

EMPIRICAL RESEARCH QUALITATIVE

Perception of nurses on the use of mobile phone text messaging for the management of diabetes mellitus in rural Ghana

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[Correction added after first online publication on 19 January 2023: The position of names in the byline has been updated.]

Abstract

Aim: This study aims to explore the perception of nurses on the use of mobile phone SMS for managing diabetes in rural Ghana.

Design: Exploratory Descriptive Qualitative Design.

Methods: Purposive sampling was used to recruit (13) participants relative to data saturation after ethical clearance (REDACTED); using a semi-structured interview guide. All interviews were transcribed verbatim and analysed using thematic content analysis.

Results: Participants believe SMS was useful in facilitating interaction between nurses, clients, family and statistically significant others; improving medication adherence and supporting blood glucose monitoring. The use of infographics was preferred to traditional SMS among digitally literate patients and voice calls for those who were illiterate. Participants had limited knowledge of downloadable diabetic applications. Participants were willing to accept and use SMS for the management of diabetes mellitus.

Patient or Public Contribution: Thirteen nurses actively participated in the study.

KEYWORDS

diabetes mellitus, mHealth, nurses, nursing management, perception, SMS

1 | INTRODUCTION

Mobile Health (mHealth) has been proven to be effective in facilitating behaviour change interventions in the self-management of diabetes mellitus. For several decades, self-management of diabetes mellitus has been considered pivotal in ensuring positive outcomes of care. The components of self-management include specific behaviour change interventions such as adequate dietary intake, adherence to medication, adequate physical exercise and appropriate use of diabetes-related devices to monitor and adjust behaviour

(Beck et al., 2017). mHealth has been described as an emerging tool of electronic health that has the potential of delivering remote care with the use of mobile applications and wireless technologies (Peprah et al., 2020). One such application is short message service (SMS). Mobile phone SMS has proven to be cost-effective in improving outcomes (Owolabi & Goon, 2019) It leverages the use of mobile devices that has witnessed a high household penetration over the last decade (Oyeyemi & Wynn, 2015). The use of SMS has been shown to improve patient's adherence to medication, dietary intake and physical activities, thus helping to ensure positive outcomes (Saronga et al., 2019).

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Despite the tremendous potential of mobile phone SMS in facilitating effective and efficient delivery of health care, empirical evidence suggests a low adoption and use among nurses (Barello et al., 2016; Lulin et al., 2020; Peprah et al., 2020; Saronga et al., 2019). This affects the successful scale-up of mHealth in the health sector since nurses constitute the greater number of health professionals in Ghana (Peprah et al., 2020). The successful adoption and use of mobile phone SMS in nursing care strategies critically depend on nurses' acceptance (Lulin et al., 2020). The perception of nurses is critical in determining their acceptance (Lulin et al., 2020). Recent studies suggest that positive perception among health professionals on the use of mobile phone SMS could greatly motivate them to endorse and be actively involved in its implementation (Barello et al., 2016). Nurses tend to adopt and use mobile phone SMS if they see it to be relevant in delivering nursing care; and easy to operate (Wallis et al., 2017). Nurses perceived mHealth applications to play an important role in lessening healthcare barriers and improving access in rural and remote areas (Peprah et al., 2020). However, limited empirical evidence exists on the perception of nurses in using mobile phone SMS for managing diabetes mellitus in rural Ghana.

Despite the proliferation and increasing use of mobile phones in accessing health care in Ghana, the perception of nurses who constitute the majority of healthcare professionals is less understood. In addition, the perception of nurses on the use of mobile phone SMS for managing diabetes mellitus in rural areas has been rarely explored. There is a need for a study to discover how nurses perceive using mobile phone SMS in managing diabetes mellitus and what might influence them to recommend it to their patients living with the condition. This study, therefore, sought to explore nurses' perceptions of using mobile phone SMS for the management of diabetes mellitus in rural Ghana.

