

Exploring Determinants of Pregnant Women's Acceptance of M-Health Applications for Antenatal Care: A Case Study in Nigeria

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Abstract

This study explores the determinants of pregnant women's acceptance of m-Health applications for antenatal care in Northeastern Nigeria. Despite the transformative potential of m-Health technologies to enhance maternal health by providing real-time information, symptom tracking, and personalized care, their adoption remains limited, particularly in rural and underserved regions. Using a mixed-methods approach, this study combined quantitative surveys with qualitative interviews, gathering data from 250 pregnant women and 50 community health workers (CHWs). The study examined key factors influencing acceptance, including socio-demographic variables (age, education, income), privacy concerns, trust in technology, and technological barriers such as internet access and mobile device availability. The findings reveal that younger, educated women with better access to mobile technology were more likely to adopt m-Health applications. However, significant barriers such as privacy concerns, low trust in technology, and limited infrastructure in rural areas hindered broader adoption. Additionally, healthcare provider endorsements were found to play a crucial role in increasing acceptance. This research underscores the need for user-friendly, secure, culturally sensitive, and affordable m-Health applications, along with targeted digital literacy programs and improved infrastructure, to enhance antenatal care and reduce maternal mortality in Nigeria. The study contributes valuable insights for healthcare providers, policy makers, and m-Health developers to tailor interventions that can effectively improve maternal health outcomes through mobile technology in resource-constrained settings.

Keywords— *Mobile Health, m-Health Applications, Maternal Health, Antenatal Care, Technology Adoption, Rural Health*

I.INTRODUCTION

Maternal health remains a critical issue in Nigeria, with the country having one of the highest maternal mortality rates in the world. According to the World Health Organization (WHO), Nigeria accounts for about 23% of global maternal deaths, with an estimated 58,000 maternal deaths annually (WHO, 2023). The primary causes of maternal mortality in Nigeria include complications during childbirth, postpartum hemorrhage, pre-eclampsia, and lack of access to quality healthcare services, especially in rural areas. While there has been progress in certain regions, the disparities in healthcare access and quality of care between urban and rural areas remain a significant challenge (Choudhury et al., 2021). The need for innovative healthcare solutions that can bridge this gap is more pressing than ever.

In response to these challenges, mobile health (m-Health) applications have emerged as a promising tool to enhance antenatal care and maternal health outcomes. These applications offer pregnant women the ability to track their pregnancy, receive real-time health information, access symptom management tips, and receive personalized care advice, all of which can help prevent complications and improve health outcomes (Mbunge & Sibiya, 2024). However, despite the potential of m-Health, its adoption remains limited, particularly among pregnant women in regions with inadequate healthcare infrastructure, such as Northeastern Nigeria

While several studies have demonstrated the benefits of m-Health applications in improving healthcare outcomes globally, limited research has focused specifically on understanding pregnant women's acceptance of these technologies in the Nigerian context. Previous studies have primarily explored the general adoption of m-Health applications without addressing the unique factors that may influence their use among pregnant women (Tawfiq et al., 2023). Moreover, research on socio-demographic factors, such as age, education, and urban-rural location, along with privacy concerns and trust in technology, remains sparse in relation to antenatal care in Nigeria.

This research aims to fill this gap by exploring the determinants of pregnant women's acceptance of m-Health applications for antenatal care in Northeastern Nigeria. Specifically, the study seeks to examine how socio-demographic factors, privacy concerns, trust in technology, and technological barriers (e.g., access to mobile devices and internet connectivity) influence

women's willingness to adopt these tools for managing their pregnancy. Understanding these factors is crucial for developing culturally appropriate, user-friendly, and secure m-Health applications that can enhance maternal health in Nigeria.

