




## KNOWLEDGE AND UTILIZATION OF E-HEALTH CARE DELIVERY AMONG HEALTH CARE PROFESSIONALS IN FEDERAL TEACHING HOSPITAL ABAKALIKI, EBONYI STATE, NIGERIA

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### ABSTRACT

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The high burden of emerging and re-emerging infectious diseases in Nigeria underscores the need for electronic health. This study determined the knowledge and utilization of e-Health care delivery among health care professionals in federal teaching hospital Abakaliki (FETHA) Ebonyi State. A self-developed questionnaire was used for the study. Two specific objectives with four null-hypotheses were postulated to guide the study. Out of a population of 2092 health workers in FETHA, 209 representing 10% were drawn through a multistage sampling technique and were studied. Frequency and percentage were used to answer research question one, Mean statistic was used to answer research questions two, Analysis of Variance (ANOVA) was used in testing null-hypotheses one and two while Binomial Logistics Regression was used in testing hypotheses three and four at .05 level of significance and appropriate degree of freedom. The findings indicated that health care professionals in FETHA possessed good knowledge of e-Health care delivery with an overall per cent (85.6%). The findings further show that utilization of e-Health care delivery was low ( $\bar{x}$  = 2.14). The four null-hypotheses tested shows that there is no statistical significant difference in level of knowledge by age ( $P = .236 > 0.05$ ), level of utilization by age ( $P$ -value =  $.087 > 0.05$ ), level of knowledge by gender ( $P$ -value =  $.051 > 0.05$ ), level of utilization by gender ( $P$ -value =  $.908 > 0.05$ ). The study concluded among others that Nigerian government at all level, through their various ministries of health should organize intensive ICT training and retraining of health workers regarding e-Health use in health care delivery.

**Contribution/Originality:** This Study Contributes to the Existing Literature by Evaluating the Knowledge and Utilization of E-Health Care Delivery among Health Care Professionals in Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria.

## 1. INTRODUCTION

The application of information communication technology (ICT) in health care delivery is not merely about technology but a means to solve the critical data management and clinical communication challenges in health care organizations [1]. Over the years, technology has touched the acme of human development and now it is not confined to developed countries. In developing countries healthcare providers can no longer ignore the application of information technology to healthcare delivery hence the concept e-Health, or electronic health [2].

E-Health is the leveraging of information and communication technology (ICT) to connect providers, patients, and governments; to educate and inform health care professionals, managers and consumers; to stimulate innovation in health care delivery and health system management [3]. E-Health which serves as a medical record used to capture, store, and share information among healthcare providers also serves in delivering of healthcare services to patients [4-6].

E-Health has a broad areas of services such as electronic health records to ensure continuity of patient care across time, mobile health (m-Health) services, telehealth, health research, consumer health informatics to support individuals in health decision making, eLearning by health workers Computerized physician order entry, ePrescribing, Clinical decision support system, Telemedicine, Health knowledge management, Virtual health care teams, Medical research using grids, Health informatics/health care information systems [7]. With the development of this new technology including Web 2.0 and 3.0 communication media, the field of e-Health has emerged and with it a plethora of new opportunities for individuals to access and exchange health information, manage their health through electronic platforms, and participate in peer-to-peer health care [8-10]. These online opportunities have been identified as a means to better enable health care providers/patient empowerment and self-management of care without face-face contact [11].

The wide areas of e-Health has enabled public health and medical practitioners to communicate with patients in both traditional and novel ways to address health concerns such as diabetes management, heart health, cancer prevention, smoking cessation, health promotion activities among others [12-18]. This Online strategies including adaptations of more traditional communication methods such as the delivery of tailored information and the creation of support networks, such as the implementation of Smartphone applications for disease prevention and management has yielded much benefits in health care delivery [19-21].

Studies have observed that the use of e-Health care delivery is growing and has recorded a huge success in health care systems in developed countries [22-25]. However, in developing countries including Nigeria it has been reported that its implementation have achieved little success with low utilization [22-24]. Given the high burden of disease incidence/prevalence in Nigeria including emerging and re-emerging infectious diseases and the high rate of contact cases among health care professionals and the emerging trends in the nation's healthcare systems and the low number of skilled personnel, e-Health is believed and has been identified to improve health care by strengthening the health system, supporting delivery of care, and improving communication without necessarily face-to-face contact among health care providers with patient.

Studies in developing countries have highlighted the following drawbacks as the factors affecting e-Health care delivery such as: lack of knowledge about ICT; unreliable ICT equipment; lack of availability of ICT equipment, high cost of ICT; low level of skills of potential users; technology compatibility; and limited access to ICT as challenges hindering e-Health use [26-29]. Studies also further highlighted lack of ICT infrastructure, access, skills and reluctance to use e-Health in healthcare services have been reported also as challenges in the use of ICT in health care delivery [30, 31]. It has been observed that the success of any new technology depends on many factors including the knowledge and understanding of the concept, skills, working environment and the effective utilization of the technology in health care delivery by the health care professionals [30-32].

