Challenges of Digitisation of Maternal Healthcare in Rural Bayelsa State, Nigeria

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Abstract

Poor level of digitisation of maternal healthcare in hospitals is a major challenge that heightens the rate of maternal mortality among rural women in Bayelsa State. The study explores the role and challenges of digitisation of maternal healthcare in rural Bayelsa State, Nigeria. Survey research design was adopted and the instruments for data collection were in-depth interview and questionnaire. Data from the questionnaire were analyzed using the Statistics for Social Sciences (SPSS), presented in tables. Findings revealed that digitisation in hospitals improve access to maternal healthcare information by rural women and this promotes safe and successful delivery. Further findings showed that poor funding on the part of government, inadequate training of medical personnel and lack of public power supply are some of the challenges of digitisation of maternal healthcare in rural communities. It is recommended among others that local government council and Bayelsa State government to jointly invest in digitalising maternal healthcare in difficult riverine terrain for quick and timely accessibility, provide adequate training of medical staff and minimum user fees can be charged to finance the cost of fuel for mini-generators used by rural healthcare facilities so as to ensure the availability of power supply.

Keywords: *Digitisation and Maternal healthcare*

Introduction

This research seeks to examine the challenges of digitisation of maternal healthcare in rural Bayelsa State, Nigeria. This becomes necessary against the backdrop of the rising rate of maternal healthcare challenges in Nigeria's rural areas over the years. The alarming rate of maternal mortality in rural Bayelsa State is occasioned by poor level of digitisation and the lack of qualified healthcare personnel available in rural communities (Iyaniwura & Yusuf, 2009). As a result, rural women resort to traditional birth attendants, family members and relations for delivery, and this has heightened the rate of maternal mortality. In addition, there are no electronic record-keeping systems where pregnant women have long-waiting hours to be attended to by a healthcare personnel (Hamilton, Brady, Ventura & Stephanie, 2012). All these factors typify the situation in Bayelsa rural communities.

In addition to the poor hospital record system, which is causing a lot of delays (unnecessary queues) for pregnant women during antenatal check-ups, emergency delivery cases where Caesarean Section (CS) is required are not carried out due to the poor level of digitisation and the unavailability of digital technologies (Kamal, 2018). These are leading causes of pregnancy complications and maternal mortality in Nigeria's rural areas. Incidentally, these factors enumerated above seem to reflect the situation in rural communities in Bayelsa State.

More so, inadequate funding on the part of the government is a major challenge to digitisation in healthcare centres in the state (Ochieng & Gichoya, 2013). There are a number of digital technologies required to improve healthcare service delivery, especially maternal healthcare service delivery, but lack of funding on the part of the government has not allowed the provision of such services (Maiurova & Kurniawan, 2022). Insufficient public power supply is also a major challenge to the digitisation of maternal health service delivery in rural communities in Bayelsa State (Iyaniwura & Yusuf, 2009). Regular electricity supply is crucial for digital health implication. In the absence of consistent electricity, the level of digitisation is always low or minimal. Also, poor training of also making it difficult for the utilisation of available digital equipment by medical staff in the healthcare facilities.

In spite of the growing literature on the subject matter, the use of digitisation to advance maternal healthcare in that respect has scarcely been explored. This research, therefore, seeks to contribute to filling this gap in order to advance the frontier on digital transformation and maternal healthcare in rural communities in Bayelsa State, as well as to identify the challenges of digitisation to inform government policies to address them. The research is further guided with the proposition that digitisation of maternal healthcare delivery service promises to reduce maternal mortality in rural communities.

Conceptual Premise

The following concepts form the conceptual thrust of this research. These concepts are digitisation and maternal healthcare. This section therefore explores these concepts with a view to providing their contextual meanings and understanding in this discourse.

Digitisation

Digitisation refer to the application of digital means for service delivery. Digitisation enable the storage, processing, transmission, capturing, and display of information by digital means for effective service delivery (Doron and Jeffrey, 2018). In modern societies, digital technologies are incorporated into almost every activity, including public health, societal planning and political organisations, such as civil society (Jain, 2014). Development and communication theorists have always observed that an increase in technological leap by adopting modern technological techniques would not only modernise the traditional societies but also reform the bureaucracies, including maternal healthcare (Jain, 2014). Digital or electronic means of governance, or e-governance, is the application of technologies by public officials and government to provide information and receive feedback from citizens, external organisations, stakeholders, and elective representatives. The application of digitisation in governance and public policy implementation can provide decision support to public administrators, improve services to citizens, and empower citizens by providing access to information and knowledge (Bhatnagar, 2014).

Digitisation have become the most supportive economic and extensive medium for service delivery and outreach across the world. Digital technologies have become more all-encompassing than the most essential infrastructure across the world. The widespread use of digital technologies has reached an efficient dissemination of maternal healthcare information to even rural communities (Patrick, Griswold, Raab, and Instille, 2008). The use and application of digital technologies and mHealth for service delivery now constitute the primary form of access and exchange of information and contribute to personal and social relationships (Donner, 2008). Nations where mHealth and the application of digital technologies constitute the primary form of access, increased exchange of information on commercial or social services is contributing to developmental goals are changing social relations. Information awareness and user-friendliness through the use of digital technologies have reduced transaction costs in terms of time and money. Digital technologies have transformed daily lives and influenced every sector of public administration and development. In Africa and Nigeria, for instance, the growth of digital technologies has been associated with accessing economic services for poor households, creating opportunities for employment, entertainment and education, and toward social, political, and economic transformation (World Bank, 2012).

