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Awareness and Utilization of Mobile Health Applications among Teaching and Non Teaching Staff of Nnamdi Azikiwe University Awka, Anambra State

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Abstract:- This study examined awareness, and utilization of mobile health applications among teaching and non teaching staff of Nnamdi Azikiwe University Awka, Anambra State, Nigeria. Adopting a survey research method, 360 (Questionnaire) were returned which formed the foundation for data analysis. The study was situated within the context of Health Belief Model and Diffusion of Innovation theory; from the data analysis, the study found that ; there is low level of awareness of mobile health applications among staff of UNIZIK; respondents showed both positive and negative attitude towards mobile health applications and utilization of the application was found to be low due to such factors as high cost of Internet subscription; limited awareness of m-health applications; lack of know-how on the use of the mobile applications and individuals' preference for face-to-face medical consultation. The study recommended that Nigerian government should at the health policy stage make and implement policies that would make the use of mobile health applications a key aspect of healthcare delivery in the country's healthcare sector and that relevant government and non-governmental health bodies should partner with both local and international software developers to develop mobile health applications that would meet the specific health needs and preferences of individuals.

Keywords:- *Applications, Attitude, Awareness, Health, Mobile and Utilisation.*

I. INTRODUCTION

In this modern era, technological advances are shaping our everyday lives in all areas of endeavor including communications, medicine, transportation, education, banking and entertainment. Particularly, modern information technologies, like computers and mobile phones, touch human life in many different ways and have changed how individuals access and disseminate information, communicate with others, learn, exchange knowledge, and provide services (Ozdalga, Ozdalga, & Ahuja, 2014; Salami, 2015).

The integration of information technology into healthcare is changing the traditional perception of healthcare in many ways and with significant influence on how health services are accessed and delivered. The change resulting from this new culture is what Smith (2008) described as a move from "industrial age medicine" to "information age health care" where health providers and health service consumers are exposed to, and increasingly use or deploy information tools in dispensing and receiving services (Salami, 2015).

Among the innovations attendant on this culture of ICT-based health services is mobile health applications, a kind of computer software that offers health-related services when installed on mobile devices like smart phones and tablets (Rouse, 2018). While some of the applications are for health service providers, others are for consumers. Mobile health applications offer diverse services to users and in the context of individual consumers, the services range from supply of health facts to facilitation of consultation with health experts (Rana, 2017; Rouse, 2018).

In Nigeria, Healthcare services in is bedevilled by many challenges including inadequate number of health facilities, poorly equipped health institutions, paucity of health experts and poverty which restricts individuals from accessing available services (Okaro, Ohagwu. & Njoku, 2010; Akintaro & Adewoyin,2015). Recent health indicators emanating from the nation have been largely negative. For instance, with a current average life expectancy of 54.07 years, Nigeria is ranked 216 in the world, and 16th in Africa, according to a study by The Lancet, the world's largest scientific collaboration on population health (Ogundipe, 2017). In terms of infant mortality, nearly10 per cent of new-born deaths in the world in 2016 occurred in Nigeria, according to a 2017 report by the United Nations Children Fund (UNICEF). The report notes further that five countries accounted for half of all new-born deaths globally during the year with Nigeria third in the list (Owoseye, 2017). Maternal mortality is equally high in the country with Nigeria having the second highest rate in the world with 111 women estimated to die daily of pregnancy-related complications (Wilfred, 2017). Similarly, another 2017 study by Lancet

indicates that the Nigerian population remains largely vulnerable to a wide range of communicable and non-communicable diseases with malaria, diarrhoea, HIV, neonatal encephalopathy, and lower respiratory infection ranking as the top five causes of premature death in the country (Obinna, 2017).

The forgoing multiple challenges underscore the need for the nation to adopt modern innovations that are improving health practices the world over. Among these is eHealth, which refers to the application of tools of electronic communication for the purpose of advancing health services. The World Health Organization (WHO) defines eHealth as "the cost effective use of ICT in the support of health and health related fields including healthcare services, health surveillance, education, knowledge and research" (Abodunrin & Akande, 2009, p.124). It encompasses ICT platforms such as mobile phone, computer, and the Internet which are utilized for a wide range of health services.

As at today, several mobile health applications are locally available in Nigeria. Okoruwa (2018) identifies a number of such apps that are popular among local users to include *Omomi, Hudibia, Find-A-Med, 25Doctors,* and *Kangpe.* These apps are consumer-oriented providing services such as health facts, health status checks, expert search, consultation, and drug authentication among others. Okoruwa (2018) argues that availability of health mobile apps will contribute significantly in improving health service dispensation and consumption in the country particularly in the face of the multifarious challenges confronting quality healthcare in Nigeria. However, such popular use will more likely be realized when there is adequate awareness and favorable attitude among the population.

A. Statement of Problem

E-health communication is relatively new in Nigeria, implying that it is a practice that is yet to be fully embraced (Abodunrin & Akande, 2009; Abubakar, 2015). Given this novelty, there may be cause for one to be concerned about the extent of awareness and use of mobile heath applications may have been realised in the country. This is even more so considering that there appears to be little or no awareness creation regarding this health resource in the country. Okoruwa (2018) observes that eHealth is yet to be satisfactorily integrated into the Nigeria's health system, and so is yet to be given a space in the state-sponsored health campaigns.