A. Problem Background

Maternal health in Nigeria continues to be a critical challenge, with the country recording one of the highest maternal mortality rates globally. According to the World Health Organization (WHO), Nigeria accounted for 23% of global maternal deaths in 2019, with an estimated 58,000 maternal deaths annually (WHO, 2023). The primary causes of maternal mortality in Nigeria include complications such as postpartum hemorrhage, severe pre-eclampsia, and obstructed labor, often exacerbated by inadequate healthcare infrastructure, especially in rural (Omwaleola Akinwaare & Osagimo, 2025). Additionally, poor access to skilled healthcare workers and the lack of timely medical interventions are significant contributors to these preventable deaths.

While Nigeria has made some progress in improving maternal health, the disparities between urban and rural areas remain stark. In rural regions, pregnant women often face limited access to healthcare facilities, insufficient transportation, and a shortage of skilled birth attendants, which severely impacts their health outcomes (Udenigwe et al., 2022). This uneven distribution of healthcare resources and the barriers to accessing quality care significantly contribute to high maternal mortality rates in the country.

Mobile health (m-Health) applications present an innovative solution to address these challenges. By leveraging mobile technology, m-Health applications can provide timely information, health monitoring tools, and reminders for essential antenatal care visits, all of which can significantly improve pregnancy outcomes. These applications offer pregnant women easy access to symptom tracking, health advice, and personalized care, thereby helping to reduce the risk of complications through early intervention and continuous monitoring (Mbunge & Sibiya, 2024).

However, despite the potential benefits of m-Health technologies, their adoption remains low in Nigeria, especially among pregnant women in rural and underserved regions. Several factors,

including privacy concerns, trust in technology, socio-demographic influences, and technological barriers, hinder widespread use. To address these challenges, it is crucial to understand the determinants that influence pregnant women's acceptance of m-Health applications, particularly in the context of Nigeria's unique socio-economic and cultural landscape.

While there has been growing interest in the use of mobile health technologies for improving maternal healthcare, there is a significant gap in research focusing on the acceptance of m-Health applications among pregnant women in Nigeria. Existing studies often focus on general mobile health usage without exploring the specific factors that affect pregnant women's adoption of these technologies for antenatal care (Tawfiq et al., 2023). Moreover, little research has been done on how socio-demographic factors such as age, education level, and urban-rural divide influence acceptance.

Further, while privacy concerns and trust in technology are often cited as barriers to mobile health adoption globally (Tovino, 2020), few studies have explored how these concerns specifically affect Nigerian pregnant women's willingness to adopt m-Health applications. Additionally, technological barriers, such as internet access and smartphone availability, are often underexplored, particularly in rural areas where digital infrastructure is lacking. This study aims to fill these gaps by exploring the determinants of pregnant women's acceptance of m-Health applications for antenatal care, focusing on the role of socio-demographic characteristics, privacy concerns, and technological access.

This research is highly relevant for improving maternal care in Nigeria, where maternal mortality remains a pressing public health issue. By identifying and understanding the determinants of m-Health acceptance, the findings can guide the development of more accessible, culturally relevant, and user-friendly m-Health applications tailored to the specific needs of Nigerian pregnant women. Given the digital divide and socio-economic disparities in the country, this study will also provide insights into how to overcome technological and cultural barriers to improve healthcare delivery and ultimately reduce maternal mortality.

Moreover, this research will contribute to the growing body of knowledge on the role of mobile health in maternal healthcare in low- and middle-income countries. By focusing on Nigeria, this study offers valuable insights that can inform

policy interventions, healthcare strategies, and technology development aimed at enhancing maternal health outcomes through innovative digital solutions.

B. Aim and Objectives

The primary aim of this study is to explore the determinants of pregnant women's acceptance of m-Health applications for antenatal care in Nigeria. The specific objectives of the study include:

- 1) To examine the factors influencing pregnant women's intention to use m-Health applications for antenatal care, focusing on Effort Expectancy and Performance Expectancy.
- 2) To assess the impact of socio-demographic factors (e.g., age, education, income, technological literacy) on the adoption of m-Health applications among pregnant women in Nigeria.
- 3) To explore the role of privacy concerns, trust in technology, and social influences (e.g., family and healthcare providers) on pregnant women's acceptance of m-Health applications for antenatal care.

