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ORIGINAL ARTICLE

Smartphone Ownership and the Willingness to receive Mobile Health Services among Patients with Hypertension in Nigeria

La Possession d'un Smartphone et la Volonté de Recevoir des Services de Santé Mobiles Parmi les Patients Souffrant d'Hypertension au Nigeria

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ABSTRACT

BACKGROUND: There are traditional barriers to accessing quality hypertension care in sub-Saharan Africa. Mobile phone technology is increasingly being used to overcome these barriers. This study assessed smartphone ownership and the willingness to receive mobile health services among patients with hypertension in Nigeria.

METHODS: Four hundred and twenty-seven (427) patients with hypertension were recruited from two tertiary health institutions in Ekiti State, Nigeria. Questionnaires were fed into the Open Data Kit form, which was used to take data on mobile phone ownership, the willingness to receive and the preferred type of mobile phone-based hypertension health care services.

RESULTS: Males were 37.2%. Mean age was 60.6 ± 15.3 years. Of the participants, 48.7% owned smartphones, 21.1% had regular internet subscription on their phones, 94.8% were willing to receive and pay mobile health services. Phone calls (48.0%) and text messages (31.6%) were the most preferred modes of receiving hypertension-related health education. Age category of 45-64 years was the only predictor of willingness to receive mobile health services.

CONCLUSION: All our participants owned mobile phones, with 48.7% being smartphones and almost all the participants were willing to receive and pay for mobile health services for prevention, treatment and information on hypertension. Middle age was the only predictor of willingness to receive mobile health, and the most preferred choices were through phone calls and text messages. The above information will guide in the design of favourable mHealth interventions that will be ideal for our study population. **WAJM 2023; 40(1): 84–89.**

Keywords: Smartphones, Willingness, Mobile health, Middle-age, Hypertension, Nigeria.

RÉSUMÉ

CONTEXTE: Il existe des obstacles traditionnels à l'accès à des soins de qualité pour l'hypertension en Afrique subsaharienne. La technologie de la téléphonie mobile est de plus en plus utilisée pour surmonter ces obstacles. Cette étude a évalué la possession d'un smartphone et la volonté de recevoir des services de santé mobiles chez les patients souffrant d'hypertension au Nigeria.

MÉTHODES: Quatre cent vingt-sept (427) patients hypertendus ont été recrutés dans deux établissements de santé tertiaires de l'État d'Ekiti, au Nigeria. Des questionnaires ont été introduits dans le formulaire Open Data Kit, qui a été utilisé pour recueillir des données sur la possession d'un téléphone mobile, la volonté de recevoir et le type préféré de services de soins de santé contre l'hypertension basés sur le téléphone mobile.

RÉSULTATS: Les hommes représentaient 37,2 %. L'âge moyen était de 60,6 ± 15,3 ans. Parmi les participants, 48,7 % possédaient des smartphones, 21,1 % avaient un abonnement Internet régulier sur leurs téléphones, 94,8 % étaient disposés à recevoir et à payer des services de santé mobiles. Les appels téléphoniques (48,0 %) et les SMS (31,6 %) étaient les modes les plus privilégiés pour recevoir une éducation à la santé liée à l'hypertension. La catégorie d'âge de 45 à 64 ans était le seul prédicteur de la volonté de recevoir des services de santé mobiles.

CONCLUSION: Tous nos participants possédaient des téléphones portables, 48,7 % étant des smartphones et presque tous les participants étaient disposés à recevoir et à payer des services de santé mobiles pour la prévention, le traitement et l'information sur l'hypertension. L'âge moyen était le seul prédicteur de la volonté de recevoir des soins de santé mobiles, et les choix les plus préférés étaient les appels téléphoniques et les SMS. Les informations ci-dessus guideront la conception d'interventions mHealth favorables qui seront idéales pour notre population d'étude. **WAJM 2023; 40(1): 84–89.**

Mots clés: Smartphones, Volonté, Santé mobile, Âge moyen, Hypertension, Nigeria.

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Abbreviations: BP, Blood Pressure; **COVID-19,** Corona Virus; **EKSUTH,** Ekiti State University Teaching Hospital Ado-Ekiti; **FETHI,** Federal Teaching Hospital Ido Ekiti; **M-HEALTH,** Mobile Health; **ODK,** Open Data Kit; **SPSS,** Statistical Package for Social Science.