Furthermore, Nigeria is still burdened by the problem of poor ICT infrastructure. This infrastructural challenge extends to the mobile telephone and Internet sectors, and which has hampered realisation of ICT objectives including as related to the health sector in the country (Idowu, Cornford & Bastin, 2008; Akadiri, Olusanya & Omitola, 2009; Adebayo & Ofoegbu, 2014; Abubakar, 2015). This situation again constitutes a cause for concern regarding the realisability of mobile health (mHealth) culture in the country especially as it concerned mobile health applications.

B. Objectives of the Study

i. To find out the number of teaching and non teaching staff of Nnamdi Azikiwe University Awka who are aware of mobile health applications;
ii. To assess the attitude of teaching and non teaching staff of Nnamdi Azikiwe University Awka to mobile health applications;
iii. To find out how much teaching and non teaching staff of Nnamdi Azikiwe University Awka utilize mobile health applications; and
iv. To find out the aspects of their health needs in which teaching and non teaching staff of Nnamdi Azikiwe University Awka utilize mobile health applications.

C. Research Question

1. What number of teaching and non teaching staff of Nnamdi Azikiwe University Awka are aware of mobile health applications?
2. What is the attitude of teaching and non teaching staff of Nnamdi Azikiwe University Awka to mobile health applications?
3. How much does teaching and non teaching staff of Nnamdi Azikiwe University Awka utilize mobile health applications?
4. In what aspects of their health needs do teaching and non teaching staff of Nnamdi Azikiwe University Awka utilize mobile health applications?

D. Significance of the Study

The study will be of benefit to designers of mobile health applications in their quest to meet the demands of consumers. By understanding how users accept their products, their taste and expectations vis-à-vis such apps, they may be in a more vantage position to achieve better user satisfaction.

The study will also help in creating awareness among smartphone users and the public in general regarding the relevance and efficacy of mobile health applications for the health wellbeing of individuals. Such awareness creation may contribute in bringing about utilization of mobile health applications among more members of the public.

This research will also contribute to health communication scholarship precisely in the area of mobile (mHealth) in general and mobile health applications use in particular. It will offer empirical data regarding the awareness and patterns of utilization of such applications among the studied population. It will equally offer insight into how much relevant theory like diffusion of innovation and Health Belief Model (HBM) may serve in explaining people's attitude to health-related ICT innovations like mobile health applications.

E. Study Scope

Variables: Awareness, Attitude, Utilization and Aspects of health need.
Unit of Analysis: Teaching and non teaching Staff of Nnamdi Azikiwe University Awka Anambra State Nigeria.
Geographical Scope: Awka, Anambra State Nigeria.

II. REVIEW OF RELATED LITERATURE

A. Health Informatics: An Overview

Health informatics is "the scientific discipline concerned with the systematic processing of data, information and knowledge in medicine and health care" (Chinaka, 2008, p.13). Also known as healthcare informatics, medical informatics or biomedical informatics, health informatics is information engineering applied to the field of health care, essentially the management and use of patient healthcare information (Warner, Sorenson & Bouhaddou, 1997).

Warner, Sorenson and Bouhaddou (1997) define health informatics as the science that deals with the use of computers and communication technology to acquire, store, analyze, communicate, and display medical/health information and knowledge to facilitate understanding and improve the accuracy, timeliness, and reliability of decision making. Before now, "medical informatics" was the known standard term until it was changed to "health informatics" or "healthcare informatics" when some health officers felt that the term "medical informatics" had to do with physicians alone (Shortliffe & Blois, 2001). Thus, the term health informatics captures the application of information systems that allow collection, updating, storing, analysis and management of health-related data in order to assist health care delivery.

Health informatics is a multi-faceted field in that it encompasses various disciplines and areas of endeavour relevant to healthcare. Association of State and Territorial health Officials, ASTHO (2004) explains this further:

Health informatics is multidisciplinary in using health information technology (HIT) to improve health care via any combination of higher quality, higher efficiency (spurring lower cost and thus greater availability), and new opportunities. The disciplines involved include information science, computer science, social science, behavioral science, management science, and others. World Health Organization (2019) defines health informatics as "the interdisciplinary study of the design, development, adoption and application of IT-based innovations in healthcare services delivery, management and planning". It deals with the resources, devices, and methods required to optimize the acquisition, storage, retrieval, and use of information in health and biomedicine. Health informatics tools include computers, clinical guidelines, formal medical terminologies, and information and communication systems, amongst others (p.3).

B. Mobile Health (mHealth)

Mobile health (mHealth) involves "the use of mobile phones or portable devices such as Personal Digital Assistants (PDAs) for healthcare service delivery. These interventions are usually in the form of direct phone calls, short message service (SMS) messages, voice calls or mobile applications" (Ilozumba, Abejirinde, Dieleman, Bardají, Broerse & Belle, 2018). Similarly, Chowdhury and Jahan (2014) explain mobile health (mHealth) to mean the use of mobile and wireless technologies, such as mobile phones, patient monitoring devices, personal digital assistants, and mobile software applications to support the achievement of health objectives. The definition by the World Health Organisation,WHO (as cited in Chowdhury & Jahan, 2014) sees it as the health-related use of mobile telecommunications and multimedia technologies within health service delivery and public health systems. Mobile health can be applied for a wide variety of purposes including health promotion and disease prevention, health care delivery, training and supervision, electronic payments and information systems (Eze & Okojie, 2016).