C. Main Research Question

What are the key factors that hinder pregnant women's acceptance and adoption of m-Health applications for antenatal care in Nigeria? The research questions of the study are:

- 1) What are the barriers preventing pregnant women from using m-Health applications for antenatal care, particularly in relation to Effort Expectancy and Performance Expectancy?
- 2) How do socio-demographic factors such as age, education, income, and technological literacy affect the adoption of m-Health applications among pregnant women in Nigeria?
- 3) How do privacy concerns, trust in technology, and social influences (e.g., family and healthcare providers) affect pregnant women's acceptance of m-Health applications for antenatal care?

D. Scope and Duration

This study initially aimed to explore the factors influencing pregnant women's acceptance and

adoption of m-Health applications for antenatal care in Northeastern Nigeria, specifically targeting regions with challenges related to healthcare access, mobile technology usage, and socio-cultural factors. The study was intended to include pregnant women and community health workers (CHWs) from states such as Bauchi, Borno, Yobe, Adamawa, Taraba, and Gombe. However, due to financial constraints, the scope was limited to Yobe State, a region with a diverse population and both urban and rural areas facing distinct challenges in healthcare delivery, including limited access to facilities and technological infrastructure.

The study focused on two key groups: pregnant women, either currently pregnant or who had given birth within the past 12 months, selected through stratified random sampling to ensure diverse representation, and community health workers (CHWs), including nurses, midwives, and healthcare extension workers, selected using purposive sampling for their expertise. The study now selected 6 Local Government Areas (LGAs) across Yobe State, with 2 LGAs chosen from each of the state's 3 political zones. In each LGA, 2 health facilities were randomly made randomly to ensure unbiased and comprehensive representation.

E. Limitations

This study faced several limitations, primarily due to financial constraints that restricted the research to Yobe State rather than the initially intended broader coverage of Northeastern Nigeria. Although 6 Local Government Areas (LGAs) were selected across 3 political zones of Yobe, the findings may not fully represent experiences from other regions or more marginalized populations within the state. The random selection of health facilities and participants, while helpful for ensuring diversity, may still introduce some bias, as it did not account for those in remote or hard-to-reach areas.

Additionally, the study is limited by technological barriers, such as limited mobile phone access and internet connectivity in rural areas, which could have affected participant responses. The use of self-reported data may also introduce social desirability bias, where participants could have given answers, they perceived as more socially acceptable rather than their true feelings. Despite these limitations, the study provides important insights into the factors affecting m-Health adoption for antenatal care in Yobe, offering valuable directions for future research in similar contexts.

II. LITERATURE REVIEW

Mobile health (m-Health) applications have emerged as a transformative tool in healthcare, providing accessible, real-time information to individuals, particularly in underserved areas (Choudhury et al., 2021). In the context of maternal health, m-Health technologies can enhance antenatal care by offering pregnant women the ability to track symptoms, receive personalized care advice, and access timely health information. This is especially crucial in countries like Nigeria, where maternal mortality rates remain alarmingly high (WHO, 2025). m-Health applications provide an innovative solution to address the gaps in healthcare access, particularly in rural areas, and can bridge the disparity in maternal care services (Choudhury et al., 2021).

A. Socio-Demographic Factors Influencing m-Health Adoption

Research has consistently demonstrated that socio-demographic factors such as age, education, income, and technological literacy play a crucial role in determining the likelihood of adopting mobile health technologies. A study by Tawfiq et al. (2023) revealed that younger individuals and those with higher education levels are more likely to embrace digital health tools, given their familiarity with technology. Similarly, income and technological literacy have been shown to influence adoption rates, with wealthier and more digitally literate individuals more likely to use m-Health applications (Tawfiq et al., 2023).