The digital revolution may have transformed interpersonal and social relations, but it has not broken gender barriers (Balasubramanian, Thamizoi, Umar and Kanwar, 2010). Despite technological advancement in developing countries, women, especially from rural communities, still face a double disadvantage than the men when in poverty (Hafkin & Taggart, 2001). There are different patterns of digital technologies utilisation across gender. GSMA (2015), in a report on digital technology utilisation gender gap in low and middle-income countries, estimated, that women are 14% less likely to utilise digital technologies than men, creating a gender gap of 200 million fewer women than men accessing digital technologies. Studies on digital technology suggest that wealthier, better educated males are more likely to utilise digital services (Bertot, J. C., Jaeger, P. T., & Grimes, J. M., 2010). Bertot et al, further argued that in some areas, men can

be three times more likely to utilise digital technologies than women in low-income settings; this is because most of the women, especially in rural communities, are not literate; they are unemployed and depend solely on their husband. Martin (2010) similarly argued that women are also less likely to adopt mobile phones and use it for unique purposes such as access to market information or taking photos, for collective organisation, using voice recorder or storing data.

The relationship between digitisation, the community and the individual has become complicated in many communities, including Nigeria. Avgerou (2008) explored this complex relationship within the Nigerian context in order to understand how the application of digital technologies can be used to support maternal health delivery service in various ways. Digitisation can be used to deliver services to the poor and women in rural communities. Privacy was a rare privilege in Nigerian families, affecting courtship practices, marriage relations and kinship ties. Digitisation have changed and challenged the traditional institutions of authority that reinforced the traditional gender roles (Avgerou, 2008).

Almost every country has disparity between rural and urban areas. Healthcare providers and specialists are more likely to be located in densely populated jurisdictions because that is where advanced equipment and hospitals are found. Digital technologies improve service delivery (including maternal health) in many countries, irrespective of the population count in a particular area. In India, for instance, rural dwellers gain access to maternal healthcare far from their hometowns through video conferencing. Using broadband connections, doctors who are geographically remote from patients can still examine them and diagnose particular problems (Nuhu, Artur, Ganesan, and Gordon, 2011). In countries where rural areas lack physicians, this can enable patients in underserved locales to get required medical attention. Also, for rural communities, it is essential electricity and digital technologies be provided as this will reduce certain deficiencies in the use of digital technologies.

Maternal Healthcare

Maternal healthcare is the overall well-being of women at the stage of pregnancy and children below age 5 years (Aluko & Ademiluyi, 2015). It is comprehensive as it includes educational, social, nutritional services as well as medical care during and post pregnancy. A number of reasons have been attributed to why many pregnant and nursing mothers choose not to make use of appropriate antenatal and postnatal care. Some of these are family, cultural, or hereditarily related to the social, economic and political developments. This implies that the natural environment performs critical and powerful functions in healthcare utilisation behaviour of women across African societies. However, family and cultural factors majorly determine healthcare utilisation behaviour of pregnant women in Nigeria in general and Bayelsa State in particular (Aluko & Ademiluyi, 2015).

One of the SDGs' major goal risks is the advancement of the health of pregnant and nursing mothers (maternal health) and reducing maternal and child death by 2030 (Elem & Nyeche, 2016). Inspite of this global devotion, the loss of women's lives as a result of complications during

pregnancy has been on the increase in most Sub-Saharan African countries (Nwokocha, 2008). In Nigeria, for example, maternal mortality is responsible for about 59, 000 deaths of women annually (WHO, 2009). Nigerian women are 500 times prone to lose their lives in childbirth when compared to some of the advanced countries of the world (Owumi, Isiugo-Abanihe, Isamah, & Adeshina, 2002). In addition, Nigeria is rated second after India in global maternal incident rate and the worst in Africa (WHO, 2007). Thus, the occurrence of maternal mortality in Nigeria has become very worrying as every birth procedure becomes a potential incidence, leading to at least one case of maternal mortality in every 20 live births. This confrontation is directly connected to the nation's poor maternal healthcare service delivery system.