Experts have identified mHealth as one of the key trends reshaping the future of health care. It is a broad supportive system within healthcare sectors around the world, and has been seen as having the potential to improve the access, efficiency, effectiveness, and quality of clinical and business processes utilized by healthcare organizations, practitioners, and patients in developing countries (Chowdhury & Jahan, 2014; Eze & Okojie, 2016).

At the basic level, mHealth involves leveraging of mobile technology platforms to provide information and learning to the patient. However, at more advanced levels, it involves "more complicated platforms of communication between healthcare provider and patient, support for decision making through platforms with analytics, and even support of remote diagnostics and treatment" (Ilozumba *et al.*, 2018, p.2). Mobile health (involving application of mobile phone cum Internet-based systems) has been used continuously with success for healthcare in the developed world. Commenting on the proven efficiency of mHealth, Ilozumba *et al.* (2018) note:

mHealth is a potential game changer in the delivery of healthcare as there is the potential for applications which could enhance the value proposition for all players in the mobile technology ecosystem. Furthermore, the use of mobile communication technologies in health services can reduce gaps in health-related needs that exist between people. Such needs could include: functional quality of health information, availability of services, affordable cost options, communication infrastructure between client and healthcare providers; and easy to use information can play a predominant role in improving user perception of the health care system (p.6).

- *Mobile Health Applications*

Rouse (2018) defines mobile health applications (or mobile apps for short) as computer software that offers health-related services when installed on mobile devices

like smartphones and tablets. Before now, there were other computer programmes that offered health services; however, the advantage of mobility was added when such programmes were designed for mobile phones, thus developing what is known today as mobile health apps (Rana, 2017). Given that mobile health applications are "accessible to patients both at home and on-the-go, health apps are a part of the movement towards mobile health (mHealth) programmes in health care" (Rouse, 2018, p.1).

Rouse (2018) gives difference classes of mobile health applications as follows:

- *Mobile health apps for providers*

These are programmes used by healthcare providers for clinical decision support around the time of a patient's visit. For example, providers can use mobile health apps to perform searches or access clinical reference tools. This class of mobile health apps also help providers monitor and follow up with patients. For example, some mobile health apps use GPS (global system positioning) technology to track a patient's movement for a specified period, generate questions about the patient's well-being, and include regular reminders to report or measure symptoms (Rouse, 2018).

- *Mobile health apps for consumers*

This class of mobile health apps is used by consumers to manage their health through accessing of information and other health services including consultation. There has been explosive growth in the number of this class of mobile health apps for consumers. ICT giants such as Apple, Google and Microsoft have all developed and are marketing new consumer health apps. However, there have been concerns about the accuracy and unregulated status of mobile health apps for consumers (Rouse, 2018).

- *Patient portals*

This class of mobile health apps make it easier for healthcare providers, staff and patients to communicate. They allow patients to check test results, refill prescriptions, review their medical record, view education materials and even check in for appointments – all from their mobile devices. Some apps even allow patients to use their mobile devices to communicate with their providers through their patient portals. These features streamline administrative tasks such as registration, scheduling appointments, and patient reminders, and empower patients to easily and securely connect with their providers while on the go (Rouse, 2018).

- *Secure text messaging (STM)*

This class of mobile health apps helps providers securely exchange text and picture messages between mobile devices and office workstations. STM ensures that the information shared is confidential and protected. Messages (text and pictures) that are sent and received with STM are encrypted while they are being transmitted to and from a device or workstation (Rouse, 2018).

- *Patient monitoring devices*

This class of mobile health apps enables use of wearable sensors for remote health monitoring and to improve a patient's compliance with treatment recommendations. Many companies are developing products that measure biological factors (such as blood pressure, weight, and glucose) and behaviours (such as mobility and taking medication), then store that information in a secure place where they are accessible to health care providers. This can help providers keep track of patients, particularly those with chronic illness who are at risk of serious health incidents. For example, a device could pick up elevated blood pressure or glucose and alert the provider before the patient has to be sent to a hospital. However, establishing and getting paid for remote monitoring remains a challenge, especially for small and solo independent practices (Rouse, 2018).

- *Telemedicine*

This class of mobile health apps enables real time interaction between a patient and their healthcare provider. With cloud-based health information technology (HIT) and other technology such as two-way video, providers can review lab results in real time, see patients, and prescribe treatment. Telemedicine offers important benefits, such as better access to health care for isolated populations, better preventive care and reduced costs of care. (Rouse, 2018).

Sotunde (2014) identifies 10 mobile apps that are popularly utilized on the African continent. These include *Hello Doctor* which provides free essential healthcare information (including in local languages); *mPedigree*, an anti-counterfeit ICT software application which allows pharmaceutical retailers and users verify the authenticity of a drug; *MomConnect*, an application that provides information and advice for pregnant women in South Africa; *Matibabu*, an app that helps to diagnose malaria without a blood sample; and *MedAfrica* which helps people in rural areas diagnose and monitor symptoms of diseases. Others include *mRamadan*, an app that helps diabetic patients manage their health while fasting; *Smart Health app* which provides accurate baseline information resource on HIV/AIDS, TB and Malaria; *Sehatuk* **(**meaning "Your Health" in Arabic) which provides a huge data base of drugs available in Morocco, along with their prices and dosages; and *DrBridge* used mostly in Egypt to make appointments with a doctor online.