INTRODUCTION

Hypertension is a leading cause of morbidity and mortality in developing countries including Nigeria.[1] The prevalence of hypertension in Nigeria was reported as 38.1% in the year 2020[2] and 30.6% in the year 2021[3] respectively. Hypertension is the primary risk factor for myocardial infarction, chronic kidney disease, stroke, heart failure, and cardiovascular-related deaths.[4] Mobile health (mHealth) is the use of telecommunication technologies to deliver health-related services and information that support patient care, health education, and administrative activities. The use of interactive text messaging, smartphone applications, and telephone calls have demonstrated significant reduction in mean systolic blood pressure (SBP) and increase in the proportion of hypertensives with blood pressure (BP) control.[5]

Traditional measures of educating patients through face-to-face interactions are becoming challenging due increasing workload on healthcare workers especially in low and middle-income countries like Nigeria where manpower shortages prevail.[6] Interventions that included text messaging with educational content had the potential to improve hypertension knowledge, influence behavioural modifications and boost health-seeking behaviours.[5] MHealth interventions have been shown to be effective in raising health education awareness, and for sustaining BP control in high-income countries.[7–10] MHealth has the potential to reduce the burden of hypertension and its associated cardiovascular morbidity and mortality in the developing countries.[8] This is achieved by reducing the cost of commuting, waiting-time in the hospitals, limiting the spread of infectious disease while saving the clinicians and the patients' time and productivity. Overall, the cost of hypertensive care will reduce and patients with hypertension will achieve better BP control.[11]

Medical practitioners therefore can use mobile phones as a medium for transmitting health information about the symptoms, risk factors and complications of hypertension. MHealth have been widely favoured in the management of hypertension and for follow-up intervention programmes.[12,13] Mobile phones have also been instrumental to fostering actions which encourage lifestyle modifications such as promotion of healthy diets, regular physical activity, prevention of obesity, enhanced engagement of patients to hypertension care and to achieve overall improvement in BP control.[9,14,15] Similar study done in patients with heart failure in a developed country showed that most patients with heart failure had smartphones and were interested in using mHealth apps to self-monitor their condition.[16] In Nigeria, mHealth intervention done among Obstetrics and Gynaecological patients showed significant benefits in its usage.[17,18] In our environment, there is a paucity of study on the use of mHealth and the willingness to receive mHealth among patients with hypertension. Therefore, this study assessed smartphone ownership and the willingness to receive mHealth among patients with hypertension.

SUBJECTS, MATERIALS AND METHODS

This was a descriptive cross-sectional study that was conducted at the Out-patient Departments of two (2) tertiary health Institutions in Ekiti State, Nigeria between October and December 2020. The participating facilities were Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti and the Federal Teaching Hospital, Ido-Ekiti (FETHI), both in Ekiti State. A total of four hundred and twenty-seven (427) participants were recruited from both sites over a period of three (3) months. Three hundred and fifty participants (350) and seventy-seven (77) were recruited from EKSUTH and FETHI respectively. Consecutive sampling was used, that is, every patient that met the inclusion criteria was selected until the required sample size was achieved. The inclusion criteria were: being 18 years and above, having been diagnosed with hypertension and currently attending a follow-up clinic for treatment at the selected centres while patients with secondary hypertension, heart failure and mental health conditions, critical illness that could interfere with their response to the study questions were excluded from the study. Data was collected by the researcher, assisted by the research assistants using Open Data Kit collection form. The questionnaire had sections on sociodemographic characteristics, hypertension-related questions and the assessment of ownership of mobile phone, including the type (basic or smartphones), duration of use, ability to send and receive text messages, and the willingness to subscribe to mobile phone-based hypertension services.

The Statistical Package for Social Sciences (SPSS Inc., Chicago, IL) version 22.0 (IBM Corp., Armonk, N.Y., USA) was used for data analysis. Descriptive statistics was used to summarize the demographic and baseline characteristics. Continuous variables were summarized as means and standard deviation while categorical variables were described as frequency and percentages. Associations between characteristics of participants and smartphone ownership were analysed using binary logistic regression analysis. A p-value <0.05 was considered to be statistically significant.

Ethical clearance with protocol numbers: EKSUTH/A67/2021/01/006 and ERC/2020/06/007 were obtained from the institutional Ethics and Research Committee of EKSUTH and FETHI respectively. Informed written consent was obtained from each participant before the commencement of the study.

RESULTS

There were 427 participants with age ranges between 22 to 96 years, the mean age of 60.6 ± 15.3 years. Majority of the participants were females (62.8%), 309 (72.4%) were married, and 333 (78.0%) of the participants earned above the minimum wage of thirty-thousand naira. The details of the socio-demographic information are as shown in Table 1.