2 | THEORETICAL FRAMEWORK

The technology acceptance model (TAM) is an information systems theory that understands and predicts an individual's acceptance of a given technology (Marangunić & Granić, 2015). The model posits that behavioural intention is a factor that leads people to use a given technology. The behavioural intention is influenced by the attitude, which is the general perception formed about the said technology. Technology Acceptance Model (TAM) is the most influential extension of Ajzen and Fishbein's Theory of Reasoned Action (TRA). The model hypothesized that the attitude of a user toward a system was a major determinant of whether the user will use or reject the system (Davis, 1989). The attitude of the user, in turn, was influenced by two major beliefs: perceived usefulness and perceived ease of use.

Perceived Usefulness (PU) is considered one of the primary factors that influence users to adopt new technology in their care interventions. Perceived usefulness refers to the extent to which an individual believes that applying certain technology will advance

job performance (Davis, 1989). Studies suggest that the degree to which nurses believe mobile phone SMS would be advantageous in achieving glycaemic controls for their patients will likely encourage them to adopt it in their care interventions (Mayer et al., 2019; Wallis et al., 2017). If Nurses feel that mobile phone SMS will improve medication adherence, interactions between colleagues, clients and relatives, simplifies their work performance and assist them to increase their productivity, it will encourage them to use the technology to deliver care. Similarly, the consequence theory asserts that, when individuals expect an intervention to result in positive outcomes, they usually develop a positive perception and desire to adopt the said intervention (Sekhon et al., 2017).

Perceived Ease of Use (PEU): This construct describes the extent to which an individual believes that a given technology will be easy to operate and less effort-driven (Davis, 1989). Perceived ease of use has been considered pivotal in understanding and predicting nurses' acceptance or adoption of any given technology (Schnall et al., 2015). It has been asserted that, when nurses perceive mobile phone SMS to be free of effort, comfortable, convenient and help them complete their tasks, they will have the desire to use it in their care strategies. It implies a lower acceptance and usage of mobile phone SMS if the features of the application are perceived to be complicated and or difficult to operate.

Though the model has been criticized by (Abbasi et al., 2016) that it fails to consider the social perspective that influences any decision-making process, it has been contended that the model considers the interpersonal nature of people (Kashada & Ehtiwsh, 2020). Besides acting interpersonally, we act jointly with others or for others. It is observed that mobile health is the product of collaborative thinking, and perception formed about a given technology would influence its acceptance and use.

The TAM was chosen as the conceptual framework for this research because the model has emerged as the most popular model for information technology adoption (Kashada & Ehtiwsh, 2020) and has since been used almost ubiquitously in several studies to understand users' adoption of a given technology. The Technology Acceptance Model is more suitable to emerging technologies and applies fundamental concepts such as usefulness and ease of use. Additionally, the model adopts the simplest assumptions when formulating or interpreting data. It is more robust in various information system applications. TAM helps to understand and explain users' behaviour in information system implementation. It is an advanced theory derived from the theory of reasoned action (TRA) and the theory of planned behaviour (TPB; Marangunić & Granić, 2015).

2.1 | Aim

The main aim of this study is to explore the perception of nurses on the use of mobile phone SMS for managing diabetes mellitus. The study sought to explore the perceived usefulness of mobile phone SMS, perceived ease of use and the intent to use mobile phone SMS for managing diabetes among nurses in rural Ghana.

3 | METHODS

3.1 | Design

The study employed the Exploratory Descriptive approach to explore the perception of nurses on the use of mobile phone SMS in the management of diabetes mellitus. The design allows an in-depth and detailed description of participants' perception of the usefulness of SMS, the simplicity of using SMS and the intention to use mobile phone SMS (Creswell et al., 2017).

3.2 | Setting

Ghana is a developing country in West Africa with an estimated total land area of 92,000 square meters. Ghana is bounded to the north by Burkina Faso, to the south by the Gulf of Guinea, to the west by Ivory Coast and the east by Togo. It has 16 administrative regions.

The Eastern Region is the third most populace and sixth largest among the 16 administrative regions. It occupies an area of 19,323 square kilometres. The region is divided into 32 administrative MMDAs. Birim-North is one of the main districts in the region. The district was carved out of the former Birim District Council in 1987 with an estimated total land area of 550 square kilometres. It has 78 settlements in its jurisdiction with one district hospital. Most of the settlements are far away from the district capital. The Majority of the roads are unmotorable especially in the rainy season, affecting easy access to health care.