In Nigeria, mobile health applications have also become freely available. Okoruwa (2018) provides a list of what he terms the five leading mobile health applications in Nigerian. The list is as follows:

i. **Omomi:** Omomi (Meaning "My Child" in Yoruba) is a health platform which enables parents to monitor their children's health with the help of a SmartPhone. The app was designed with the child's health in mind and has all the important features that cover all of WHO's childhood survival strategies. It ensures that a woman's health is covered right from pregnancy to childbirth and beyond. It is also a platform for child health information

on key themes such as breastfeeding, child growth, and nutrition, food supplementation, and management of diarrhoea. Moreover, *Omomi* serves as a reminder for immunization visits and also has a GPS (global positioning system) locator of the nearest hospitals to facilitate emergency health care (Okoruwa, 2018).

ii. **Hudibia:** This app was introduced in 2016 and is intended to bridge the gap between patient and doctors by providing medical care without the initial problems that come with directly going to hospital. *Hudibia* was founded by Ahjoku Amadi-Obi, a medical doctor, and researcher of telemedicine in Nigeria. He founded the app with the motive of enabling anyone search for a doctor anywhere in the world, book medical appointments, and have live consultations. *Hudibia* is designed to reach a wide audience as it has translator icons for Yoruba, Hausa, and Igbo. The most interesting feature on the app is the ability for patients to have their consultations with doctors via live video stream. The app also stores patients' records like a real hospital and securely transfers them to other healthcare providers when required. Quality of medical care on the platform is monitored through ratings and tracking of hospitals' and doctors' performance. With drug delivery, maternal/child health care, and all these other systems in place, *Hudibia* is designed to make "contacting the doctor" a less herculean task (Okoruwa, 2018).

iii. **Find-A-Med:** This app was invented by Emeka Onyenwe in 2014. Like Hudibia, *Find-A-Med* has over 5, 000 registered medical centres giving users access to a host of hospitals, caregivers, pharmacies, doctors, laboratories and other medical facilities and services. Just as the name implies, *Find-A-Med* serves as a directory for users to locate hospitals and medical centres with ease. In addition, the catalogue of reviewed medical centres on the app ensures that individuals make informed decisions when choosing a medical platform (Okoruwa, 2018).

iv. **25Doctors:** This app was designed by Charles Davies Omiete, a medical doctor. Via this app, Charles together with a team of online doctors, provides valuable information to the public on health and medical facts. This is to enable individuals to learn very basic things about their body in a fun and easy manner. *25Doctors* provides users with information on human anatomy, diet and weight loss, lifestyle, life hacks and more. Users can also get familiar with the medical jargon and play interactive quizzes which are answered once submitted. With these services and many more, *25Doctors* is rapidly growing to become a globally recognized mobile health application providing the public with health-related knowledge (Okoruwa, 2018).

v. **Kangpe:** This app was invented by three friends; Femi Kuti, Ope Olumekan, and Matthew Mayaki in 2015. People get on *Kangpe* through their mobile phones, type in their medical questions and have them answered by medical staff for a small fee within 10 minutes or less. Furthermore, the app is an advice-giving platform for all health-related questions and also issues referrals for patients to see doctors. *Kangpe* operates in Ghana and Kenya as well and has over 100 thousand downloads on Google PlayStore. The *Kangpe* founders plan to provide Africans with the best medical care possible at reasonable prices (Okoruwa, 2018).

C. Theoretical Framework

The Diffusion of Innovation theory and Health Belief Model (HBM) are considered apt for situating this study in a proper theoretical framework. The theory of Diffusion of Innovation recognises that new ideas such as mobile health applications do not just become adopted at the same time by everyone in society; rather the process of adoption is gradual, moving from one layer of society to the other i.e. from innovators down to laggards (Rogers, 1964; Lewis, 2009). Hence, the theory will help to explain how and why a particular smartphone user may accept such innovation at a particular point in time; why a person may accept it faster or slower than the other. It will also be useful for explaining factors that motivate adoption of a technology like health mobile apps. These factors, according to the theory, includes relative advantage – the degree to which mobile health apps are seen as better than the idea, programme, or product they replace; compatibility – how consistent the apps are with the values, experiences, and needs of the potential adopters; complexity – how difficult the apps are to understand and/or use; triability – the extent to which the apps can be tested or experimented with before a commitment to adopt is made; and observability – the extent to which the apps provide tangible results.

Then, the Health Belief Model (HBM) helps to view smart phone users as people who would adopt mobile health apps based on their belief that such practice would fetch specific health benefits to them. In other words, if they perceive use of such applications as a helpful health action, then they are likely to adopt them. Such perception is constitutive of the following: perceived susceptibility – the extent an individual perceives themselves as facing the likelihood an adverse health; perceived severity – an individual's belief concerning the effects a given disease or condition would have their state of affairs; perceived benefits of taking action – the extent an individual believes that taking action i.e. use of mobile health apps will help deal with the perceived health risk; perceived barriers to taking action – the extent an individual sees hurdles in adopting mobile health apps; cues to action – the extent an individual is spurred to action either by internal or external cues; and self-efficacy – the extent an individual is confident in their ability to take action i.e. use mobile health applications.

Therefore, the Diffusion of Innovation theory and Health Belief Model (HBM) both helps to understand how a health resource like mobile health applications become understood, accepted and utilised among a population. While the diffusion of innovation provides a sociological insight into how such innovation spreads among a given social unit, the HBM gives a psychological explanation as

to why an individual may be motivated to utilise such a health resource.

