the mobile health system for efficient contraceptive services reception, delivery, and reporting and to assist in preventing more maternal mortality ratio caused by high unwanted fertility rate in the state.

The findings show high acceptability of mobile technology among CHWs. The majority of the CHWs express a positive opinion on the use of mobile devices for contraceptives while noting the cumbersome old manual paperwork. Though it was learned that both the manual and automated data collections were currently in use, the maximum number of CHWs found the mobile/ automated data capture easier to use. However, few have expressed concern over the lack of smartphones but still prefer mobile/automated data capture. Many CHWs have strongly agreed that the mobile health information system had simplified work and noted improved data management. CHWs were contented by the real-time data reportage capability presented by the mobile health information system.

Most of the CHWs explained that they had access to technical support through supervisors if they experienced challenges. Furthermore, all CHWs demanded continued training and expressed

fears for the loss of lack of power supply, problems with transmission and processing of data. Some CHWs worried about phone thievery, even though none of them testified that it had happened in the past.

The study participants revealed numerous benefits of mobile health to service quality. Several CHWs stated that mobile health assists in delivering timely contraceptive data which in turn assist in effective decision making by stakeholders and various donor agency. Many CHWs acknowledged optimistic changes in interacting with the client as well as perceived improved privacy, confidentiality, and trust. CHWs perceived mobile health technology to increase knowledge and awareness of different contraceptive methods, including information on their side effects from the comfort of their homes. Furthermore, previous studies have buttressed the use of mobile health technology for contraceptives. For instance, a study by Greenleaf et al [9] revealed that mobile phone ownership increases the likelihood to use modern contraceptive methods.

This claim supports the predictions of rapid mobile phone penetration in Nigeria. Which has further buttressed the theory that mobile health has the potential to strengthen contraceptives services in resource constrain like Yobe state and another similar context.

II. BACKGROUND

Yobe state has the lowest modern contraceptive prevalence of 0.2% [10] and is one of the Nigerian states with a high maternal mortality ratio (MMR) of 1,549 deaths per 100,000 live births. Mothers die frequently from complications of pregnancy and childbirth: anemia, obstetric hemorrhage, shock, sepsis, and toxemias'. According to a recent survey by Nigeria Demographic and Health Survey in 2018, there is a low contraceptive prevalence, as a result of the unmet need for family planning, which resulted in a high fertility rate (TFR) of 5.7 children per woman and unwanted pregnancies across the states [11]. However, the intuitive appeal of mobile technology presented an opportunity in health services. Hence the need to adopt mobile information technology in improving family planning services.

Recently, mobile devices are one of the leading forms of communication globally [5]. Nigeria, is the seventh most populous country in the world, with an estimated population of about 203 million [12]. It has the fastest-growing mobile market in African [13]. Nigeria's Mobile subscription has reached 204 million as of December 2020 with a record penetration of about 107.4% with an estimated of over 40 million smart

mobile phone users, expected to rise to 140 million by 2025. The unprecedented penetration and increase in the use of mobile phones in a developing country such as Nigeria have led to better utilization of mobile health [14]. Mobile health has the potential to enhance health services accessibility, thus improving health standards and well-being [15].

Evidence from other settings suggests that mHealth can be used to bridge the expertise and distance gap. Despite the growing body of evidence to support the use of mHealth for contraceptive service, implementation of these mHealth solutions remains surprisingly low in developing countries [16]. The high penetration of mobile phone subscriptions in Nigeria, the adoption of mobile health information systems to transform contraceptives and other health-related services appears to be lagging, which needs to be fully utilized.

III. LITERATURE REVIEW

Mobile health information system is also known as mobile health (mHealth) is the use of mobile technology for the management of health system [14]. It is the process of collecting, processing, and retrieving health information for effective decision making through the use of mobile devices can be termed as "mobile health system" — aims to enhance health service outcomes by addressing limitations in critical health systems for effective service delivery, reporting, and utilization [1]. Mobile phone has penetrated worldwide as its widespread is rapidly increasing, particularly in resource constraint settings with high disease burden [4]. There is a growing call to harness the potential of mobile phone technology in improving health care delivery [2].

Moreover, it is reported that 8 in 10 people in developing countries own a mobile phone, and the number is increasing steadily. Thus, mobile device use in healthcare has the potential to provide easy healthcare access, expand delivery care, reach patients through targeted messages and gather real-time data for resource optimization and quick decision making [17]. Mobile technologies are being established, tested, and piloted for resource constraints. The use of mobile technology by community health workers CHWs to improve health services has a promising potential, providing services that are far from the health facilities, in remote areas/resource constraints, as well as hard to reach communities [18].