It is therefore not known if health care professionals in FETHA possessed good knowledge and have effective use of e-health care delivery in FETHA Ebonyi State, Nigeria. Hence, Ebonyi State, Nigeria is a new State with its

own health system at the developmental stage; therefore, it is essential to determine the knowledge and utilization of e-Health care delivery among health care professionals in Federal Teaching Hospital Abakaliki (FETHA) Ebonyi State. To the best knowledge of this researcher, no such studies have been carried out in FETHA, Ebonyi State. It is therefore not known if the factors highlighted above influences e-Health care delivery among health care professionals in FETHA, Ebonyi State. Again, for the fact that Ebonyi State is a new State with its own health system at the developmental stage, it is not unlikely that the factors reviewed above may be influencing e-Health care delivery among health care professionals in FETHA, Ebonyi State. The present study therefore examined the knowledge and utilization of e-Health care delivery among health care professionals in FETHA, Ebonyi State, Nigeria.

## **2. MATERIALS AND METHOD**

### *2.1. Research Design*

A descriptive cross sectional research design was conducted between August 12<sup>th</sup> 2018 – January 11<sup>th</sup> 2019 on knowledge and utilization of e-health care delivery among health care professionals in Federal Teaching hospital Abakaliki (FETHA), Ebonyi State, Nigeria.

### *2.2. Research Area*

The area of the study is Federal Teaching Hospital Abakaliki (FETHA), Ebonyi State, Nigeria. FETHA is located in the heart of Abakaliki, the capital of Ebonyi State. It is the federal and the biggest hospital in Ebonyi State with about 608 beds. It is also a training institution for medical students, nursing students, medical laboratory science students among others. Just recently, it started receiving students from the new Federal University, Ndufu Alike Ikwo in Ebonyi State. Generally, the hospital renders primary as well as specialist services to those in need within and outside Ebonyi State. Being the largest tertiary and federal hospitals in the state, it receive clients directly and referrals from general hospital and nooks and crannies of the 13 local government areas of Ebonyi State and beyond.

### *2.3. Population of the Study*

The population of the study consisted of 2,092 staff comprising of 200 consultants in various specialties, 467 resident doctors undergoing residency training, 1,070 Nurses, 189 Med Lab, 56 Radiographers and 110 Pharmacists totaling 2,092 health care professionals in FETHA.

### *2.4. Sampling Technique and Sample Size*

The sample for this study is 209 health care professionals in FETHA. This represented 10 per cent of the total population. This is in line with the rule of the thumb which stated that, when a population is in a few thousand, five to ten per cent of the population will be deemed appropriate to determine the sample size [33]. The total sampling was stratified into different departments where 10% were proportionately drawn from the population of each of the department or unit. These are consultant 20, resident's doctors 47, nursing 107, medical laboratory 19, radiography 7, and pharmacy 11 staff. This process gave a total of 209 sampled staff that was studied.

### *2.5. Instrument for Data Collection*

A self developed instrument was used for data collection. The instrument was titled, Knowledge and Utilization of e-Health Care Delivery Questionnaire (KUEHCDQ). A pilot study was done among 20 health care professionals working in National Fistula Center (NAFIC), Abakaliki who were not included in the study but possessed similar characteristics. The internal consistency of each subscale was computed separately. The overall reliability coefficient of the instrument was 0.72. The instrument was then considered reliable to be distributed to the research

participants from FETHA. This was in consonance with the assertion that in reliability test, if the reliability coefficient index of an instrument is .60 and above, the instrument should be deemed reliable enough to be used in a study [34].

### 2.6. Method of Data Collection

An approval letter to carry out this study was collected from Research and Ethics Committee (REC) of the hospital. The letter enabled the researcher to gain access to head of different departments concerned and the respondent. Informed consent was explained in writing and obtained from all participants. The (KUEHCDQ) was administered by the researcher and two research assistant to all eligible respondent in FETHA on a unit basis.

### 2.7. Data Analysis

The completed copies of the KUEHCDQ were collected and crosschecked for completeness of information and responses. All statistical analysis was done using the Statistical Package for Social Science (SPSS) batch system. Frequency and percentage were used to answer research question one, where a percentage between 0.1 and 50 was adjudged poor knowledge while between 51 and 100% was adjudged good knowledge. Mean was used to answer research questions two, where a mean between 2.4 and below was adjudged low utilization of e-Health tools while mean between 2.5 and above was adjudged good levels of utilization of e-Health. The Analysis of Variance (ANOVA) was used in testing null hypotheses one and two while Binomial Logistics Regression was used in testing hypotheses three and four at .05 level of significance and appropriate degree of freedom. The results were illustrated using tables.

### 2.8. Ethical Consideration

The Institutional Research and Ethics Committee (REC) of Federal Teaching Hospital Abakaliki (FETHA) provided ethical approval with clearance numbers FETHA/REC/VOL.2/2018/079 and REC APPROVAL NUMBER 11/07/2018- 30/07/2018 respectively.

## 3. RESULTS

**Research Question 1:** What is the knowledge of health care professionals about e-Health use in health care delivery in FETHA?

**Table-1.** Mean Responses regarding knowledge of health care professionals about e-Health use in health care delivery in FETHA.