III. METHODOLOGY

A. Research Design

The research was designed as a quantitative study. In the quantitative study, survey was used as the study method. Survey became necessary due to the large population and nature of variable under investigation.

B. Area of Study

The area of study was Nnamdi Azikwe University, Awka. It is one of the Federal universities in Nigeria. It has its main campus at Awka, Anambra State's capital, while other campuses are at Nnewi, Agulu, Mbaukwu and Umuawulu.

C. Population of Study

The population of study is all staff members of the Nnamdi Azikwe University, Awka. They number 5, 183 according to the data supplied by the Academic Planning Unit of the university. This population comprised 1, 881 academic staff members and 3, 302 non-academic staff members. They are scattered across the 14 faculties of the university as well as administrative offices, units and centres.

D. Sample Size and Sampling Procedure

The sample size for the survey will be based on the sample sizes for various population ranges as worked out by Israel (2006). This is as presented in Table 1.

Population Size	**Error Margin = 5%**	
	95% Confidence Level	**99% Confidence Level**
100	80	87
500	217	285
1, 000	278	399
10, 000	370	622
100, 000	383	659
500, 000	384	663
1 million and above	384	663

Table 1:- Populations and Sample Sizes As Suggested by Israel (2006)

Hence, being that the study population (5,183) is up to 1, 000 but less than 10, 000, the researcher will settle for 399 as the sample size. Therefore, the sample size of 399 is adopted at 5% error margin and 99% percent confidence level. The 399 sample size is thus approximated to 400 based on the maxim as held by Nwokoye (2018) that because in research one is seeking to generalize, there is no harm in travelling to a higher sample size. Thus, sample size of 400 was deemed appropriate for the study.

Since the staff of UNIZIK comprised academic and non-academic categories, the researcher sought to determine the number to be selected from each of the two categories of the staff. This was done applying the following formula:

$$n = \frac{C \times S}{N}$$

Where n = number to be selected from a category
C = population of a category
S = sample size
N = sum of the populations of the two categories

Number to be selected from the academic staff category

$$= \frac{1,881 \times 400}{5,183}$$

= 145

Number to be selected from the non-academic staff category

$$= \frac{3302 \times 400}{5,183}$$

= 255

Thus, 145 respondents were selected from the academic staff category while 255 were selected from the non-academic staff category.

The multi-stage sampling procedure was adopted in the sample selection. For the academic staff category, the stages were as follows:

At the first stage, the researcher selected six out of the 14 faculties of Nnamdi Azikiwe University, Awka. The selection was made using simple random procedure. The faculties were listed in alphabetical order, and using a table of random numbers, the following faculties were selected: Arts, Biological Sciences, Education, Engineering, Management Sciences, and Physical Sciences.

At the second stage, the researcher chose two departments from each of the six faculties selected above, using the same simple random procedure described earlier. So, a total of 12 departments emerged as follows: Arts – English and Religion; Biological Sciences – Biochemistry and Microbiology; Education – Educational Foundation and Guidance & Counselling; Engineering – Chemical Engineering and Civil Engineering; Management Sciences

– Accountancy and Business Administration; and Industrial Physical Sciences –Physics and Mathematics.

At the third stage the researchers selected 11 academic personnel from each of the 12 departments using the same random approach earlier described. This gave a total of 132 respondents. However, the researcher went further to select two more respondent each from Guidance & Counselling, Chemical Engineering, Business Administration, Religion, Education foundation and Physics; while one more was picked from physics the seven departments were determined through a balloting process. This brought the respondents to the required total of 145.

For the non-academic staff category, the researcher selected three personnel from each of the 12 departments chosen above bringing the number to 36 respondents on the whole. He then went further to randomly select 24 units and centres from the university, selecting a designated number of respondents based on the size of each centre or unit.

E. Instrument of Data Collection

The data collection instrument was the questionnaire. The questionnaire contained only structured questions framed to generate quantitative data in line with the variables to be measured in the study

F. Method of Data Analysis

The method of data analysis was both quantitative and qualitative. Answers extracted via the questionnaire were recorded as numeral data. The frequency of each answer was found and the percentage computed accordingly. Statistical tables were employed for presentation of these data.

IV. RESULTS AND DISCUSSION

As specified in Chapter Three, the study utilized a survey design. Thus, this chapter analyzed and presented the quantitative data in this section.

A. Survey data

➢ *Demographic Variables*

Six demographic variables were measured viz gender, age, marital status, highest educational qualification, and staff category. Data collected in this regard were presented in Table 4 below.

Variables	Items	Frequency	Percentage
Gender	Male	176	48.1%
	Female	184	59.1%
	Total	**360**	**100%**
Age Bracket	18-24	6	1.7%
	25-30	113	31.4%
	31-39	72	20.0%
	40-49	102	28.3%
	50 and above	67	18.6%
	Total	**360**	**100%**
Marital Status	Single	141	39.2
	Married	212	58.2
	Divorced	7	1.9
	Total	**360**	**100%**
Highest Educational Qualification	SSCE/Equivalent	30	8.3%
	OND/NCE/Pre-degree Diploma	4	1.1%
	First Degree/HND	188	52.2%
	Postgraduate Qualifications	138	38.3%
	Total	**360**	**100%**
Staff category	Academic staff	122	33.9%
	Non-academic staff	238	66.1%
	Total	**360**	**100%**

Table 2:- Demographic Variables

As shown on Table 2, majority of the respondents (59.1%; n=184) were females; while 48.1% (n=176) were males. This difference was purely coincidental as the researcher did not consider gender representation in sampling the respondents. In terms of age, 31.4% (n=113) of the respondents fell within the age bracket of 25-30. This was followed by those who fell within the age bracket of 40-49 years (28.3%; n=102) and then 31-39 years (20.0%; n=72). In addition, 18.6% (n=67) of the total number of respondents fell within the age bracket of 50 years and above; while only 1.7% (n=6) were between 18-24 years old. Hence, the modal age bracket was 25 – 30 years, while the least featured was 18-24. For marital status, majority of the respondents (58.2%; n=212) stated that they were married; while 39.2% (n=141) were single. More so, 1.9% (n=7) of the total number of respondents stated that they were divorced.