Initial pilots result from Tanzania and South Africa in [19], submit that consistent SMS communication can encourage and provide

information on neonatal health to expectant mothers. Furthermore, the results were also promising from the mobile health initiatives that support healthcare workers in the recording of information, pregnancy monitoring, and reporting out of stocks of drugs. A study conducted in Tanzania by Rebecca Braum et al [4] showed that mobile phones can be an effective device with the potentials to support CHWs in contraceptive data recording, reporting, including, screening, counseling, and referrals. In another similar study from Bangladesh [20] discovers that women who received digital contraceptive services shows an improvement in terms of choices; concerning side effect management and contraceptive methods. In addition, a higher prevalence of modern contraceptive family planning methods was discovered among those who received digital health when compared with those that did not receive it [20].

A recently conducted survey by InStrat Global Health Solutions covering about 339 health facilities across Nigeria found that there was an average of 7 phones per facility, 5 of which were smart ones capable of supporting applications meant for mobile health [21]. Moreover, a randomized control clustered trial conducted in Nigeria evaluated the effectiveness of digital health devices 'Smart Client' on behavioral and ideational variables on family planning [10]. The findings of the research like in [20], found that those who received consistent mobile phone calls, exhibited some improvements in the confidence level of clients while interacting with health workers, and are more likely to use modern family planning/contraceptives methods compare with those that did are not in the intervention group [23].

Furthermore, more than 600 pilot mHealth programs have been introduced worldwide [4]. Despite the proliferation of mobile health programs, there is still limited evidence of their effectiveness [5–7]. Mobile information system has recorded some modest improvements, where users request services via SMS messages or automated voice [7]. Although the growing calls to address the gaps in connecting the impact of digital technologies on health indicators are emerging, slight attention has been paid to improve program monitoring, as well as, critical processes determinants on the technological and behavioral performance of the program. Therefore, it is learned from the literature and in practice that the popularity of mobile technologies presents an opportunity to serve as an assistive instrument for family planning management/contraceptive services.

IV. AN OVERVIEW OF THE EXISTING SYSTEM

Governmental and non-governmental organizations are working to enhance how information can be collected and disseminated to improve data accessibility and availability in Nigeria. Recently, mobile technology has been proved to be efficient in improving digital data collection in healthcare service delivery, especially

to complement the health worker's shortages [19]. Consequently, the Federal Ministry of Health in its quest to gather reliable data for effective management decision-making processes developed the Nigeria Health Logistics Management Information System (NHLMIS). It is supporting the Community Health Workers CHWs in providing health services, including contraceptives. [22].

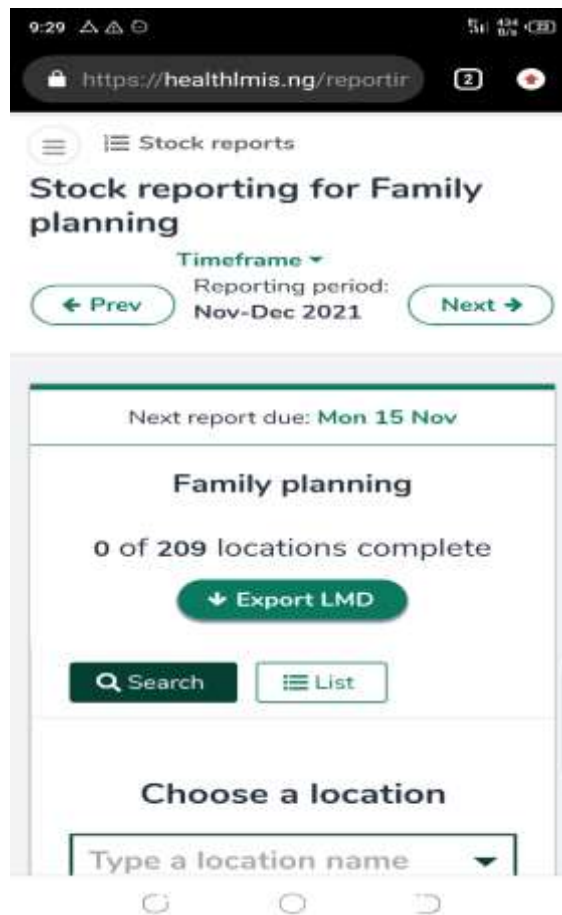


Table 1. Healthlmis interface accessed by the CHWs

The above table 1. depicts the system is used by the community extension workers CHWs in Yobe state. Currently, it is used by the community health workers in the respective health facilities to capture, record, track and assess health data across the national public health programs which include contraceptive family planning services. CHWs usually export data generated through the District Health information system DHIS. It is another gateway for data collection, reporting, and management of health information, available both for web and mobile applications [15].