S/N	Meaning of E-health	Yes	% Rating	No	% Rating
7.	E-Health is the use of electronic health in health care delivery	183 (91.5%)	Good	17 (8.5%)	Poor
8.	It is the application of information and communication technologies (ICT) for health	203 (97.1%)	Good	6 (2.8%)	Poor
9.	E- health could also mean mobile health	172 (83.5%)	Good	34 (16.5%)	Poor
10.	e-health is a part of health system and services	196 (95.1%)	Good	10 (4.9%)	Poor
11.	It is a relatively recent healthcare practice that uses electronic processes and communication	203 (96.7%)	Good	6(2.9%)	Poor
	Cluster % and ratings	<b>92.8%</b>	<b>Good</b>	<b>7.2%</b>	<b>Poor</b>
	E-health services				
12.	Provides easy communication of patient data between different healthcare professionals	208 (99.5%)	Good	1(.5%)	Poor
13.	Offers platform for requesting diagnostic tests and treatments electronically and receiving the results	198 (94.7%)	Good	11 (5.3%)	Poor
14.	E-health offers access to prescribing options and printing prescriptions to patients	192 (93.7%)	Good	13 (6.3%)	Poor
15.	E-health services include electronic transmission of prescriptions from doctors to pharmacists	182 (88.3%)	Good	24 (11.7%)	Poor
16.	It provides information electronically about	193	Good	15	Poor

	protocols and standards for healthcare professionals to use in diagnosing and treating patients	(92.8%)		(7.2%)	
17.	It provides physical and psychological diagnosis and treatments at a distance, including tele-monitoring of patients functions;	155 (74.9%)	Good	52 (25.1%)	Poor
18.	Health knowledge management is an importance service of e-health	194 (93.7%)	Good	12 (5.8%)	Poor
19.	E health offers solutions for appointment scheduling, patient data management, work schedule management and other administrative tasks surrounding health	187 (92.1%)	Good	16 (7.9%)	Poor
	Cluster % and ratings	<b>91.2%</b>	<b>Good</b>	<b>8.8%</b>	<b>Poor</b>
	Channels of E-health Delivery				
20.	E-health can be delivered through visual communication	154 (76.2%)	Good	48 (23.8%)	Poor
21.	Internet can be used to deliver e-health services	196 (94.2%)	Good	12 (5.8%)	Poor
22.	E-health can be provided through Facebook	164 (80.8%)	Good	39 (19.2%)	Poor
23.	Landline Phone can be used to deliver health care	161 (79.7%)	Good	41 (20.3%)	Poor
24.	Twitter is another good means of delivering e-health service	169 (82.8%)	Good	35 (17.2%)	Poor
25.	Instagram is a means of proving health care services	168 (82.4%)	Good	36 (17.6%)	Poor
26.	Health care can be carried-out through Email	176 (87.6%)	Good	25 (12.4%)	Poor
27.	Fax is used to deliver e-health services	158 (78.2%)	Good	44 (21.8%)	Poor
28.	Paper post can also be used to deliver e health services	97 (48.7%)	Poor	102 (51.3%)	Good
	Cluster % and %	<b>79%</b>	<b>Good</b>	<b>21%</b>	<b>Poor</b>
	Areas e-health can be applied				
29.	Clinical area	170 (84.6%)	Good	31 (15.4%)	Poor
30.	Health education	192 (92.8%)	Good	15 (7.2%)	Poor
31.	Health care administration	184 (89.8%)	Good	21 (10.2%)	Poor
32.	Health Policy making	177 (85.9%)	Good	29 (14.1%)	Poor
33.	Research	185 (92.5%)	Good	15 (7.5%)	Poor
	Cluster % and ratings	89.1%	Good	10.9%	Poor
	Examples of E-health applications				
34.	Electronic health records is one of the applications of e-health	179 (89.1%)	Good	21 (10.4%)	Poor
35.	Electronic medical records is not an example of e-health application	98 (49.0%)	Poor	102 (51.0%)	Good
36.	Software systems is another example of e-health application	161 (81.7%)	Good	36 (18.3%)	Poor
37.	Apple's new health kit is also an example of e-health application	158 (83.2%)	Good	27 (14.2%)	Poor
	Cluster % and ratings	75.8%	Good	24.2%	Poor
	Overall % and ratings	85.6%	Good	14.4%	Poor

Source: Field work, 2019.

Data in Table 1 shows an overall percentage of 85.6% which indicated that health care professionals in FETHA generally possessed a good level of knowledge of e-Health care delivery while 14.4% possessed a poor knowledge of e-Health care delivery. Specifically, the table indicated through clusters that health care professional possessed a good knowledge of the meaning of e-Health care delivery, (92.8%); e-Health services, (91.2%); channels of e-Health delivery (79%); Areas of e-Health application (89.1%); and examples of e-Health application (75.8%).

**Research Question 2:** What is the level of e-Health Utilization in health care delivery among health care professionals?

**Table-2.** Mean Responses regarding level of e-Health Utilization in health care delivery among health care professionals.