The study was conducted in the district hospital. The hospital is in the district capital, New Abirem. It is the only district hospital serving the health needs of the populace and neighbouring districts. It has a nurse population of about 110 and a bed capacity of 100.

3.3 | Population and sampling technique

The study population was professional nurses with at least 3 years of working experience in managing diabetes mellitus in the district hospital. The study involved male and female nurses caring for patients with diabetes mellitus. The participants were intentionally chosen because of their ability to provide relevant information to the study being conducted, a technique referred to as purposive sampling. This technique allows the recruitment of participants with homogeneity in features about the use of mobile phone SMS and managing patients with diabetes mellitus. The recruitment was truncated after the thirteenth participant when repetitive codes and categories were observed (Creswell et al., 2017).

3.4 | Data collection tool and procedure

The study employed a semi-structured interview guide to collect the data. This allowed the lead author to obtain detailed and natural responses on the perception of nurses on the use of mobile phone SMS in managing diabetes mellitus. The questions in the interview

guide were based on the constructs of TAM such as perceived usefulness, perceived ease of use and behavioural intention to use. The interview guide was developed in the English language.

The conduct of the pilot test assisted the researchers to improve the questions contained in the guide. New probes that emerged from the initial interviews conducted in the field were incorporated into the guide and explored. The guide comprised of four sections. Section A was centred on participants' demographic characteristics such as age, gender, marital status, educational qualification, number of years of internet experience and rank. Section B questions were designed to elicit participants' responses on the usefulness of mobile phone SMS for the management of diabetes. Participants were asked what they know about using mobile phone in supporting health care; how applications or text supports adherence to diet, medication, communication and information, exercise and work output; each having accompanying probes.

Section C questions sought to uncover the perceptions of nurses on the ease of use of SMS in managing diabetes. They responded to questions such as their experience of using the internet and mobile phone for health purposes; how often, which device they usually browse with; what makes it easy for them to use the internet, device or tools; and what makes it difficult to use. This section enabled the researcher to discover the participants' beliefs on how effortless mobile phone SMS could be.

Section D contained questions on the participants' intention to use mobile phone SMS to manage diabetes mellitus. Field notes were also used to capture the events and non-verbal observations of participants to help enrich the responses obtained. The interviews were recorded using an audio recording gadget. Each interview spanned between 45 and 60 min.

With the support of the Ward In-charges, nurses who met the inclusion criteria were identified. They were met individually, consent sought and interviewed at their preferred place and time using the same interview guide until the researcher realized the repetition of codes and categories after the thirteenth participant, a point where no new data emerged, referred to as saturation.

3.5 | Data analysis

Thematic content analysis was used to analyse the data (Anderson, 2007). The collection and analysis were done concurrently to enable the researchers to identify, analyse and report commonalities of ideas in the data. The authors familiarized themselves with that data; systematically worked through the data to generate codes and group similar codes to form themes and sub-themes. The themes were reviewed and categorized to form subheadings. The data was manually managed to obtain an extract that supported the findings.

3.6 | Ethical considerations

Ethical clearance with ERC Number GHS-ERC 021/10/20 was obtained from Ghana Health Service Ethics Review Committee prior to the

commencement of the study. Institutional approval was also obtained from the Birim-North District hospital. Participants were contacted for the interview during their free periods after verbal and informed consent was obtained. They were made to understand that participation was based on one's own free will. The purpose of the study and its implications were further explained to the participants. The participants were reminded that they could withdraw from participating in the study at any point in the course of the study if they so desire despite signing the consent form. The data of participants were protected from unauthorized access. Pseudonyms were used to ensure the information obtained could not be linked to participants, thus protecting their identity.

3.7 | Rigour

To ensure findings represent participants' reality, asking appropriate questions and prolonged engagement of participants was ensured. A detailed written account of the study setting and participants' characteristics was given to ensure the findings could be applied to a similar setting. Also, the same interview guide was used for all the participants to ensure the consistency of the data gathered. Furthermore, each interview was audio-recorded, and the content was transcribed verbatim. Audio recordings were played back to the participants after the interview, thus immunizing the findings from the preconception and expectations of the researchers.