V. METHODOLOGY

The study adopted a formative research process, where cross-sectional analytical survey designs is used. An adult population 18 years of age and above were respondents, cutting across the three senatorial zones in Yobe State.

Sample Size Selection

A purposive selection was employed in selecting two Local Government Areas LGAs from each senatorial district, this is to avoid random

selection, due to the security situation of the state. Totalling six (6) LGAs, three (3) health facilities HF were further selected for the study.

Target Audience

The target audiences were community health workers CHWs that are directly or indirectly dealing with contraceptive services. CHWs affiliated with health facilities were carefully chosen for the study. Each of the LGA primary centers has a health facility and a community extension worker in charge of family planning/ contraceptives services.

Data Collection

The data collection instrument was a self-administered questionnaire titled “mhealth and contraceptives services” The questionnaire was then divided into; Demographic Characteristics, Mobile phone access/ease of use into two sections A, B respectively. The fieldwork was conducted between 4th – 21st October 2021. The questionnaire was designed using Kobotoolbox and was administered via mobile phone. There were about 10 questions, including demographic ones, where an agreement had been reached to conceal the respondent's identity and all information will be solely used for this research only after which all the data will be destroyed.

Interview Guide

The interview guides followed a semi-structured data collection to explore these two main themes: (1) Acceptability and (2) Perceived benefit of mobile health information system in contraceptives services. Under the main themes, there are also a variety of sub-themes such as CHWs preferences, perception, attitudes CHWs knowledge with mobile technology; experience and familiarity of using mobile technology; acceptability and feasibility of using mobile health; potential challenges, risk, and concerns in using mobile technology. The guides were piloted and tested with three CHWs in Jajimaji health facility before the main interview. There was no major editing apart from the language.

Data Analysis

The Semi-Structured Interviews and Focus group discussion FGDs were audio-recorded mostly in Hausa and then transcribed, which were later translated into English for analysis. The data were analyzed into themes to identify and generate codes patterns [23]. An inductive analysis was adopted; this is to avoid leaving a blind spot. The transcripts were thoroughly read to familiarize with the data, where initial codes were generated. The identified codes were extensively and carefully observed for harmonization. In addition, line by line was re-read, where colors were also assigned to content for themes categorization and organization in sequence, then the data were analyzed and interpreted.

VI. RESULT

	No. (%)
n=24	
Sex	
Male	7 (29%)
Female	17 (71%)
Age Mean (Range)	31 (25-50)
Marital Status	
Single	9 (38%)
Married	15 (62%)
Education Level	
Primary	1 (4%)
Secondary	10 (42%)
Tertiary	13 (54%)
Experience as CHEW Mean (Range)	6 (2-16)
Experience with mobile health	
Yes	24 (100%)
No	
Possessing of Mobile Smart phone	
Yes	20 (83%)
No	4 (17%)

Table 2. Demographic Characteristics of CHWs

The above table presents demographic characteristics of the 24 CHWs who are directly or indirectly related to the contraceptives services.

Acceptability

The study discovered that there is high acceptability among CHWs. Majority express a positive opinion on the use of mobile devices for contraceptives while noting the cumbersome old

manual paperwork. Though it was learned that both the manual and automated data collections are currently in place. But the maximum number of CHWs found the mobile/ automated data capture easier to use. However, few have expressed concern over the lack of smartphones but still prefer mobile/automated data capture. Many CHWs have strongly agreed that the mobile health information system also known as mobile health had simplified

work and noted improved in data management. CHWs were contented by the real-time data reportage capability presented by the mobile health information system.

Most of the CHWs explained that they had access to technical support through supervisors if they experienced challenges. Furthermore, all CHWs demanded continued training and expressed fears for the lack of consistent power supply, and network stability which will likely affect the transmission and processing of data. Some CHWs worried about phone thievery, even though none of them testified that it had happened in the past.