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In terms of education, 1.1% (n=4) of the respondents held OND/NCE/Pre-degree Diploma as their highest educational qualification; 8.3% (n=30) SSCE/Equivalent; 38.3% held postgraduate qualifications; while 52.2% (n=188) held first degree/ HND. Thus, first degree/HND was the modal qualification while the least featured was SSCE/Equivalent.

B. Respondents' smart phone access/ use pattern

This section presented data on respondents' smart phone access/ use pattern. The study focused specifically on the proportion of respondents who owned smart phones, and those who used theirs to access the internet. In addition, data on the respondents' frequency of internet access was also presented.

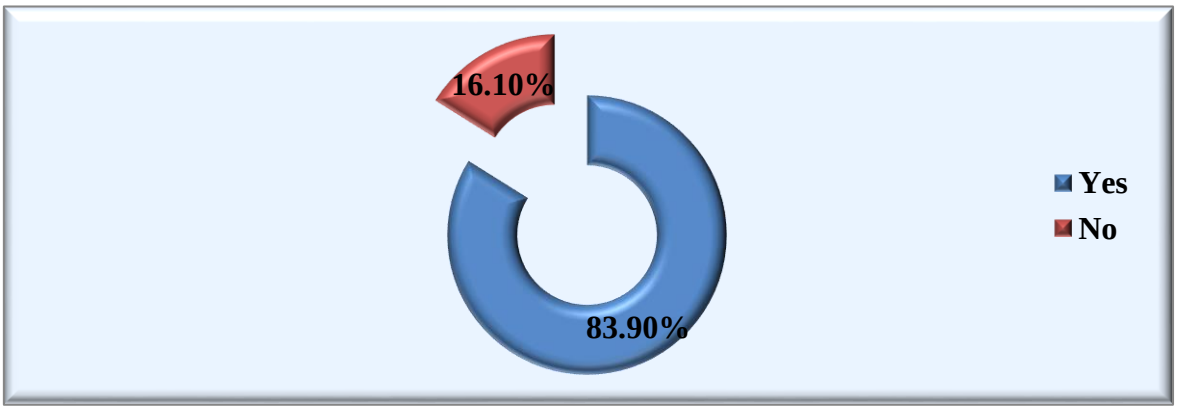

Fig 1

➢ *Respondents' Smart Phone Ownership*

Figure 1 presented data on the proportion of respondents who owned smart phones. As shown on the table, 83.9% of the respondents stated that they owned smart phones; while 16.1% stated that they did not. This result suggests a high rate of smart phone ownership among staff in Nnamdi Azikiwe University, Awka.

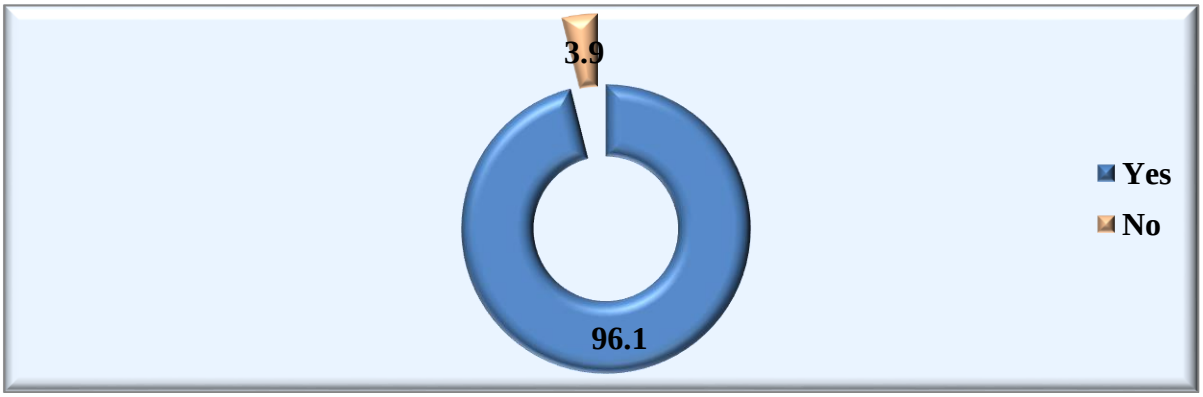

Fig 2

C. Respondents' Internet usage

Figure 2 presented data on the proportion of respondents who accessed the Internet with their smart phones. As shown in the figure, 96.1% of the respondents who stated that they had smart phones accessed the internet with theirs; while 3.9% of this category of respondents stated otherwise. This result suggests that there is a high rate of internet use among staff at Nnamdi Azikiwe University, Awka.