The state has an essential role to play in maternal healthcare service delivery. Ladipo (2008) observed that the Nigerian health sector is confronted with the most daunting crisis of maternal mortality, during pregnancy and post-delivery. Ladipo further noted that the Bayelsa State Government, for instance, claims to be spending about 30% to 40% of the state's available resources for healthcare at the point of need of all citizens. The social system therefore cannot function effectively in a different and better way to deliver better healthcare outcomes. It is the duty of the state to effectively address the healthcare needs, including maternal mortality, by adequately utilising the funds allocated for healthcare delivery at all cost. The state is supposed to focus on the key indicators of maternal healthcare, which is primary healthcare. However, despite the allocation of money by the federal government to state governments to tackle maternal healthcare, the reality remains that these funds are not used for the purpose for which they are meant, and as such the pending challenges with the healthcare system are still lingering (Harrison, 2009). It is therefore essential that the healthcare service delivery system at the state level should be devoid of corruption. Money budgeted for maternal healthcare service delivery is siphoned, as well as resources that are meant to lead to effective and efficient delivery of maternal healthcare become illusive in the sector (Harrison, 2009). Primary, secondary and tertiary healthcare therefore should be replicated, most especially in the rural areas of Nigeria, to allow pregnant mothers to have access to digital technologies that will provide quality and affordable healthcare services. In Nigeria in general and Bayelsa State in particular have achieved major successes in reducing maternal mortality, emphasises child health and strengthening control of other pregnancy-related complications. These successes in some states demonstrate that goal 3 of SDGs is indeed achievable with the right application of digital technologies and adequate level of investment.

Methodology

This research employed a survey research design to address the purposes of the research. Collection and analysis of primary and secondary data related to maternal healthcare service delivery in rural Bayelsa State, Nigeria were carried out for this research. Secondary data were collected from information available in the public domain, such as books, journals, internet, library etc. The primary data were collected from key informant interview (KII) and the instrument of the questionnaire administered to rural women in the four LGAs. The research interviewed stakeholders, ranging from doctors, nurses, government officials from the Bayelsa State Ministry of Health and pregnant women. The study further collected data through the instrument of

questionnaire that was administered to rural women only. The population and location of this research were women in rural areas who have experienced pregnancy or child-birth in four local government areas of Bayelsa State, because the four (4) LGAs have the highest recorded cases of maternal mortality. The data collected from the field were presented using tables and simple percentages. Descriptive statistics was used to explain and analyse the research propositions regarding whether digitisation of maternal healthcare service delivery has improved maternal healthcare service delivery in rural Bayelsa State.

Theoretical Framework

The key ideas of the 'rational choice theory' (RCT) can be traced back to the writings of moral philosophers such as Adam Smith. The thrust of the RCT was consequently developed by what is now referred to as neo-classical economics. The purpose of the RCT is to explain social events or phenomena by assuming rational choice at the actor's level (Coleman, 1990; Hechter and Kanazawa, 1997). Two procedures were analysed in this study to explain how the purpose of rational choice theory can be used to explain a social phenomenon or problem: first is the choice by actors and the macro-micro-macro change. rational choice theory presupposes that an actor chooses an alternative that he/she believes brings about a social outcome that maximises his/her interest under independently conceived constraint.

Coleman (1990) identified three (3) assumptions of the Rational Choice Theory, which are:

i. Individuals have selfish interest or preferences;
ii. They maximise their own utility; and
iii. They act independently based on full information.

Following the assumption of the RCT, rural women in Bayelsa State are constrained by the preferences and selfish interests of politicians. The purpose is to maximise their personal usefulness based on the information, power and resources they have at their disposal. While the choices of the politicians favour themselves, rural women continue to suffer from poor maternal healthcare service delivery in the rural Bayelsa State. In addition, the absence of digitisation in rural Bayelsa State has contributed immensely to poor maternal health services delivery and out-of-health facility delivery in rural communities. The preferences and interests of politicians denote the positive or negative outcome of an action. Political actors in the society have different choices, i.e. either to concentrate on the delivery of maternal health service to women or to focus on other social issues like provision of water supply, construction of road and building of schools. The theory presupposes that, if there are alternatives for a politician to make a choice, he/she sees that choice as being rational

Results and Analysis

The results and summary of the findings from the instrument of the questionnaire administered to rural women of reproductive age in four (4) local government areas and the data collected using semi-structured interviews with stakeholders in the health sector ranging from doctors, nurses, pregnant women and government officials from the Bayelsa State Ministry of Health are presented.

To establish or refute the relationship between digitisation and maternal health service delivery in rural Bayelsa State, respondents were asked to respond to twelve (12) questions based on their knowledge of how the accessibility and utilisation of digital technologies in hospitals have improved maternal health service delivery in rural Bayelsa State. The analysis presented key issues related to the well-being of pregnant women in rural communities. These issues include maternal healthcare information, online appointments, adequate power supply, online outside consultations, regular pregnancy scan and general application of digital technologies for maternal healthcare service delivery. Other issues include the availability of primary health care facilities, issues of funding, training and public power supply, as well as factors that impede the successful digitisation of maternal healthcare service delivery in rural Bayelsa State. The summary of respondents' reactions is shown in table 1 and 2.