In the context of Nigeria, the socio-economic divide significantly impacts m-Health adoption. Rural women, in particular, face greater challenges due to limited access to smartphones, internet connectivity, and education. A study by Udenigwe et al. (2022) emphasized that rural populations are less likely to adopt mobile health technologies due to infrastructural limitations and low technological literacy. This digital divide underscores the need for targeted interventions that consider the unique challenges faced by different socio-demographic groups.

B. Privacy Concerns and Trust in Technology

Privacy concerns are one of the most significant barriers to the adoption of m-Health applications, particularly in the context of sensitive health data. A study by Tovino et al. (2019) found that privacy concerns were the primary deterrent for users of m-Health technologies, with many individuals fearing the potential misuse or theft of their personal health

data. This is particularly relevant in Nigeria, where concerns about data security are heightened due to a lack of robust data protection laws and practices (Benjamin Idoko et al., 2024). Trust in technology, therefore, plays a pivotal role in m-Health adoption. Women who trust the security of mobile health platforms are more likely to engage with these technologies, while those who have concerns about data protection are less likely to adopt them (Sowon & Chigona, 2020).

Moreover, the role of healthcare providers and social influence cannot be underestimated. A study by Choudhury et al. (2021) found that healthcare providers who encourage the use of m-Health applications and reassure patients about data security can significantly increase adoption rates. Social influence, including advice from family members and peers, also affects the decision-making process, highlighting the importance of addressing privacy concerns and building trust through education and awareness campaigns.

C. Effort Expectancy and Performance Expectancy

The Technology Acceptance Model (TAM), widely used to understand technology adoption, posits that perceived ease of use (effort expectancy) and perceived usefulness (performance expectancy) are critical determinants of adoption (Davis, 1989). Effort expectancy refers to the perceived ease of using technology, while performance expectancy refers to the perceived benefits and usefulness of technology.

Research has shown that the perceived ease of use is a significant predictor of adoption. A study by Asadollahi et al. (2025) found that m-Health applications with simple, intuitive interfaces and minimal technological barriers are more likely to be adopted by pregnant women (Asadollahi et al., 2025). Similarly, performance expectancy, how useful and beneficial technology is perceived to be—plays a crucial role. Prio et al. (2021) noted that pregnant women are more likely to adopt m-Health applications when they perceive them as useful in managing their health, tracking pregnancy symptoms, and providing personalized advice (Prio et al., 2021).

D. Cultural and Socio-Cultural Factors

Cultural factors significantly influence the acceptance of m-Health applications, particularly in countries with strong traditional healthcare practices, such as Nigeria. Traditional birth attendants and community-based healthcare

providers often play a central role in maternal healthcare, and their views on technology can influence a woman's decision to adopt digital health tools. According to Onuoha et al. (2024), many pregnant women in Nigeria prefer traditional care methods and are skeptical of modern digital health solutions. This resistance to change can be a significant barrier to the adoption of m-Health technologies.

Cultural attitudes toward technology in healthcare must be addressed to facilitate the successful integration of m-Health applications. Onuoha et al. (2024) argue that m-Health applications must be designed with cultural sensitivity, taking into account local beliefs and practices (Onuoha et al., 2024). Additionally, incorporating local languages and health content relevant to the community is crucial to ensure the adoption and effective use of m-Health technologies (Oke & Sibomana, 2025).

E. Technological Barriers: Infrastructure and Access

Infrastructural challenges, particularly in rural areas, are a major impediment to the widespread adoption of m-Health applications in Nigeria. Poor internet connectivity, electricity shortages, and limited access to mobile devices are significant barriers to using digital health tools (Udenigwe et al., 2022). A study by Oke et al. (2025) found that inconsistent electricity supply and poor mobile network coverage in rural areas make it difficult for pregnant women to consistently use m-Health applications (Oke & Sibomana, 2025).

Furthermore, access to smartphones and internet services is a key determinant of m-Health adoption. The National Population Commission (2018) highlighted that rural areas in Nigeria often lack the necessary infrastructure for m-Health adoption, which disproportionately affects rural women who would benefit most from these technologies.