	Frequency	**Percent**
Always	147	40.8
Sometimes	63	17.5
Rarely	89	24.7
Total	**299**	**83.1**

Table 3:- Respondents' frequency of Internet access

Table 3 presented data on the frequency at which the respondents who had access to the internet did so. As shown on the table, 40.8% (n=147) of this category of respondents stated that they accessed the internet all the time. This was followed by those who stated that they rarely had access to the internet (24.7%; n=89) and then those who stated that they accessed the internet sometimes (17.5%; n=63).

D. Respondents' awareness of mobile health applications

This section presented data on respondents' awareness of various mobile health applications. In addition, data on the respondents' awareness of the various affordances which M-health apps can offer were also presented.

	Yes	No	Total
MySugr	51 14.1%	309 85.8%	360 100%
Matibabu	13 3.6%	347 93.4%	360 100%
	10 2.7%	350 97.2%	360 100%
MedAfrica	9 2.5%	351 97.5%	360 100%
Smart Health app	5 1.3%	355 98.6%	360 100%
Omomi	2 0.5%	358 99.5%	360 100%
Hudibia	39 10.8%	321 89.1%	360 100%
Find-A-Med	44 12.2	316 87.8	360 100%
25Doctors	0 0%	360 100%	360 100%
Kangpe	11 3.0%	349 96.9%	360 100%
NovaDoc			

Table 4:- Respondents' awareness of mobile health applications

Table 4 presented data on the respondents' awareness of M-health applications. As shown on the table, only 14.1% (n=51) of the respondents stated that they were aware of MySugr application, while 85.8% (n=309) stated otherwise; 3.6% (n=13) stated that they were aware of Matibabu, while 93.4% stated otherwise; and 2.7% (n=10) stated that they were aware of MedAfrica, while 97.2% (n=350) stated otherwise. More so, only 2.5% (n=9) stated that they were aware of Smart Health app, while 97.5% (n=351) stated otherwise; 1.3% (n=5) were aware of Omomi, while 98.6% (n=355) were not; and 0.5% (n=2) were aware of Hudibia, while 99.5% (n=358) stated otherwise. In addition, 10.8% (n=39) of the respondents stated that they were aware of Find-A-Med, while 89.1% (n=321) stated otherwise; 12.2% (n=44) stated that they were aware of 25Doctors, while 87.8% (n=316) were not; and 3.0% (n=11) stated that they were aware of NovaDoc, against the 96.9% (n=349) that stated otherwise. Furthermore, as shown on Table 4, none of the respondents was aware of Kangpe. Summarily, results on Table 4 suggest that awareness of M-health apps is generally low among the respondents.

E. Respondents' Attitude towards M-Health Apps

This section presented data on what the respondents think about m-health applications, or stated differently, their disposition towards these applications.

	Frequency	Percent
Very necessary	175	48.6
Necessary	59	16.4
Barely necessary	113	31.4
Not necessary	13	3.6
Total	**360**	**100.0**

Table 5:- Respondents' consideration of M-health applications as necessary for healthy living

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Table 5 presented data on the respondents' consideration of M-Health applications as necessary for healthy living. As shown on the table, 48.6% (n=175) indicated that M-health applications were very necessary. This was followed by the 31.4% (n=113) who stated that the apps were barely necessary. More so, 16.4% (n=59) stated that the apps were necessary, while 3.6% (n=13) stated that they were not necessary.

	Frequency	Percent
Very reliable	148	41.1
Reliable	83	23.1
Barely reliable	85	23.6
Not reliable	44	12.2
Total	**360**	**100.0**

Table 6:- Respondents' consideration of M-health applications as reliable for healthy living

Table 6 presented data on respondents' consideration of m-health applications as reliable for healthy living. As shown on the table, 41.1 (n=148) considered the apps as very reliable for healthy living; 23.1 (n=83) considered it reliable; while 23.6 (n=85) and 12.2% (n=44) considered it barely reliable and not reliable, respectively.

	Frequency	Percent
Very willing	183	50.8
Willing	51	14.2
Barely willing	74	20.6
Not willing	52	14.4
Total	**360**	**100.0**

Table 7:- Respondents' willingness to acquire and use m-health applications

Table 7 presented data on respondents' willingness to acquire and use mobile health apps. As shown on the table, 50.8% (n=183) of the respondents stated that they were very willing to acquire and use these apps. This was followed by the 20.6% (n=74) that stated that they were barely willing, and then the 14.4% (n=52) that stated that they were not willing to acquire and use these apps. More so, 14.2% (n=51) stated that they were willing to acquire and use the apps.

F. Respondents' Utilisation of Mobile Health Applications

This section presented data on respondents' utilisation of online mobile health applications. It focused specifically on data on the proportion of respondents among those who owned smart phones who have mobile health apps on their devices and those who used these apps. It also focused on the frequency at which those who used these apps did so.

	Frequency	Percent
Yes	63	20.9
No	239	79.1
Total	**302**	**100.0**

Table 8:- Respondents' who have mobile health apps on their device

Table 8 presented data on the proportion of respondents who had m-health apps on their smart phones. As shown on the table, of the respondents who stated that they used smart phones, majority (79.1%) did not have any mobile health app on their devices; while 20.9% (n=63) stated that they did. This result shows a difference of 171 between the proportion of respondents who were very willing and willing to acquire and use the m-health apps (n=234) and those who actually had these apps (n=63) and suggests that there are factors that hinder the respondents who were 'very willing' and 'willing' to acquire these apps from actually doing so.