Table 1. The Relationship between Digitisation and Maternal Healthcare Service Delivery

Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), Strongly Agree
n=367

Variables	SD (*f*-%)	D (*f*-%)	U (*f*-%)	A (*f*-%)	SA (*f*-%)	Mean	Std. Deviation
Digitisation help pregnant women to connect with doctors through mobile apps	27(7.4%)	180(49.6%)	26(7.1%)	129(35.1%)	5(1.4%)	2.7411	1.06151
Digitisation increase safe and successful delivery of pregnant women	5(1.4%)	6(1.6%)	4(1.1%)	213(58.0%)	139(37.9%)	4.2943	0.70171
Digitisation aid maternal health delivery service more effectively and efficiently	4(1.1%)	4(1.1%)	4(1.1%)	310(84.5%)	45(12.3%)	4.0572	0.52218
Digitisation help pregnant women access maternal health care information	13(3.5%)	13(3.5%)	19(5.2%)	210(57.2%)	112(30.5%)	4.0763	0.90213
Digitisation help support pregnancy scan for pregnant women	1(0.3%)	13(3.5%)	3(0.8%)	183(49.9%)	167(45.5%)	4.3678	0.70389
Mobile apps are used to access maternal health care information	16(4.4%)	76(20.7%)	64(17.4%)	183(49.9%)	28(7.6%)	3.3569	1.02993
There are outside consultation online for maternal health delivery service	14(3.8%)	178(48.5%)	96(26.2%)	72(19.6%)	7(1.9%)	2.673	0.89742
There are adequate digital infrastructures for maternal health care	23(6.3%)	123(34.1%)	18(4.9%)	111(30.2%)	90(24.5%)	3.327	1.33138

Digital resources are lacking where you go for your maternal health care	0(0.0%)	21(5.7%)	15(4.1%)	260(70.8%)	71(19.3%)	4.0381	0.68046
There is adequate power supply where you go for your maternal health care	22(6.0%)	105(28.6%)	15(13.9%)	99(27.0%)	90(24.5%)	3.3542	1.2867
You are able to book appointment through email for your maternal health care	29(7.9%)	132(36.0%)	18(4.9%)	103(28.1%)	85(23.2%)	3.2262	1.35525
You receive text messages and phone calls for your maternal health care	14(3.8%)	131(35.7%)	29(7.9%)	170(46.3%)	23(6.3%)	3.1553	1.09663

Source: Field Work, 2024

Table 1 shows the frequency, percentage, mean, and standard deviation to understand the nexus between digitisation in hospitals and maternal health service delivery in rural communities in Bayelsa State. The study revealed that the majority 180(49.0%), of the respondents disagreed that pregnant women in rural communities connect with doctors through charts, audio, and mobile apps. The reason for this is probably the low coverage of teledensity in the area and the inability of some rural women to acquire mobile phones. However, 129(35.1%), agreed that they can connect with doctors through digital technologies. Similarly, 27(7.4%) strongly disagree, 26(7.1%) undecided and only 5(1.4%) strongly agree. Overall, the result is supported by (mean = 2.7411, std = 1.06151). It was further revealed that the majority, 213(58.0%), of the respondents agreed that digitisation in hospitals increases the safe and successful delivery of pregnant women (mean = 4.2943, std = 0.70171). Also, 139(37.9%) strongly agreed, 6(1.6%) of the respondents disagreed, 5(1.4%) strongly disagreed, and only 4(1.1%) of the respondents were unsure about the opinion.

On effectiveness and efficiency, the study shows that most of the respondents, 310(84.5%), agreed, and also 45(12.3%), strongly agree of the opinion that digitisation in hospitals aids more effective and efficient delivery of maternal healthcare services (mean = 4.0572, std = 0.52218). However, only a few respondents, 4(1.1%) strongly disagree; 4(1.1%), disagreed and 4(1.1%), undecided. The results further revealed that the majority of the respondents, 210(57.2%), agreed, and 112(30.5%), strongly agreed with the opinion that digitisation in hospitals helps pregnant women in rural communities to access maternal healthcare information (mean = 4.0763, std = 0.90213). However, 19(5.2%) of the respondents were undecided, 13(3.5%) strongly disagreed, and 13(3.5%) disagreed.

On pregnancy scan, the study result showed that the majority, 183(49.9%), of the respondents agreed that digitisation in hospital helps women to undergo pregnancy scans for complications (mean = 4.3678, std = 0.70389). Also, 167(45.5%) of the respondents strongly agreed with the opinion. However, other respondents 13(3.5%) disagreed, 3(0.8%) were undecided, and 1(0.3%) strongly disagreed. The table also clearly shows that most of the respondents, 183(49.9%), agreed that mobile apps are used to access maternal healthcare information in rural communities (mean = 3.3569, std = 1.02993). While 76(20.7%) of the respondents disagreed, 64(17.4%) were undecided, 28(7.6%) agreed, and only 16(4.4%) of the respondents strongly disagreed with the opinion.

On online consultations, the study revealed that most of the respondents, 178(48.5%) disagreed that there were outside hospital consultations where they booked for their maternal health care (mean = 2.673, std = 0.89742). Notwithstanding, 96(26.2%) of the respondents were unsure about their opinion. However, a number of the respondents, 72(19.6%), agreed; 14(3.8%) disagreed, and 17(1.9%) strongly disagreed. The disparity in the opinion is perhaps due to the different experiences with hospitals where pregnant women book for their maternal healthcare.