Smartphone ownership and the willingness to accept m-Health services are summarized in Table 2. All the study participants owned a mobile phone: 51.3% owned basic mobile phones (that is, mobile phone with no facility for internet access or wi-fi) while 48.7% owned smartphones, with 232 (54.3%) never subscribing to internet on their

Table 1: Sociodemographic Characteristics of the Study Population

Variables	Total N (%)
Age (in years)	
Less than 45	71 (16.6)
45 – 64	174 (40.7)
65 and above	182 (42.6)
Mean age ± SD	**60.6 ± 15.3**
Sex	
Male	159 (37.2)
Female	268 (62.8)
Marital Status	
Single	18 (4.2)
Married	309 (72.4)
Divorced	12 (2.8)
Widowed	88 (20.6)
Religion	
Christianity	396 (92.7)
Islam	31 (7.3)
Education	
None	72 (16.9)
Primary	68 (15.9)
Secondary	113 (26.5)
Tertiary	174 (40.7)
Occupation	
Civil Servant	99 (23.2)
Self-employed	185 (43.3)
Pensioner	110 (25.8)
Unemployed	33 (7.7)
Income	
≤₦30,000	110 (25.8)
>₦30,000	317 (74.2)

SD, Standard Deviation.

Table 2: Smartphone ownership and willingness to receive and pay for mHealth

Variable	Frequency N = 427	Percentage (%)
Duration of phone ownership (in years)		
≤10	234	54.8
> 10	193	45.2
Median (IQR)	**10 (9)**	
Type of Phone owned presently		
Smartphone	208	48.7
Ordinary phone	219	51.3
Frequency of phone internet subscription		
Never	232	54.3
Rarely	37	8.7
Occasionally	68	15.9
Always	90	21.1
Willingness to receive and pay for mHealth services		
Yes	405	94.8
No	22	5.2
Preferred mode of receiving mHealth tips		
Not interested	22	5.2
E-mail	4	0.9
Mobile health application	2	0.5
Phone call	205	48.0
SMS	136	31.6
WhatsApp	58	13.6
Interested areas of mHealth services* (n=405)		
Dietary advice	16	4.0
Medication use reminder	16	4.0
Clinic appointment reminder	14	3.5
Advice on lifestyle modification	16	4.0
All of the above	394	97.3
Perceived problem(s) with mobile phone use*		
Poor network	195	45.7
Visual impairment	19	4.4

phones. Almost all (94.8%) were willing to receive and pay for mobile hypertension-related health services. The preferred mode of mobile communication was phone calls – 205 (48.0%), text messages 136 (31.6%), WhatsApp 58 (13.6%), emails 4 (0.9%), mobile health Application – 2 (0.5%). Majority of the study participants, 394 (97.3%) would want to receive mobile phone-based hypertension health services in all the following areas: medication use reminder, advice on diet and lifestyle modification, and clinic appointment reminder. The commonly envisaged challenges that could impair their effective use of mHealth services were poor network 195 (45.7%) and irregular electricity needed for charging the phone battery194 (45.4%). Participants' preferred languages for receiving hypertension-related health education from healthcare providers were Yoruba 224 (52.5%), English 180 (42.2%) and Others 1 (0.2%).

Comparison of the socio-demographic characteristics of the study population, based on the willingness to receive mobile health services are shown in Table 3. Significant number of participants who were willing to receive mHealth were in the middle-age group and had tertiary education. The predictor of willingness to receive mHealth was the middle-aged group (45–64 years) as shown in Table 4.

DISCUSSION

In this study, all the participants owned mobile phones, with 48.7% being smartphones and almost all (94.8%) were willing to receive and pay for mHealth hypertension-related services. Contrastingly, the use of smart phones is more widespread in high-income countries.[14,19] Furthermore, another earlier study carried out to assess mobile phone use and acceptability for the delivery of mental health information among perinatal adolescents in Nigeria, revealed that 89.6% of their participants owned mobile phones and 20.5% of them had smartphones while 96.2% were willing to use mHealth for preventive interventions of depression.[20] However, 50.4% of them preferred to receive such information in the form of text messages. The lower smartphone ownership among the adolescents could be due to inadequate economic empowerment and the high rate of willingness to receive mHealth could be attributable to the fact that young

Table 3: Comparison of the Sociodemographic characteristics of the study population, based on Willingness to receive m-Health