S/N	Item Statement	$\bar{x}$	SD	Dec
58	Body scanner	1.73	1.06	Low
59	Printer	2.48	1.08	Low
60	Projector	2.59	1.06	High
61	Telemedicine (for radiology, stroke assessment etc.)	1.80	1.11	Low
62	Tele-health (remote monitoring of vital signs, video conference)	2.02	1.03	Low
63	Mobile health	2.10	.93	Low
64	Health IT system	2.04	.94	Low
65	Hybrid operating rooms	1.65	.89	Low
66	Health staff management technology	1.93	1.02	Low
67	Infection detecting technology	1.68	.95	Low
68	Patient-friendly technology	1.73	.98	Low
69	Surgical and service technology	1.66	.92	Low
70	Fax machine	1.67	1.02	Low
71	Application of smart phones in health care delivery	2.47	1.22	Low
72	SPSS/Epi Info	2.37	1.19	Low
73	Electronic personal health records and patient portals	2.19	1.06	Low
74	E-mail	2.54	1.14	High
75	Social media (WhatsApp, Face book etc.)	2.46	1.12	Low
76	Consumer-focused wireless app	2.03	1.08	Low
77	Internet search	2.63	1.14	High
78	Computerize databases	2.58	3.31	High
79	Computerize sensor	1.94	1.09	Low
80	E-leaning or E-Journal	2.31	1.17	Low
81	Microsoft access	2.41	1.19	Low
82	Microsoft excels	2.38	1.15	Low
	Overall % and $\bar{X}$	2.14	.46	Low

Source: Field work, 2019.

The data in Table 2 above shows the overall mean of ( $\bar{x} = 2.14$ ) which implies that the utilization of e-Health care delivery among health care professionals in FETHA is low. Specifically, the Table shows that “Body scanner ( $\bar{x} = 1.73$ ); “Printer ( $\bar{x} = 2.48$ ); “Telemedicine (for radiology, stroke assessment etc.) ( $\bar{x} = 1.80$ ); “Tele-health (remote monitoring of vital signs, video conference) ( $\bar{x} = 2.02$ ); “Mobile health ( $\bar{x} = 2.10$ ); “Health IT system ( $\bar{x} = 2.04$ ); “Hybrid operating rooms ( $\bar{x} = 1.65$ ); “Health staff management technology ( $\bar{x} = 1.93$ ); “Infection detecting technology ( $\bar{x} = 1.68$ ); “Patient-friendly technology ( $\bar{x} = 1.73$ ); “Surgical and service technology ( $\bar{x} = 1.66$ ); “Fax machine ( $\bar{x} = 1.67$ ); “Application of smart phones in health care delivery ( $\bar{x} = 2.47$ ); “SPSS/Epi Info ( $\bar{x} = 2.37$ ); “Electronic personal health records and patient portals ( $\bar{x} = 2.19$ ); “Social media (WhatsApp, Face book etc.) ( $\bar{x} = 2.46$ ); “Consumer-focused wireless app ( $\bar{x} = 2.03$ ); “Computerize sensor ( $\bar{x} = 1.94$ ); “E-leaning or E-Journal ( $\bar{x} = 2.31$ ); “Microsoft access ( $\bar{x} = 2.41$ ); “Microsoft excels ( $\bar{x} = 2.38$ ), indicated low utilization of e-Health care delivery as their mean scores fall below 2.5 cut-off point. Furthermore, the Health professional indicate high utilization of “Projector ( $\bar{x} = 2.59$ ); “E-mail ( $\bar{x} = 2.54$ ); “Internet search ( $\bar{x} = 2.63$ );” Computerize databases ( $\bar{x} = 2.58$ ) in e-Health care delivery as their mean score fall within 2.5 and above.

*Hypothesis 1: There is no significant difference in the level of knowledge of e-Health care delivery among health care professionals in FETHA by age.*

**Table-3.** Summary of one-way Analysis of Variance (ANOVA) testing the hypothesis that there is no significant difference in the level of knowledge of e-Health care delivery among health care professionals in FETHA by age.

Level of knowledge	Sum Between Groups	Squares Within Groups	df	Mean Between Groups	Squares Within Groups	F	P-value
Age	151.727	7237.330	3	50.576	35.477	1.426	.236**

Note: \*\* = Not Significant at .05 level.

Data in Table 3 above shows that the probability value of .236 is greater than the significant level of 0.05 (P-value = .236 > 0.05). This means that the earlier stated null hypothesis will be accepted. Hence, there is no statistical significant difference in level of knowledge of e-Health care delivery among health care professionals in FETHA by age.

*Hypothesis 2: There is no significant difference in the level of utilization of e-Health care delivery among health care professionals in FETHA by age.*

**Table-4.** Summary of one-way Analysis of Variance (ANOVA) testing the hypothesis that there is no significant difference in the level of utilization of e-Health care delivery among health care professionals in FETHA by age.

Level of Utilization	Sum Between Groups	Squares Within Groups	df	Mean Between Groups	Squares Within Groups	F	P-value
Age	4791.289	51315.516	3	1597.096	702.952	2.272	.087**

Note: \*\* = Significant at .05 level.

Data in Table 4 above shows that the probability value .087 is greater than the significant level of 0.05 (P-value = .087 > 0.05). This implies that the earlier stated null hypothesis will be accepted. Therefore, there is no statistical significant difference in the level of utilization of e-Health care delivery among health care professionals in FETHA by age.

*Hypothesis 3: There is no significant difference in the level of knowledge of e-Health care delivery among health care professionals in FETHA by gender.*

**Table-5.** Summary of Binomial Logistics Regression table testing the hypothesis that there is no significant difference in the level of knowledge of e-Health care delivery among health care professionals in FETHA by gender.

**Variables in the Equation**

Sex	N	B	S.E.	Wald	df	Sig.
Male	116					
		-.276	.141	3.819	1	.051*
Female	88					

Note: \* = Significant at .05 level.