On digital infrastructures, the study found that the majority of the respondents, 125(34.1%), disagreed that digital infrastructures are adequate in the hospital where they book for their antenatal healthcare (mean = 3.327, std = 1.33138). However, several respondents, 111(30.2%), agreed that there are adequate digital infrastructure. Similarly, 90(24.5%) strongly disagreed, 23(6.3%)

strongly agreed, and only 18(4.9) were undecided. Also, the table revealed that most of the respondents, 260(70.8%) agree that digital resources are lacking in the hospitals where they book their maternal healthcare (mean = 4.0381, std = 0.68046). Similarly, 71(19.3) strongly agreed with the earlier opinion. However, 21(5.7%) of the respondents disagreed, and 15(4.1%) were not sure of their opinion. In addition, the study revealed that majority of the respondents, 105(28.6%) disagreed that there is adequate power supply in the hospitals where they book their maternal healthcare service (mean = 3.3542, std = 1.2867). While 99(27.0%) of the respondents agreed with the opinion, 90(24.5%) strongly disagreed. Similarly, 51(13.9%) were not sure, and 22(6.0%) strongly disagreed.

On email appointments, the study revealed that the majority of the respondents, 132(36.0%), disagreed that they are able to book hospital appointments through email (mean = 3.2262, std = 1.35525). However, a number of the respondents, 103(28.1%) agreed that emails are used to book hospital appointments. Similarly, while 85(23.2) strongly agreed with the opinion, 29(7.9%) strongly disagreed, and only 18(4.9%) were not sure of the opinion.

Finally, on text messages and phone calls, the study showed that most of the respondents, 170(46.3%), receive text messages or phone calls as a reminder for their maternal healthcare. While 131(35.7%) disagreed, 29(7.9%) were not sure, 23(6.3%) strongly agreed and only 14(3.8%) strongly disagreed.

The quantitative data presented in table 1 above were corroborated by the qualitative data generated through interview. One of the respondents, Ayo James, a medical doctor at Comprehensive Health Centre, Okoloba in Kolokuma LGA, stated that:

> Well, in rural communities, both primary and tertiary health care facilities we work in synergy because not all the necessary technologies/equipment are available in one facility. In most cases, referrals are given to enable the patient to receive effective health care in another facility. To be sincere, this is a primary health care facility. We just have a few technologies, but this has no doubt improved health care delivery service to pregnant women (James, male, 45 years).

Another respondent, Grace Etim, a nurse in the Comprehensive Primary Health Centre, Okoloba, further posited that:

> This is a primary healthcare facility and we don't have adequate digital technologies; this is because the healthcare facility is located in a rural community. However, we have enjoyed digitisation in other tertiary health care facilities that have drastically reduced maternal mortality. I know for sure that with digitisation, there is always timely intervention in most of our pregnancy-related complications. Not only maternal healthcare, but with digitisation, healthcare in general has improved (Grace, 27 years).

One of the respondents, Orusa Timipah, a pregnant woman who was currently attending antenatal service at Comprehensive Health Centre, Oporoma, has this to say:

> As you can see, I am four (4) months pregnant, and I attend this primary health, care for my antenatal care because it is close to my community. The distance from here to other hospitals is a bit far and due to the difficult environment, I cannot easily travel for my pregnancy check-ups. My experience so far is hospital uses computers for my records, and it reduces queues and blood pressure machines to know my blood pressure. I remember when I had some complications, I was referred to another hospital for a scan because there were no scanners. But with the few services using technologies, it has helped my pregnancy, and I am very happy. I just pray that all the other machines that are not available should be provided (Timipah, female, 37 years).

A staff of the Bayelsa State Ministry of Health has this to say:

> Using technologies for maternal health care in rural communities is very essential. In all government policies related to health care, we have encouraged the application of digital technologies. Succeeding governments are trying their best, but it is still not enough. The level of digitisation in the urban and rural areas is not the same. There is a low level of digitisation in rural area, perhaps because there is little competition. But in the urban centres, the level of digitisation is moderate. While the rate of maternal mortality has drastically dropped as a result of using technologies for health care, I advise that the government will redouble their efforts to ensure that the adequate required technologies are provided in the available health care facilities in rural communities.

These respondents have expressed their views about the level of digitisation in hospitals and how digital technologies have improved maternal health service delivery in rural communities. While the level of digitisation in some healthcare facilities is not adequate, especially the primary healthcare service providers, maternal healthcare services are accessed from other healthcare facilities with a certain level of digitisation. It is crystal clear that with digitisation in hospitals, healthcare services, including maternal healthcare service delivery, will be more effective and efficient.