	Frequency	Percent
Yes	25	39.7
No	38	60.3
Total	**63**	**100.0**

Table 9:- Respondents' use of Mobile health apps on their devices

Table 9 presented data on respondents' use of m-health apps on their devices.As shown on the table, of the respondents who stated that they had m-health applications installed in their smart phones, majority (60.3%; n=60) stated that they did not use these apps; while 39.7% (n=25) stated otherwise.

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	Frequency	Percent
Always	7	28.0
Sometimes	7	28.0
Rarely	11	44.0
Total	**25**	**100.0**

Table 10:- Respondents' frequency of mobile health app use

Table 10 presented data on the frequency at which respondents who stated that they used m-health apps installed in their smart phones did so. As shown on the table, 44.0% (n=11) of this category of respondents stated that they rarely used the m-health apps installed in their device, while 28.0% (n=7) stated that they always used these apps and another 28.0% (n=7) stated that they used them sometimes.

G. Aspects of Use of m-health applications

	Frequency	Percent
Health inquiry/information	23	92.0
Health checks/ tracking/ monitoring	11	44.0
Doctor's scheduling/appointment	5	20.0
Medical documentations	2	8.0

Table 11

Table 11 presented data on respondents' aspects of use of m-health applications. As shown on the table, 92.0% of the respondents that had earlier indicated that they used health applications stated that they used it for health inquiry and to get health information; 44.0% health checks/ tracking/monitoring; 20.0% doctor's scheduling/appointment; and 8.0% for medical documentations.

H. Discussion of Findings

Findings from the quantitative data showed that majority of the respondents (59.1%; n=184) were females; while 48.1% (n=176) were males. In terms of age, 31.4% (n=113) of the respondents fell within the age bracket of 25-30. This was followed by those who fell within the age bracket of 40-49 years (28.3%; n=102) and then 31-39 years (20.0%; n=72). For marital status, majority of the respondents (58.2%; n=212) stated that they were married; while 39.2% (n=141) were single. More so, 1.9% (n=7) of the total number of respondents stated that they were divorced.In terms of education, 1.1% (n=4) of the respondents held OND/NCE/Pre-degree Diploma as their highest educational qualification; 8.3% (n=30) SSCE/Equivalent; 38.3% held postgraduate qualifications; while 52.2% (n=188) held first degree/ HND.

More so, findings from the study showed that 83.9% had smart phones and 96.1% of this category of respondents accessed the internet with theirs. With regards to awareness of mhealth applications, majority of the respondents (64.1%; n=231) showed low awareness of m-health apps and their affordances. However, majority of the respondents generally showed positive attitude towards the applications- 48.6% (n=175) indicated that M-health applications were very necessary, in addition to the 16.4% (n=59) that stated that the apps were necessary. Furthermore, 41.1 (n=148) considered the apps as very reliable for healthy living and 23.1 (n=83) considered it reliable. Fifty percent (n=183) of the respondents were also very willing to acquire and use these apps.

In addition, of the respondents who stated that they used smart phones, majority (79.1%) did not have any mobile health app on their devices; while 20.9% (n=63) stated that they did- a result which showed a difference of 171 between the proportion of respondents who were very willing and willing to acquire and use the m-health apps (n=234) and those who actually had these apps (n=63) and suggests that there are factors that hinder the respondents who were 'very willing' and 'willing' to acquire these apps from actually doing so. More so, of the respondents who stated that they had m-health applications installed in their smart phones, majority (60.3%; n=60) stated that they did not use these apps; while 39.7% (n=25) stated otherwise. The study also presented data on respondents' views on factors that can hinder acquisition and use of m-health applications and showed that it was high cost of Internet subscription; limited awareness of m-health applications; lack of know-how on the use of the mobile applications; and individuals' preference for face-to-face medical consultation for majority of them.

In a nutshell, results from the study showed that the awareness of mobile health applications among the respondents was generally low and that they also had both negative and positive attitude towards the applications. However, the respondents' positive attitude did not translate to acquisition and use of these applications due to such factors as high cost of Internet subscription; limited awareness of m-health applications; lack of know-how on the use of the mobile applications; and individuals' preference for face-to-face medical consultation.

V. CONCLUSION

This study however concluded that the effective and widespread use of mobile health applications on smart phones or tablets for health or healthcare related purposes in Nigeria is possible since findings from this study showed that the respondents generally had positive attitude towards the applications as most of the perceived them as reliable and necessary and were willing to acquire and use them. More so, the general inconsistent patterns in the use of mobile health apps do not show a category of the population that is consistently left behind. This suggests that the barriers that exist may be amiable to changes in Nigeria's healthcare policy environment. The identified characteristics of individuals and factors that influence use of mobile health applications particularly may help the relevant government and non-governmental health bodies in conjunction with the information technology industry to target their services and products and to promote their use in the untapped populations.

RECOMMENDATIONS

The following recommendations are made based on the findings of this study:

1. First, the Nigerian government should at the health policy stage make and implement policies that would make the use of mobile health applications a key aspect of healthcare delivery in the country's healthcare sector.
2. Since it was found in this study that the awareness of mobile health applications is generally low, relevant government and non-governmental health bodies should organize health awareness campaigns to inform individuals on the availability of mobile health applications and sensitize individuals on them on the need to use them regularly.
3. Relevant government and non-governmental health bodies should partner with both local and international software developers to develop mobile health applications that would meet the specific health needs and preferences of individuals.

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