Perceived benefits to service quality

The study participants revealed numerous benefits of mobile health to service quality. Several CHWs stated that mobile health assists in delivering timely contraceptive data which in turn assist in effective decision making by stakeholders and various donor agency. Many CHWs acknowledged optimistic changes in interacting with clients as well as perceived improved privacy, confidentiality, and trust.

CHWs perceived mobile health technology to increase knowledge and awareness of different contraceptive methods, including information on their side effects from the comfort of their homes. Furthermore, previous studies have buttressed the use of mobile health technology for contraceptives. For instance, a study by Greenleaf et al [1,2,5,18] revealed that mobile phone ownership increases the likelihood to use modern contraceptive methods.

This claim supports the predictions of rapid mobile phone penetration in Nigeria. Which has further buttressed the theory that mobile health has the potential to strengthen contraceptives services in resource constrain like Yobe state and another similar context.

VII. DISCUSSION

This study explored the role of the mobile health system among community health extension workers in improving contraceptive services. It is also learned that mobile device is one of the effective tools for collecting, reporting, and communicating data. With mhealth, it will be much easier to overcome the limitations imposed by cost and access in resources constraints. CHWs found mobile data collection and reporting to be an acceptable form of reporting contraceptives services. While some CHWs have expressed wariness over usage of mobile health but noted that experience increased with time. In tandem with

previous similar researches, CHWs explained that health made their work easier and improved service efficiency. This study encompasses knowledge with mobile support tools for CHWs by supporting that mobile phones can be effective tools for FP service delivery, providing a convenient, responsive job aid to support counseling, screening and referrals, data collection and reporting, and communication and field support

The findings of the result show how other developing nations like Tanzania in [4], South Africa in [18], and Bangladesh in [19] have maximized the use of the mobile health system in improving contraceptive family planning methods. However, despite the improvement presented by the use of mobile health systems among the CHWs in contraceptives services. Yobe State is still lagging behind in the full implementation of mobile health systems, as findings revealed parallel paperwork is still in use, which is another added workload to the CHWs. Therefore, the need for CHWs to adopt a completely digital approach in the management of contraceptives, already available in the DHIS which offers both mobile and web data collection, and also the flexibility for customization based on the community needs. Furthermore, for mobile contraceptives services to be robust in collecting and reporting for sustainable and universal coverage. It is learned that only the CHWs have access to the mobile contraceptive system available for use in Yobe State. This is based on the careful observation of the systems at the time of gathering this report, and the system contrary to the ones reported in [4, 7, 9, 17, 18, 19, 20, 23] did not provide any means of tracking and or communicating with the recipient of the contraceptive services.

Therefore, there is also a need for the system to be two-way; where users will also be granted access to their contraceptive choices and to be able to request further services via SMS or voice messages. Effective utilization of mobile systems requires CHWs to be able to send, and receive reminders to alert clients for facilitation contraceptives health talk. Collaboration between health experts and mobile health developers remains essential to fully address the needs of women seeking family planning services. Further research is needed to aid in the development of mobile health technology that best incorporates patients' preferences to assist them in preventing pregnancy as well as evidence-based methods with respect to the delivery of health information, both for contraception and abortion services.

VIII. CONCLUSION

As at the time of gathering this report, efforts were made to discover any similar research conducted in Yobe state but it has proven abortive. Therefore, this study is considered the first of its kind in Yobe state. The findings of this research have found that there is still a void in literature and practice in Yobe as well as other Nigerian states concerning extensive mhealthusage among the community health extension workers CHWs for contraceptives services [24].

Consequently, cultural barriers restrict a lot of people from accessing contraceptive services especially in the rural settings, coupled with state actors' failure to prioritize mobile technology in contraceptives and other health service delivery. It will be difficult for them to take the lead in the Yobe state. Therefore, there is a need for all the health stakeholders in Yobe state to invest hugely in the state health sector and make use of the rapid penetration of mobile phones because of their potential to reach difficult-to-reach areas.

However, for the mobile information system to play a central role in contraceptive service delivery, mobile health developers need to collaborate with CHWs to fully address the needs of contraceptive services. Moreover, an effort to access client data prove abortive, limiting the ability to measure the impact before the mhealth contraceptives. Furthermore, there is a need for future research to focus on user-centered mhealth that best integrates clients' preferences to assist them in choosing from range of contraceptive methods.

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Conflict of interest

The authors have no conflicts of interest.