4 | RESULTS

4.1 | Demographic characteristics

Thirteen participants were enrolled and interviewed in this study. Ten (10) participants constituted females and three (3) participants constituted males. They were all Christians and of Ghanaian nationality. The age range of the participants was between twenty-five (25)

and thirty-nine (39) years with internet experience ranging from 5 to 16 years. Of the total participants, eleven (11) were between the ages of 30–39 while two (2) were between the ages of 25–29. Eight (8) of the participants had 5–10 years of internet usage experience while five (5) had 11–16 years of internet usage experience. About their educational level, all the participants had tertiary education. Also, most of the participants (6) were Nursing Officers, one (1) being a Senior Nursing Officer, three (3) being Senior Staff Nurses and three (3) were staff nurses. All the participants were fluent in English. The demographic information can be seen in Table 1.

Three major themes were identified from the data. These themes included Nurses' perception of the usefulness of mobile phone SMS in managing diabetes mellitus, Nurses' perception of the ease of use of SMS and willingness to use mobile phone SMS for the management of diabetes mellitus. The sub-themes of Nurses' perception of the usefulness of mobile phone SMS for diabetes management included improving adherence to the medication of diabetes patients, information and communication support for patients with diabetes and monitoring diabetes patients' response to treatment.

4.2 | Nurses' perception of the usefulness of Mobile phone SMS for diabetes management

Participants believe mobile phone SMS was a useful technology that could improve medication adherence, facilitates communication between nurses and patients, enhance blood glucose monitoring and improve access to health care.

4.2.1 | Improving adherence to medication of diabetes patients

Some of the participants (8) expressed the view that the in-built alarm system in mobile devices could be used to remind patients

Pseudonym	Age	Level of education	Gender	Years of internet experience	Rank	Marital status
P1	37	Tertiary	Female	10	Nursing Officer	Single
P2	26	Tertiary	Female	8	Staff Nurse	Married
P3	30	Tertiary	Female	5	Senior Staff Nurse	Married
P4	30	Tertiary	Female	10	Staff Nurse	Single
P5	30	Tertiary	Male	13	Nursing Officer	Married
P6	26	Tertiary	Male	8	Staff Nurse	Single
P7	35	Tertiary	Female	16	Nursing Officer	Married
P8	30	Tertiary	Female	11	Senior Staff Nurse	Single
P9	33	Tertiary	Male	16	Senior Staff Nurse	Single
P10	32	Tertiary	Female	9	Nursing Officer	Married
P11	39	Tertiary	Female	7	Senior Nursing Officer	Married
P12	32	Tertiary	Female	10	Nursing Officer	Married
P13	31	Tertiary	Male	11	Nursing Officer	Married

TABLE 1 Socio-demographic data of participants

to take their hypoglycaemic medication on time. This, they argued could help improve treatment adherence. Some expressed as follows:

In using mobile devices, you can always set an alarm. You can always set an alarm as to when you should take your medicine. So, having an alarm will always prompt you to take your medicine so that you don't relapse.

(P1 Female, Age 37)

Most of these applications come with alarm reminders that can be used to alert a patient when it's time to take their medication.

(P5 Male, Age 30)

Some participants reported that through periodic reminders either by text or phone calls from the nurse on the need to adhere to the treatment regimen, patients are more likely to comply thus reducing non-adherence with their treatment.

The problem we normally encounter with non-adherence to the treatment regimen will also be curtailed because the nurse can usually remind them either by text or calls on why they should take their drugs.

(P11 Female, Age 39)

4.2.2 | Information and communication support for patients with diabetes

Participants opined that mobile phone SMS facilitates interaction between nurses, clients, family and statistically significant others. The interaction could be created through social media networks, phone calls and text messaging. According to them, this could improve nurse-patient interaction.

We can create platforms for the various diabetics. So, on the platform, you can have several diabetic patients, some Nurses, and Medical Officers. So, when there is a case, we can discuss issues on that platform to serve as a source of education for diabetic patients.