Data in Table 5 above shows that the probability value .051 is greater than the significant level of 0.05 (P-value = .051 > 0.05). This implies that the earlier stated null hypothesis will be accepted. Therefore, there is no statistical significant difference in level of knowledge of e-Health care delivery among health care professionals in FETHA by gender.

**Hypothesis 4:** There is no significant difference in level of utilization of e-Health care delivery among health care professionals in FETHA by gender

**Table-6.** Summary of Binomial Logistics Regression table testing the hypothesis that there is no significant difference in level of utilization of e-Health care delivery among health care professionals in FETHA by gender.

**Variables in the Equation**

Sex	N	B	S.E.	Wald	df	Sig.
Male	38					
		-.027	.231	.013	1	.908**
Female	37					

Note: \*\* = Significant at .05 level.

Data in Table 6 above shows that the probability value .908 is greater than the significant level of 0.05 (P-value = .908 > 0.05). This implies that the earlier stated null hypothesis will be accepted. Therefore, there is no statistical significant difference in level of utilization of e-Health care delivery among health care professionals in FETHA by gender.

#### 4. DISCUSSION

The study found that health care professionals in FETHA possessed good knowledge of e-Health care delivery. This finding of the study is in consonance with the studies by Adeleke, et al. [35]; Alwan, et al. [36]; Kirubel and Abetu [37] who reported good knowledge of e-Health care delivery among health care professionals. However, the findings contradict the studies [26, 27] who observed lack of knowledge about ICT as challenges hindering ICT use in health care delivery.

The study also found that there was low utilization of e-Health care delivery among health care professionals in FETHA. The finding of the study is in consonance with the studies [22-24] who reported low utilization of ICT in health care delivery in developing countries. The study is also in line with the studies [26-29] who highlighted factors affecting e-Health care delivery utilization such as: lack of availability of ICT equipment, high cost of ICT; low level of skills of potential users; technology compatibility; and limited access to ICT as challenges hindering e-Health utilization in health care delivery.

The study indicated that there is no statistical significant difference in level of knowledge of e-Health care delivery among health care professionals in FETHA by age. The findings were in consonance with the studies [38-42] who indicated age not to be a significant influencing factor for the e-Health care delivery. The study disagree with the study [43] who reported that the younger population is more aware of e-Health possibilities compared to older persons who have less knowledge about e-Health.

The study also indicated that there is no statistical significant difference in the level of utilization of e-Health care delivery among health care professionals in FETHA by age. However, the following studies [38-42] indicated age not to be a significant influencing factor for e-Health care utilization. This study disagree with the study of Fabienne, et al. [25] who indicated age to be a significant factor that influences the utilization of e-Health care delivery. The study is also at variant with the studies [44-50] who revealed that younger people are more willing and have more experience and interest in using e-Health care delivery compared to older people. The study also disagrees with Terschüren, et al. [43] who report that older people are afraid of losing personal contact with their physician when they start using e-Health. Also disagree in the study of Goyal, et al. [51] who observed that older persons, once they adopt the technology, adhere longer to a risk management app than younger people who, although they download the app more often, also lose interest more often.

The study further indicated that there is no statistical significant difference in level of knowledge of e-Health care delivery among health care professionals in FETHA by gender. This finding is however, surprising and not expected, hence there is evidence that women usually bear primary responsibility for family care and health and other family factors that are capable of depriving women the knowledge of e-Health care delivery. The finding is at variant with the findings of Khatun, et al. [52] who reported that gender differences existed in the knowledge of e-Health care delivery irrespective of education and socioeconomic status. The study is also in disagreement with Khatun, et al. [52] who also observed that women with high education and those of higher socioeconomic status also have low knowledge of mHealth services, which indicates that available mHealth services are not focused appropriately for women to be aware about the mHealth program. Although there is a lack of mobile phone ownership, low awareness of mobile phone use in healthcare and low knowledge about available mHealth services, there is a high probability of women in every socioeconomic and education group being interested in joining the mHealth program in future.

The study also found that there is no statistical significant difference in level of utilization of e-Health care delivery among health care professionals in FETHA by gender. Finding is however, surprising and not expected; hence studies indicated that traditional gender roles may result in women lagging behind men in the utilization of modern technologies, especially in developing countries [52]. More so females and males behave differently and play different roles in society [53]. Males are more prone to adventure, use of technology, and exploring new things than females. Also in Abakaliki, Ebonyi State, Nigeria where the present study is conducted gender



inequality is pronounced; women are meant to understand that they are weaker sex in so many areas. This disagree with the studies [51, 54, 55] who reported that women are more engaged with eHealth applications and use them more often than men. The study also at variant with the studies [43, 45] who reported men to be more likely to accept telemonitoring than women and that Males are more prone to adventure, use of technology, and exploring new things than females.

## 5. CONCLUSIONS

E-health is a new and specialized concept in healthcare delivery, and its application has not been explored in health care delivery in FETHA and in Nigeria health sector hence the present study focused on knowledge and utilization of e-health care delivery among health care professionals in Federal Teaching Hospital Abakaliki, Ebonyi State, Nigeria. However our respondents reported a good knowledge of e-Health care delivery and low utilization despite the multitude of structural and systemic difficulties in nations health care systems. Based on our findings, much work is needed to be done to providing awareness, training and retraining and continuous follow-up among health care professionals on the utilization of e-Health care delivery in the nation's health sector. Also there is need for e-Health to be fully integrated in the healthcare system in Federal Teaching Hospital Abakaliki (FETHA), Ebonyi State and Nigerian hospital in general given the high burden of disease incidence/prevalence including emerging and re-emerging diseases in Nigeria and the rate of contact cases among health workers, e-Health is believed and has been identified to improve health care by strengthening the health system, improving communication among different health care organizations and professionals and supporting delivery of care to patients without necessarily face to face contact.