Variable	Willingness to receive m-Health		p-value
	Yes n (%)	No n (%)	
Age (in years)			
Less than 45	69 (97.2)	2 (2.8)	0.001*
45 – 64	172 (98.9)	2 (1.1)	
65 and above	164 (90.1)	18 (9.9)	
Mean age ± SD	60.0 ± 15.1	70.8 ± 16.4	0.001*
Sex			
Male	150 (94.3)	9 (5.7)	0.714
Female	255 (95.1)	13 (4.9)	
Marital Status			
Single	17 (94.4)	1 (5.6)	0.103
Married	297 (96.1)	12 (3.9)	
Divorced	10 (100.0)	0 (0.0)	
Widowed	79 (89.8)	9 (10.2)	
Religion			
Christianity	375 (94.7)	21 (5.3)	0.614
Islam	11 (35.5)	20 (64.5)	
Education			
None	62 (86.1)	10 (13.9)	0.002*
Primary	64 (94.1)	4 (5.9)	
Secondary	110 (97.1)	3 (2.7)	
Tertiary	169 (97.1)	5 (2.9)	
Occupation			
Civil Servant	97 (98.0)	2 (2.0)	0.106
Self-employed	170 (91.9)	15 (8.1)	
Pensioner	106 (96.4)	4 (3.6)	
Unemployed	32 (97.0)	1 (3.0)	
Income			
≤₦30,000	105 (95.5)	5 (4.5)	0.738
>₦30,000	300 (94.6)	17 (5.4)	

*SD, Standard Deviation; *, Statistically Significant.*

Table 4: Predictor of Willingness to Receive mHealth Services

Variable	AOR	95% CI	p-value
Age (in years)			
Less than 45	2.58	0.52 – 12.84	0.247
45 – 64	6.781	1.46 – 31.52	0.015*
65 and above (ref)	1.00		
Education			
None (ref)	1.00		
Primary	2.38	0.70 – 8.07	0.165
Secondary	3.38	0.86 – 13.34	0.082
Tertiary	2.80	0.83 – 9.48	0.098

*AOR, Adjusted Odd Ratio; CI, Confidence Interval; Ref, Reference Category; *, Statistically Significant.*

people are comfortable with the phone usage for their health as it reduces cost and provides their inquisitive minds with ready information without fear of stigmatization. Furthermore, other previous studies among patients with diabetes in Nigeria and Ethiopia revealed that 72.6 % and 70.5% of their respective study population were willing to receive and pay for mHealth services.[21,22] It is noteworthy that this present study was conducted after the first wave of the COVID-19 pandemic with the imposed complete lockdown in April to June, 2020. Hence, an increased (100%) level of mobile phone ownership and the willingness in almost all our participants (94.8%) to receive and pay for mHealth services may be explained by the fact that Nigerians travel a lot, with a number of family members overseas, hence owning a phone would enable them to communicate regularly with their loved ones.

Additionally, this study revealed that phone calls (48.0%) and text messages (31.8%) were the preferred choices for receiving mHealth services. This is concordance with other previous studies that preferred the use of phone calls and text messages.[8] These choices by respondents may be due to the fact that phone calls and text messages cheaper and also for the clarity of messages through calls.[23] Moreso, in this study, only 21.1% of our study participants had regular access to internet services on their mobile phones, contrary to over 90% with regular internet access in a study done in the United Kingdom. Therefore, tailoring phone calls and text messages interventions to meet the specific needs of patients with hypertension will guide in the design of favourable mHealth interventions that will be ideal for our study population.

Among the study participants, patients within the middle-age group and higher education levels were willing to receive m-Health. These results agreed with previous studies which reported that compared to the elderly age group, patients in the lower age groups were more interested in using mobile phone health services.[24] Many of the participants also stated that using mobile phone for hypertension health services would educate them on how to better

manage their hypertension and the participants expressed their intention to use the services if and when available. This agrees with findings in similar study conducted for mobile phone-based health services in patients with type II diabetes.[21,22] In this study, most participants (97.3%) required all the mobile phone-based healthcare services, which included lifestyle modification especially dietary advice, reminder about clinic appointments, and medication reminder. A previous study showed that the percentage of hypertensive patients with the right knowledge about lifestyle modification is very low.[25] Studies have shown the relationship between the use of mHealth and an increased level of measured physical activity.[26,27] It has also been associated with better outcomes in the management of hypertension and improved lifestyle modification.[26] Therefore, mHealth can be deployed to give reminders on lifestyle modification, appointment and medications.[27] Given the importance of these self-management activities in the overall outcome of hypertension, these services will be of immense value in reducing hypertension-related complications by improving medication adherence and encouraging health-promoting habits.

CONCLUSION

All our participants owned mobile phones, with 48.7% being smartphones and were willing to receive and pay for mobile health services for prevention, treatment and information on hypertension. Middle age was the only predictor of willingness to receive mobile health, and the most preferred choices were through phone calls and text messages. This will guide in the design of favourable mHealth interventions that will be ideal for our study population.

Limitation of the Study

The research was carried out in only one geo-political zone in the Country. It would have been more representative, if it were to be carried out in all the six (6) geo-political zones in Nigeria.

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Duality of Interest

The authors report no duality of interest.

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