Table 2. Challenges of Digitisation of Maternal Healthcare Service Delivery in rural Bayelsa State
Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), Strongly Agree
n=367

Variables	SD (*f*-%)	D (*f*-%)	U (*f*-%)	A (*f*-%)	SA (*f*-%)	Mean	Std. Deviation
There is a primary health care facility in your community for your maternal health care	4(1.1%)	19(5.2%)	2(5%)	308(83.9%)	34(9.3%)	4.6485	0.47809
Inadequate funding is a problems for digitisation in rural communities	2(5%)	22(6.0%)	26(7.1%)	200(54.5%)	117(31.9%)	4.5967	0.51299
The State government support digitation for maternal health delivery service	3(8%)	10(2.7%)	26(7.1%)	191(52.0%)	137(37.0%)	4.6594	2.16935
There are enough digital facilities in the hospital where you go for your maternal health care	26(7.6%)	170(46.3%)	73(19.9%)	70(19.1%)	26(7.1%)	4.6267	0.51708
You experience poor network concerns where you go for your maternal health care	5(1.4%)	16(4.4%)	68(18.5%)	246(67.0%)	32(8.7%)	4.6676	0.51066
Medical personnel have sufficient knowledge on how to use digital technologies for maternal health care	17(4.6%)	37(10.1%)	224(61.0%)	69(18.8%)	20(5.4%)	4.6921	0.48532
There is adequate staff training on digitisation in the hospital where you go for your maternal health care	18(4.9%)	57(15.5%)	156(42.5%)	126(34.3%)	10(2.7%)	4.5913	0.52970
You experience unstable power supply or failure in the hospital where you go for your maternal health care	0(0%)	38(10.4%)	17(4.6%)	253(68.9%)	59(16.1%)	4.6594	0.50793
Lack of digitisation in the hospital is as a result of high cost of digital technologies	7(1.9%)	58(15.8%)	106(28.9%)	115(31.3%)	80(21.8%)	4.6894	0.46338
You are comfortable with the digital technology utilisation policies in the hospital where you go for your maternal health care	8(2.2%)	59(16.1%)	26(7.1%)	215(58.6%)	58(15.8%)	4.6621	0.50165
Digitisation breach on pregnant women's right on privacy and confidentiality	11(3.0%)	85(23.2%)	83(22.6%)	127(34.6%)	61(16.6%)	4.7330	0.44914

Corruption is making it difficult for politicians to support digitisation in hospitals in rural communities	0(0%)	8(2.2%)	9(2.5%)	111(30.2 %)	239(65.1 %)	4.7302	0.48557

Source: Field Work, 2024

Table 2 shows the challenges of digitisation to maternal service health delivery in rural communities in Bayelsa State. The results of the study revealed that the majority of the respondents, 308(83.9%) agreed, supported by 34(9.3%) who also strongly agreed that there are primary health care facilities in the communities for their maternal health service delivery (mean = 4.6485, std = 0.47809). However, 19(5.2%) disagreed, and 4(1.1%) strongly disagreed with the view, and only 2(5%) were not sure of the opinion.

In terms of funding, the results of the study showed that most of the respondents, 200(54.5%), agreed, and 117(31.9%) strongly agreed that inadequate funding is a problem of digitisation in rural communities (mean = 4.5967, std = 0.51299). While 26(7.1%) were not sure of the view, 22(6.0%) disagreed, and only 2(5%) strongly disagreed with the opinion. On the state government support for digitisation, the results of the study further revealed that the majority of the respondents, 191(52.0%) agreed, and 137(37.0%) strongly agreed that the state government supports digitisation in hospitals for maternal health service delivery (mean = 4.6594, std = 2.16935). While 26(7.1%) were not certain of the opinion, 10(2.7%) disagreed, and 3(8%) strongly disagreed.

Furthermore, the results showed that most of the respondents, 170(46.3%), disagreed that there are enough digital facilities in the hospital where they book their maternal health service delivery (mean = 4.6267, std = 0.51708). While 73(19.9%) were not sure of the opinion, 70(19.1%) agreed, 26(7.1%) strongly agreed, and 26(7.1%) strongly disagreed. On poor network concerns, most of the respondents, 246(67.0%) agreed that they experience poor network where they go for their maternal health service delivery (mean = 4.6676, std = 0.51066). While 68(18.5) were not sure of the opinion, 32(8.7%) strongly agreed, 16(4.4%) disagreed, and 5(1.4%) strongly disagreed.

The study further revealed that most of the respondents, 253(68.9%), agreed, and 59(16.1%) strongly agreed that pregnant women experience unstable power supply or failure in the hospitals where they book for their maternal health service delivery (mean = 4.6594, std = 0.50793). While 38(10.4%) disagreed with the view, 17(4.6%) were not certain about the opinion, and none strongly disagreed with the view. On the cost of digital technologies, the results of the study further revealed that majority of the respondents, 115(31.3%), agreed that lack of digitisation in hospitals is as a result of high cost of digital technologies (mean = 4.6894, std = 0.46338). While 106(28.9%) were not sure of the opinion, 80(21.8%) strongly agreed, 58(15.8%) disagreed, and only 8(2.2%) strongly disagreed.