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## REFERENCES

- [1] J. Soar, J. Gow, and V. Caniogo, "Sustainability of health information systems in developing countries: The case of Fiji," *Health Information Management Journal*, vol. 41, pp. 13-19, 2012. Available at: <https://doi.org/10.1177/183335831204100302>.
- [2] N. Gour and D. Srivastava, "Knowledge of computer among healthcare professionals of India: A key toward e-health," *Telemedicine and e-Health*, vol. 16, pp. 957-962, 2010. Available at: <https://doi.org/10.1089/tmj.2010.0049>.
- [3] World Health Organization, "Eastern mediterranean region health observatory. Retrieved from <http://www.emro.who.int/ehealth/>," 2003.
- [4] M. Bagyendera, "E-health," *The Bulletin Series, WHO-Uganda*, 2016.
- [5] ITU-International Telecommunication Union, "Implementing e-health in developing countries, Guidance and principles 2008. Retrieved from [http://www.itu.int/ITU-D/cyb/app/docs/e-Health\\_prefinal\\_15092008](http://www.itu.int/ITU-D/cyb/app/docs/e-Health_prefinal_15092008)," 2016.
- [6] C. Austin and S. Boxerman, *Information systems for healthcare management* 6th ed. Chicago: Health Administration Press, 2003.
- [7] A. Neto and M. Flynn, *The internet and health in Brazil: Challenges and trends*. New York: Springer, 2018.
- [8] S. Fox and S. Jones, *The social life of health information*. Washington, DC: Pew Internet & American Life Project, 2009.
- [9] S. Fox and K. Purcell, *Chronic disease and the internet*. Washington, DC: Pew Internet & American Life Project, 2010.
- [10] S. Fox and M. Duggan, *Health online*. Washington, DC: Pew Internet & American Life, 2013.
- [11] G. L. Kreps and L. Neuhauser, "New directions in e-Health communication: Opportunities and challenges," *Patient Education and Counseling*, vol. 78, pp. 329-336, 2010. Available at: <https://doi.org/10.1016/j.pec.2010.01.013>.
- [12] B. Bock, A. Graham, J. Whiteley, and J. Stoddard, "A review of web assisted Tobacco interventions (WATIs)," *Journal of Medical Internet Research*, vol. 10, pp. 1-10, 2008. Available at: <https://doi.org/10.2196/jmir.989>.

- [13] S. Lindsay, S. Smith, P. Bellaby, and R. Baker, "The health impact of an online heart disease support group: A comparison of moderated versus unmoderated support," *Health Education Research*, vol. 24, pp. 646-654, 2009. Available at: <https://doi.org/10.1093/her/cyp001>.
- [14] D. T. Smith, L. J. Carr, C. Dorozynski, and C. Gomashe, "Internet-delivered lifestyle physical activity intervention: Limited inflammation and antioxidant capacity efficacy in overweight adults," *Journal of Applied Physiology*, vol. 106, pp. 49-56, 2009. Available at: <https://doi.org/10.1152/jappphysiol.90557.2008>.
- [15] R. M. Steele, W. K. Mummery, and T. Dwyer, "A comparison of face-to-face or internet-delivered physical activity intervention on targeted determinants," *Health Education & Behavior*, vol. 36, pp. 1051-1064, 2009. Available at: <https://doi.org/10.1177/1090198109335802>.
- [16] A. L. Graham, N. K. Cobb, G. D. Papandonatos, J. L. Moreno, H. Kang, D. G. Tinkelman, B. C. Bock, R. S. Niaura, and D. B. Abrams, "A randomized trial of Internet and telephone treatment for smoking cessation," *Archives of Internal Medicine*, vol. 171, pp. 46-53, 2011. Available at: <https://doi.org/10.1001/archinternmed.2011.65>.
- [17] A. M. Vuong, J. C. Huber Jr, J. N. Bolin, M. G. Ory, D. M. Moudouni, J. Helduser, D. Begaye, T. J. Bonner, and S. N. Forjuoh, "Factors affecting acceptability and usability of technological approaches to diabetes self-management: A case study," *Diabetes Technology & Therapeutics*, vol. 14, pp. 1178-1182, 2012. Available at: <https://doi.org/10.1089/dia.2012.0139>.
- [18] W. Kuijpers, W. G. Groen, N. K. Aaronson, and W. H. van Harten, "A systematic review of web-based interventions for patient empowerment and physical activity in chronic diseases: Relevance for cancer survivors," *Journal of Medical Internet Research*, vol. 15, pp. 1-16, 2013. Available at: <https://doi.org/10.2196/jmir.2281>.
- [19] N. Cobb, A. Graham, M. Byron, R. Niaura, and D. Abrams, "Workshop participants online social networks and smoking cessation: A scientific research agenda," *Journal Med Internet Res*, vol. 13, pp. 1-12, 2011. Available at: <https://doi.org/10.2196/jmir.1911>.
- [20] K. E. Muessig, E. C. Pike, B. Fowler, S. LeGrand, J. T. Parsons, S. S. Bull, P. A. Wilson, D. A. Wohl, and L. B. Hightow-Weidman, "Putting prevention in their pockets: Developing mobile phone-based HIV interventions for black men who have sex with men," *AIDS Patient Care and STDs*, vol. 27, pp. 211-222, 2013.
- [21] L. Hebden, K. Balestracci, K. McGeechan, E. Denney-Wilson, M. Harris, A. Bauman, and M. Allman-Farinelli, "TXT2BFiT'a mobile phone-based healthy lifestyle program for preventing unhealthy weight gain in young adults: Study protocol for a randomized controlled trial," *Trials*, vol. 14, pp. 1-10, 2013.
- [22] D. S. Wamala and K. Augustine, "A meta-analysis of telemedicine success in Africa," *Journal of Pathology Informatics*, vol. 4, pp. 1-16, 2013.
- [23] M. Kifle, F. C. Payton, V. Mbarika, and P. Meso, "Transfer and adoption of advanced information technology solutions in resource-poor environments: The case of telemedicine systems adoption in Ethiopia," *Telemedicine and e-Health*, vol. 16, pp. 327-343, 2010.
- [24] K. Mengistu, V. W. Mbarika, and R. V. Bradley, "Global Diffusion of the internet X: The diffusion of telemedicine in Ethiopia: Potential Benefits, present challenges, and potential factors," *Communications of the Association for Information Systems*, vol. 18, pp. 612-640, 2006.
- [25] R. Fabienne, J. Sturm, L. J. Bouw, and E. J. Wouters, "Sociodemographic factors influencing the use of eHealth in people with chronic diseases," *International Journal of Environmental Research and Public Health*, vol. 16, p. 645, 2019. Available at: [10.3390/ijerph16040645](https://doi.org/10.3390/ijerph16040645).
- [26] N. L. Ruxwana, M. E. Herselman, and D. P. Conradie, "ICT applications as e-health solutions in rural healthcare in the Eastern Cape Province of South Africa," *Health Information Management Journal*, vol. 39, pp. 17-29, 2010.
- [27] A. Coleman, "Migration from resource based to knowledge based strategy for e-health implementation in developing countries," *Journal of Communication*, vol. 5, pp. 1-7, 2014.
- [28] United Nation Foundation, *Assessing the enabling environment for ICTs for Health in Nigeria: A review of policies*: United Nations Foundation in Support of ICT4SOML, September 2014, 2014.