(P1 Female, Age 37)

Also, some participants argue that the use of platforms such as WhatsApp among nurses allowed easy dissemination of information.

We also have a WhatsApp page where we share knowledge and ideas. It gives fast dissemination of information because you just put it on the WhatsApp platform and before you realize everyone gets the information.

(P5 Male, Age 30)

We have a WhatsApp platform that nurses who work at that unit belong and then the hospital at large where we have a lot of interaction. For example, if someone read some article somewhere and finds it interesting; it can be forwarded there for all of us to read and share ideas.

(P6 Male, Age 26)

However, some participants prefer face-to-face interaction. They claimed relying on the application could not allow an objective physical assessment to be conducted.

If the patient is right by you, you know what you know, you know what to write but if the patient is with the mobile app, he might not give you all that is needed to help the patient, but when the patient is with you, you can do a physical assessment to know what is wrong with your patient.

(P8 Female, Age 30)

4.2.3 | Monitoring diabetes patients' response to treatment

Some participants reported that the texts, phone calls and WhatsApp features of mobile health could enable nurses to remotely reach out to clients with diabetes mellitus to know how they were responding to treatment. They had these to say:

Through WhatsApp, texts, or calls, the nurse would be able to know the blood sugar and adherence to their drugs, diet, and medication most of the time.

(P10 Female, Age 32)

I think with mHealth you the nurse can reach out to the patient, and this will encourage him to want to do whatever you said. You will be able to also monitor the glucose if the patient is having the machine.

(P2 Female, Age 26)

Similarly, some participants opined that the application could be used to collect and track data of patients:

they can use the application to collect data, to keep track of their sugar levels on a daily, monthly or even on a yearly basis to see how they are improving.

(P1 Female, Age 37)

4.3 | Nurses' perception of ease of use of MHealth tools in managing diabetes

Participants prefer the use of infographics to voice calls and traditional SMS. According to them, most people including nurses do not like to read long texts. They opined as follows:

I think if it is in a form of graphics, people can easily read them, a lot of people don't like reading text messages. Even some nurses, once they open and the message is long, will just close it or read part. Not to talk of the ordinary patients.

(P13, Male, Age 31)

.... people don't like reading ooo, especially long messages.

(P7, Female, Age 35).

4.4 | Willingness to use mobile phone SMS to manage diabetes mellitus

All the participants expressed their desire to accept and use mobile phone SMS for the management of diabetes though some of them stressed the need for the applications to be approved by the local health authorities:

...yes, I intend to use it, I think it is the simplest way of helping clients to manage their condition even while living at home but what I want to be done is, the Ghana Health Service need to vet and approve the applications.

(P13 Male, Age 31)

I intend to use the applications of mHealth and I will tell others about it.

(P1 Female, Age 37)

We believe in the quickly changing world that everything is becoming more electronic base. So, if we have something like that sort and it is helping, I think it is good to welcome it in our facility and our part of the world.

(P6 Male 26)

However, some participants reported that some of their colleagues might not be willing to use it; attributing reasons such as laziness, fear of change and poor network connectivity:

some of us will, by all means, have cold feet because we are humans, not everyone is comfortable using this new technology; the network here too, is very poor, this might not motivate others to use it.

(P2 Female, Age 26)

We have diverse ways of responding to things; some will enjoy using it others will not and that is how I see it because some are lazy.

(P7 Female, Age 35)

Furthermore, most of the participants opined on the need for management to provide the infrastructure such as Wi-Fi, mobile phones and incentives to motivate nurses to use the application to manage patients with diabetes:

I strongly think management needs to give us data or money for the data we would be using to enable us to use the application.

(P5 Male, Age 30)

Once I have a smartphone which most nurses have, what I need is the data and some tokens to be able to use it for our patients. Management can provide Wi-Fi in the wards so we could use it for nursing our patients.