In addition, on digital technology utilisation, the result of the study showed that most of the respondents, 215(58.6%), agreed that pregnant women were comfortable with the digital technology utilisation polices in the hospital where pregnant women book for their maternal health service delivery (mean = 4.6621, std = 0.60125). Also, 58(15.8%) strongly agreed with the view. However, 59(16.1%) disagreed, 8(2.2%) strongly disagreed, and 26(7.1%) were not sure of the view. More so, the study further revealed that most of the respondents, 127(34.6%), agreed that digitisation breaches pregnant women's right to privacy and confidentiality (mean = 4.7330, std = 0.44914). While some of the respondents, 85(23.2%) disagreed with the view, 83(22.6%) were not certain about the opinion, 61(16.6%) strongly agreed, and only 11(3.0%) strongly disagreed with

the view. Finally, in terms of corruption, the result of the study revealed that the majority of the respondents, 239(65.1%), strongly agreed, and 111(30.7%) agreed that corruption is making it difficult for politicians to support digitisation in hospital in rural communities (mean = 4.7302, std = 0.48557). While 9(2.5%) were not sure of the opinion, 8(2.2%) disagreed, and none strongly disagreed.

The quantitative data presented in table 2 were also supported by qualitative data generated through interviews with stakeholders. Respondents were asked in their opinion to identify some of the challenges of digitisation in rural communities in Bayelsa State. One of the respondents, a medical doctor at General Hospital Nembe, in Nembe LGA, stated that:

> There are several challenges, like limited knowledge and manpower, inadequate training and resources, and funding. These are basic challenges in both the tertiary and primary healthcare systems in the State. Even the healthcare facilities that have some of these technologies, the technical know-how, or not everyone knows how to use digital technologies. If these salient issues can be handled, I am sure healthcare services will also improve (Ayo, male, 35 years).

Another respondent, a nurse at General Hospital, Amassoma, in Southern Ijaw LGA, posited that:

> Well, as a nurse, I noticed that the computers are not adequate; how can you have only one or two computers in a facility? This is not enough for effective services. Another problem is the issue of maintenance, poor electricity, etc. Imagine you want to undergo a surgery, and there is not electricity; this could lead to the death of patients. There is a need to provide adequate technologies and have a maintenance culture, am sure healthcare services will be better than the way it is (Ebi, female, 29 years).

Similarly, another respondent, a pregnant woman, stated that:

> Some of the challenges I have experienced, particularly in this facility is lack of ICT manpower, inadequate training, and retraining of staff. For example, sometimes, when you come for your antenatal care and perhaps you need a scan for any complication or any other digital services, I noticed that only one or two people are responsible for such services. Once such staff is not in the hospital, you cannot be attended to on time. Everyone knows that most of these technologies are innovations, and most staff do not have any idea or experience and this requires training in order for pregnant women to have better services (Ayibakie, female, 37 years).

From the Bayelsa State Ministry of Health, one of the respondents stated that:

> There are so many challenges to digitisation of maternal health delivery services, especially in rural communities. Poor implementation of health care policies on the part of the government, inadequate funding, lack of infrastructure, and costs of some of these digital technologies. In some cases, when these technologies are acquired, we do not have the technical know-how to even fix them, let alone using them. The

> services of expertise abroad in this case is always required for such services. Digitisation I believe, is a gradual process, and I hope that someday these challenges will be a thing of the past (Ebitimi, male, 48 years).

Data have revealed that there are myriads of challenges in the Bayelsa State health sector. Some of the challenges identified include knowledge manpower, funding on the part of the government, training and retraining of staff, poor electricity supply, lack of resources, lack of maintenance culture, etc.

This research was predicated on the assumptions that digitisation of maternal healthcare service delivery has the capacity to reduce maternal mortality. Findings revealed that digitisation in hospitals in rural Bayelsa State contribute significantly to maternal healthcare delivery service. This is in the area of access to maternal healthcare information, foster safe and successful delivery and ensure effectiveness and efficiency. All these exemplify the assertion that digitisation in hospital contribute or reduce maternal mortality in rural Bayelsa State.

Discussion of findings

This section mainly focuses on the discussion of findings of the research. This is done based on the objectives of this research.

The Impact of Digitisation on Maternal Healthcare Service Delivery in Rural Bayelsa State

The first objective of this study was to find out the impact of digitisation on maternal health service delivery in rural communities in Bayelsa State. It is interesting to note that some of the respondents affirm that digitisation in hospitals brings about safe and successful delivery during pregnancy. Based on the findings, participants revealed that digitisation has empowered patients and pregnant women, even in rural communities, to access quality maternal health service delivery. However, since many rural communities are hard to reach, occasioned by the extensive riverine terrain, some women resort to patronising traditional birth attendants for care during pregnancy, including delivery, and this is one of the causes of maternal mortality in rural communities. It was found that with digitisation, when there is an emergency or pregnancy complication, intervention is easily accessible and timely, such as referrals to other hospitals in the interest of both mother and baby. CS carried out in hospitals upon being referred enables healthcare providers to secure the lives of both mother and baby, thereby fostering the safe and successful delivery of pregnant women. This finding is in agreement with Ramachandran, D. (2010), who posited that insufficient access to healthcare technologies (digitisation) has been recognised as an underlying cause of poor quality of childbirth care and is linked with increased risks of adverse health outcomes, leading to the high rate of maternal mortality in remote areas. It is therefore possible to state that digitisation in hospitals aids safe and successful delivery of pregnant women in rural communities in Bayelsa State.