- [29] O. T. Geoffrey, W. O. Yagos, and E. Ovuga, "Knowledge and attitudes of doctors towards e-health use in healthcare delivery in government and private hospitals in Northern Uganda: A cross-sectional study," *BMC Medical Informatics and Decision Making*, vol. 15, p. 87, 2015.
- [30] N. A. Jadoon, M. F. Zahid, H. Mansoorulhaq, S. Ullah, B. A. Jadoon, A. Raza, M. Hussain, R. Yaqoob, and M. A. Shahzad, "Evaluation of internet access and utilization by medical students in Lahore, Pakistan," *BMC Medical Informatics and Decision Making*, vol. 11, p. 37, 2011. Available at: [10.1186/1472-6947-11-37](https://doi.org/10.1186/1472-6947-11-37).
- [31] A. Woodward, M. Fyfe, J. Handuleh, P. Patel, B. Godman, A. Leather, and A. Finlayson, "Diffusion of e-health innovations in 'post-conflict' settings: A qualitative study on the personal experiences of health workers," *Human Resources for Health*, vol. 12, p. 22, 2014. Available at: <https://doi.org/10.1186/1478-4491-12-22>.
- [32] N. Wickramasinghe and J. Schaffer, *Realizing value driven e-health solutions*. Washington DC: Report for IBM, 2010.
- [33] O. Nwana, *Introduction to educational research*. Ibadan: Thomas Nelson, 1990.
- [34] S. Olaitan, A. Ali, E. Ejoh, and K. Sowande, *Research skills in education and social sciences*. Owerri: Cape Publishers International Ltd, 2000.
- [35] I. T. Adeleke, A. A. Salami, M. Achinbee, T. C. Anamah, I. B. Zakari, and M. H. Wasagi, "ICT knowledge, utilization and perception among healthcare providers at National Hospital Abuja, Nigeria," *American Journal of Health Research*, vol. 3, pp. 47-53, 2015.
- [36] K. Alwan, A. Awoke, and B. Tilahun, "Knowledge and utilization of computers among health professionals in a developing country: A cross-sectional study," *Journal of Medical Internet Research Hum Factors*, vol. 2, pp. 10-21, 2015.
- [37] B. Kirubel and E. Abetu, "Knowledge and attitude of health professionals toward telemedicine in resource-limited settings: A cross-sectional study in North West Ethiopia," *Journal of Healthcare Engineering*, vol. 30, pp. 1-7, 2018.
- [38] R. Whittemore, S. Jaser, M. Faulkner, K. Murphy, A. Delamater, and M. Grey, "Type1 diabetes e-health psychoeducation: Youth recruitment, participation, and satisfaction," *Journal Med Internet Reserch*, vol. 15, pp. 1-16, 2013.
- [39] M. J. Rho, H.-S. Kim, K.-H. Yoon, and I. Y. Choi, "Compliance patterns and utilization of e-health for glucose monitoring: Standalone internet gateway and tablet device," *Telemedicine and e-Health*, vol. 23, pp. 298-304, 2017.
- [40] L. Rixon, S. P. Hirani, M. Cartwright, M. Beynon, A. Selva, C. Sanders, and S. P. Newman, "What influences withdrawal because of rejection of telehealth—the whole systems demonstrator evaluation," *Journal of Assistive Technologies*, vol. 7, pp. 219-227., 2013.
- [41] U. Sarkar, J. D. Piette, R. Gonzales, D. Lessler, L. D. Chew, B. Reilly, J. Johnson, M. Brunt, J. Huang, and M. Regenstein, "Preferences for self-management support: Findings from a survey of diabetes patients in safety-net health systems," *Patient Education and Counseling*, vol. 70, pp. 102-110, 2008.
- [42] L. Song, K. Tatum, G. Greene, and R. Chen, "e-health literacy and partner involvement in treatment decision making for men with newly diagnosed localized prostate cancer," *Oncol. Nurs. Forum*, vol. 44, pp. 225-233, 2017.
- [43] C. Terschüren, M. Mensing, and O. C. Mekel, "Is telemonitoring an option against shortage of physicians in rural regions? Attitude towards telemedical devices in the North Rhine-Westphalian health survey, Germany," *BMC Health Services Research*, vol. 12, p. 95, 2012. Available at: <https://doi.org/10.1186/1472-6963-12-95>.
- [44] J. Hofstede, J. de Bie, B. Van Wijngaarden, and M. Heijmans, "Knowledge, use and attitude toward eHealth among patients with chronic lung diseases," *International Journal of Medical Informatics*, vol. 83, pp. 967-974, 2014.
- [45] K. Kamis, M. R. Janevic, N. Marinec, R. Jantz, H. Valverde, and J. D. Piette, "A study of mobile phone use among patients with noncommunicable diseases in La Paz, Bolivia: Implications for mHealth research and development," *Globalization and Health*, vol. 11, p. 30, 2015. Available at: <https://doi.org/10.1186/s12992-015-0115-y>.
- [46] H. Anglada-Martínez, M. Rovira-Illamola, M. Martín-Conde, J. M. Sotoca-Momblona, and C. Codina-Jané, "mHealth intervention to improve medication management in chronically ill patients: Analysis of the recruitment process," *Postgraduate Medicine*, vol. 128, pp. 427-431, 2016.