(P4 Male, Age 30)

5 | DISCUSSION

The study identified that the in-built alarm system in mobile devices could be useful in reminding patients to take their hypoglycaemic medication on time. This finding is consistent with an earlier report that mHealth usage among participants with type 2 diabetes has the potential to increase medication adherence (Hamine et al., 2015; Viswanathan et al., 2017). This further support the findings of a previous study by Dzansi et al. (2020), which reports that the use of Voice calls, SMS and phone alarms could be useful in supporting adherence to medication (Dzansi et al., 2020).

Participants appeared to prefer the alarm system as a convenient tool for promoting adherence among patients. Contrary to these findings, a study among patients with HIV/AIDS in a low to middle-income setting revealed that mobile phone alarms were least preferred despite their usefulness in supporting medication adherence (Dzansi et al., 2020). The disparities in findings may be attributed to digital literacy differences among the participants as the use of an alarm system requires technical skills and an understanding of alarm features on the mobile phone.

The nurses believe the use of infographics could be an effective tool compared to traditional text messaging or SMS use. The use of text messaging required English language literacy and the ability to manipulate various keypads. This, coupled with the general poor reading culture among Ghanaians might pose a challenge for most patients to use text messages. This highlights the need to tailor these messages into graphical forms. Contrary to this finding, a systematic review involving 107 articles revealed the use of the Short message service (SMS) as the most commonly used adherence tool to assist patient take their medication on time (Hamine et al., 2015). Most of these studies were conducted in a developed country where literacy level is high coupled with good reading culture thus, could account for the differences in findings. The participants in this study seem to have insufficient knowledge

of tools such as automated reminders, and downloadable diabetic applications with educational and motivational content.

The study also revealed that, through mobile phone SMS, a social media platform could be created to enable patients with diabetes and health professionals to interact to share ideas and knowledge. This finding suggests that mobile health could provide an interface to help improve nurse–patient interaction. This finding is congruent with the findings of similar studies that have it that mobile phone SMS has the potential to statistically significantly change nurse–patient interactions related to chronic health conditions (Hamine et al., 2015; Raj, 2019; Viswanathan et al., 2017). For example, the ability to track a patient's biometric values and simultaneously communicate these to the nurse through a platform may potentially transform patient self-monitoring from an individual solitary activity into an active, engaged collaboration between the patient and the nurse. This may contribute to a positive outcome of care for patients with diabetes mellitus.

However, some participants prefer face-to-face interactions with their patients; they were reluctant in using mobile phone SMS. According to them, mobile phone SMS is not a replacement but a supportive measure in the delivery of health care. It is limited in allowing an objective assessment to be performed on patients. The seeming reluctance could be attributed to inadequate knowledge of mobile health among nurses, the high illiteracy rate among patients, and inadequate ICT infrastructure, especially in remote areas. Despite this limitation, the recent Covid-19 pandemic has strengthened the essence of incorporating technologies that can remotely deliver care to patients.

Most of the participants think mobile phone SMS can be used to record, track and monitor patients' blood glucose values. This finding suggests that mobile phone SMS could be statistically significant in ensuring proper documentation of patients' blood glucose values, thus contributing to the efficient management of patients' glucose levels in remote areas. This finding also resonates with a previous study that had it that, mobile phone SMS could function like automated record data and transfer patient information to an electronic health record (Raj, 2019). It also allows for information to be sent to patients in multiple formats such as photos, video and animation among others (Raj, 2019). However, contrary findings highlight concerns with data security and technical reliability of mobile devices and software to keep a record of patients (Pfaeffli Dale et al., 2016). Again, it would appear lack of infrastructure such as Wi-Fi access, incentives and lack of awareness to recommend the best application might be some of the challenges confronting the successful application to nursing practice.

The present study also found that some of the participants believe only a few of the patients with diabetes mellitus that visit the facility would be able to use or operate SMS and WhatsApp platforms. They attributed this to the high illiteracy rate among patients, poor internet connectivity and unstable electricity supply coupled with the observation that most of the patients do not have smartphones. This resonates with a study conducted in Uganda, which had shown that health professionals did not think patients can easily

use mHealth in a remote and constrained environment where the illiteracy rate is high coupled with poor internet connectivity (Gilbert & Namagembe, 2013).