The findings showed that digitisation in hospitals provides maternal healthcare information to rural women. This is evident in this study, as most of the respondents expressed how maternal healthcare

information related to prenatal, antenatal, and postnatal care is disseminated to rural women through various means in order to improve antenatal visits. It was found that digital technologies are creating opportunities for rural women to access maternal healthcare information and providing other forms of support throughout the maternity journey. It is essential to note that the affordability and utilisation of smartphones in the state where maternal healthcare information is disseminated through images, videos, text messages, and voice notes to rural women increase the number of antenatal visits for maternal healthcare check-ups. In addition, some healthcare providers are using the National Youth Service Corp (NYSC) members to embark on awareness campaigns in rural communities emphasising the importance of antenatal services. This has no doubt created awareness and increased antenatal visits for better maternal healthcare service delivery. The increase in regular antenatal visits by pregnant women in rural communities to hospitals is in line with a study conducted by Iyaniwura and Yussuf (2009), who reported that access to quality maternal healthcare information is essential towards successful delivery by pregnant women who undergo check-ups in hospitals. This factor is one of the underlying elements relating to the increase in maternal healthcare service delivery, thereby reducing maternal mortality in rural communities.

The result of the study revealed that digitisation in hospitals enables maternal health service delivery to be more effective and efficient. This finding aligns with the view of Jones and Williams (2021) that digitisation in hospitals enables effective maternal health service delivery and more individualised service to pregnant women. In this study, the participant narrated that as a pregnant woman who lives in a rural community, She can easily use the available service from any place and at any time without any problem. One of the respondents stated that, instead of long waiting hours for her antenatal check-ups, the access and presence of hospital records for management of patients with digitisation enable maternal health services to be more effective and efficient for her. Burton, Akhlagh, Pour, Ayre, Barde, Starts, and Sullivan (2020) also maintained that with digitisation, pregnant women in rural communities are able to communicate with doctors through mobile apps like WhatsApp, Facebook Messenger, etc. Community healthcare workers are also going from door to door to know patients'/pregnant women's medical records for effective service delivery. According to Davenport, T., and Kalakota, R. (2019). digitisation in hospitals enables easy access to healthcare services and improves maternal health service delivery performance levels, thereby making it more effective and efficient. It is essential to note therefore, that digitisation in hospitals makes maternal health service delivery more effective and efficient.

Challenges of Digitisation of Maternal Healthcare Service Delivery in Rural Bayelsa State

The second objective of this study was to identify the challenges of digitisation of maternal health service delivery in rural communities in Bayelsa State. Findings of the study revealed that inadequate funding on the part of the government is a major challenge to digitisation in healthcare centres in the state. There are a number of digital technologies required to improve healthcare service delivery, especially maternal health service delivery, but lack of funding on the part of the government has not allowed the provision of such equipment. For example, Cottage Hospital Ebedebiri in Sagbama Local Government Area and Cottage Hospital Oporoma in Southern Ijaw Local Government Area lack equipment like computers for maternal health service delivery. This observation is also in line with a study carried out by White, Ribbon, and Alliance (2011), where they posited that Bayelsa State had one of the lowest state budgets on healthcare in Nigeria, and the lack of adequate funding for the health sector remains the key issue resulting in the low quality of maternal health service delivery. In addition, Thomson, Dykes, Singh, Cawley, and Dey (2012) also agreed with the finding that corrupt leaders are misusing allocation (less down than 5%) of funds in the healthcare system. The misuse of funds is the result of the level of corruption, thereby bringing about poor maternal health service delivery.

Inadequate public power supply is also a major challenge to the digitisation of maternal health service delivery in rural communities in Bayelsa State. Regular electricity supply is crucial for digital health implication. In the absence of electricity, the level of digitisation is always low or minimal. The study found that the state of electricity generation, transmission, distribution, and utilisation continues to be a challenge in the health sector, which would have positively contributed to the deployment of digital technologies in maternal health service delivery. This finding is also in line with Ravindran (2012), who stated that lack of steady power supply has caused poor maternal health service delivery in the state. It can be concluded that inadequate power supply and diversion of public funds, coupled with their limited provision, have remained challenges to the digitisation of maternal health service delivery in rural areas of Bayelsa State.

Conclusion and Recommendations

This research aimed to find the challenges of digitisation of maternal healthcare service delivery in rural Bayelsa State, Nigeria. Based on the quantitative and qualitative analysis, there is a high possibility that the digitisation of maternal healthcare in rural Bayelsa State has the capacity to improve and contribute to maternal healthcare service delivery in rural communities. Despite the difficult, hard-to-reach or riverine terrain, inadequate public power supply, and insufficient health care infrastructures in the state, there is a huge promise that adequate government investment on digitisation of maternal healthcare will enable or support the provision of digital technologies in rural communities to improve maternal healthcare service delivery and reduce maternal mortality in order to save mothers and children. At this juncture, the following recommendations are essential to deepen the digitisation of maternal healthcare service delivery. Local government council and Bayelsa State government to jointly invest in digitalising maternal healthcare in difficult riverine terrain for quick and timely accessibility, provide adequate training of medical staff and minimum user fees can be charged to finance the cost of fuel for mini-generators used by rural healthcare facilities so as to ensure the availability of power supply.

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