- [47] V. Samiei, S. E. W. Puteh, M. R. A. Manaf, K. A. Latip, and A. Ismail, "Are Malaysian diabetic patients ready to use the new generation of health care service delivery? A telehealth interest assessment," *The Malaysian Journal of Medical Sciences: MJMS*, vol. 23, pp. 44-52, 2016.
- [48] R. Smith, J. Menon, J. G. Rajeev, L. Feinberg, R. K. Kumar, and A. Banerjee, "Potential for the use of mHealth in the management of cardiovascular disease in Kerala: A qualitative study," *BMJ Open*, vol. 5, p. e009367, 2015. Available at: 10.1136/bmjopen-2015-009367.
- [49] C. Drewes, T. Kirkovits, D. Schiltz, T. Schinkoethe, R. Haidinger, U. Goldmann-Posch, N. Harbeck, and R. Wuerstlein, "EHealth acceptance and new media preferences for therapy assistance among breast cancer patients," *JMIR Cancer*, vol. 2, p. e13, 2016. Available at: 10.2196/cancer.5711.
- [50] A. Saied, S. J. Sherry, D. J. Castricone, K. M. Perry, S. C. Katz, and P. Somasundar, "Age-related trends in utilization of the internet and electronic communication devices for coordination of cancer care in elderly patients," *Journal of Geriatric Oncology*, vol. 5, pp. 185-189, 2014.
- [51] S. Goyal, P. P. Morita, P. Picton, E. Seto, A. Zbib, and J. A. Cafazzo, "Uptake of a consumer-focused mHealth application for the assessment and prevention of heart disease: The < 30 days study," *JMIR Health and Health*, vol. 4, p. e32, 2016. Available at: e32, 2016. DOI: 10.2196/mhealth.4730.
- [52] F. Khatun, A. E. Heywood, S. M. A. Hanifi, M. S. Rahman, P. K. Ray, S.-T. Liaw, and A. Bhuiya, "Gender differentials in readiness and use of mHealth services in a rural area of Bangladesh," *BMC Health Services Research*, vol. 17, p. 573, 2017. Available at: <https://doi.org/10.1186/s12913-017-2523-6>.
- [53] G. Saad and T. Gill, "Applications of evolutionary psychology in marketing," *Psychology & Marketing*, vol. 17, pp. 1005-1034, 2000.
- [54] L. Hanberger, J. Ludvigsson, and S. Nordfeldt, "Use of a web 2.0 portal to improve education and communication in young patients with families: Randomized controlled trial," *Journal of Medical Internet Research*, vol. 15, p. e175, 2013. Available at: 10.2196/jmir.2425.
- [55] J. H. Han, N. Sunderland, E. Kendall, O. Gudes, and G. Henniker, "Professional practice and innovation: Chronic disease, geographic location and socioeconomic disadvantage as obstacles to equitable access to e-health," *Health Information Management Journal*, vol. 39, pp. 30-36, 2010.

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