Findings from an earlier study conducted in Turkey to investigate health professionals' perception of using mHealth applications in practice show that majority of participants were willing to use mHealth in the clinical environment (Sezgin et al., 2018). Similarly, the findings of this study indicated that all participants expressed their willingness to accept and use mobile phone SMS for the management of diabetes. According to them, the world is becoming more electronically driven thus, the need for nurses to incorporate such tools in their care strategies. They claimed it is the simplest way to help patients manage their condition and could contribute to the delivery of quality nursing care. However, related studies have reported minimal usage or adoption of mobile phone SMS among health professionals for service delivery in low-income countries despite the willingness to accept and use it (Adokiya et al., 2015; Hoque & Golam, 2017). The findings of this study, however, suggest a potential acceptance and use of mobile phone SMS by nurses for the management of diabetes if the needed interventions are ensured. These interventions include the provision of Wi-Fi, mobile phones and training for nurses. They added that some form of compensation could be provided for nurses to defray the extra costs incurred in using their data bundle and also motivate them to continue to improve health delivery through mHealth.

The study also revealed that participants recognized and stressed the need for the applications to be validated and approved by local health authorities. They explained that the internet or play stores have several applications relating to diabetes management and that not all of them might be suitable or accurate in yielding the desired results. These findings resonate with previous studies that report the need for such applications to be validated and certified by health professional institutions before using them in the clinical environment (Mayer et al., 2019).

6 | LIMITATION

The researcher's presence might have biased responses from participants thus affecting the findings. However, trustworthiness was ensured through prolong engagement in the research setting, audio recording and transcribing content verbatim. The audio recordings were played back to the participants after the interview to ensure their expectations were met. Also, the study was conducted among professional nurses and did not include auxiliary or Enrolled Nurses, thus limiting diversity in terms of the cadre of nurses. However, diversity was ensured among this category through the recruitment of professional nurses with different ranks such as Staff Nurses, Senior Staff Nurses and Nursing Officers among others. Also, not all nurses who participated in this research were equally perceptive. Perceptions are relatively easy to describe, but they do not necessarily correspond with actual

conditions. Participants were drawn from rural Ghana. Therefore, it is likely that the findings of the research may not apply to nurses working in urban Ghana.

7 | CONCLUSION

The study explored the perception of nurses on the use of mobile phone SMS for the management of diabetes mellitus in the Birim-North district hospital, in Ghana. Mobile health (mHealth) seems to be a promising strategy for improving the care of patients with diabetes mellitus. Nurses believe mobile phone SMS could be useful in improving medication adherence, facilitating interaction between nurses and patients and supporting effective monitoring of blood glucose. Though participants acknowledged the usefulness of mobile phone SMS, they had limited knowledge of specific downloadable applications on diabetes mellitus. This highlights the need to incorporate and enhance the teaching of mHealth usage, and the integration of mobile phone SMS into the care of patients with diabetes. Participants prefer the use of infographics as the most effective tool to the traditional SMS in communicating with patients with diabetes mellitus. Nurses were willing to adopt mobile phone SMS in their care strategies despite citing some barriers that might hinder them from successful usage. They emphasized the need for health authorities to provide internet data, mobile phones, incentives and training for nurses to motivate them to use mobile phone SMS in the management of diabetes mellitus. The study had a limited number of participants who were drawn from rural Ghana. There is a need for new research on a greater number of participants in urban areas to compare the results with the findings of this study.

AUTHOR CONTRIBUTIONS

EA contributed to conception, design, data analysis, drafting the manuscript and the corresponding author. KAK, GD and NG revised the manuscript. NG was involved in the data collection. EA was involved in the revision of the manuscript. All the authors read and approved the content of the manuscript.

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CONFLICT OF INTEREST

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript. We attest to the fact that all Authors listed on the title page have contributed statistically significantly to the work, have read the manuscript, attest to the validity and legitimacy of the data and its interpretation, and agree to its submission to the Nursing Open.

ETHICS STATEMENT

This paper is the authors' own original work, and has not been previously published or being considered for publication elsewhere. The paper reflects the authors' own research in a truthful and complete manner.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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