F. Implications for Policy and Practice

The findings from various studies underscore the need for targeted policies that address the barriers to m-Health adoption in Nigeria. Policymakers should focus on improving digital infrastructure, particularly in rural areas, to enhance mobile health adoption. According to Udenigwe et al., (2022), providing mobile devices at subsidized rates, improving internet access, and promoting digital literacy are essential steps toward enhancing m-

Health adoption in underserved communities (Udenigwe et al., 2022).

Additionally, healthcare providers and policymakers must collaborate with m-Health developers to design culturally sensitive, user-friendly applications that address the specific needs of pregnant women in Nigeria. As highlighted by Oluwaseun and Adebayo (2021), ensuring that m-Health applications are tailored to the socio-cultural and technological context of Nigeria is critical for increasing their uptake.

III. RESEARCH METHODOLOGY

A. Research Design

This study adopted a mixed-methods design, combining quantitative surveys and qualitative interviews to explore the factors influencing pregnant women's adoption of m-Health applications for antenatal care in Northeastern Nigeria. This approach allows for both statistical analysis and in-depth insights into the adoption process (Creswell & Creswell, 2018).

B. Study Population and Sampling

For this study, 250 pregnant women were selected using stratified random sampling, ensuring a diverse representation based on factors such as age, education, and urban or rural location. This method allowed for a comprehensive analysis of how socio-demographic factors impact the adoption of m-Health applications, as highlighted by Tawfiq et al. (2023). In addition, 50 Community Health Workers (CHWs) were purposively selected. These CHWs, with their direct experience in antenatal care, provided expert perspectives on the practicality and challenges of implementing m-Health applications in local communities, as recommended by Palinkas et al., (2015).

C. Data Collection

1) Quantitative Data

A structured questionnaire was designed to assess socio-demographics, effort expectancy, performance expectancy, privacy concerns, and trust in m-Health applications (Davis, 1989). The survey was pre-tested with 30 respondents to ensure clarity (Bryman, 2016).

2) Qualitative Data

Semi-structured interviews were conducted with a sub-sample of 30 pregnant women and 20 CHWs to explore perceptions and barriers to adoption (Braun & Clarke, 2006). Interviews were audio-recorded and transcribed.

3) Data Collection Procedure

The data collection process was conducted in two phases. First, quantitative data were gathered through structured surveys, administered both online (via Google Forms) and offline (using paper-based questionnaires) to accommodate varying levels of internet access as suggested by (Fowler, 2014). In the second phase, qualitative data were collected through semi-structured interviews with a sub-sample of 30 pregnant women and 20 Community Health Workers (CHWs), conducted in person by trained research assistants. Interviews were audio-recorded and transcribed for thematic analysis to capture participants' in-depth experiences and perceptions (Kitzinger, 1995).

D. Data Analysis

The quantitative data were analyzed using SPSS to calculate descriptive statistics and perform regression analysis to examine the relationship between socio-demographic factors and m-Health adoption. The qualitative data from the semi-structured interviews were analyzed using thematic analysis with the aid of NVivo software. This approach helped identify recurring themes related to barriers and enablers of m-Health adoption, providing deeper insights into participants' experiences and perceptions.

E. Consent and Ethical Considerations

All participants provided informed consent, ensuring their confidentiality and voluntary involvement. The study followed ethical guidelines for research involving human subjects, with a strong emphasis on respecting privacy and safeguarding sensitive data (World Medical Association, 2013).

RESULTS

F. Quantitative Results

The quantitative data were analyzed to understand the relationship between socio-demographic factors, effort expectancy, performance expectancy, privacy concerns, trust in technology, and the adoption of m-Health applications. The analysis included 250 pregnant women and 50 Community Health Workers (CHWs).

1)

Socio-Demographic Characteristics of Participants

The socio-demographic characteristics of the participants were critical in understanding the

diversity of the sample and how these factors influenced m-Health adoption. The study used stratified random sampling to ensure representation from different age groups, educational levels, and urban versus rural settings.

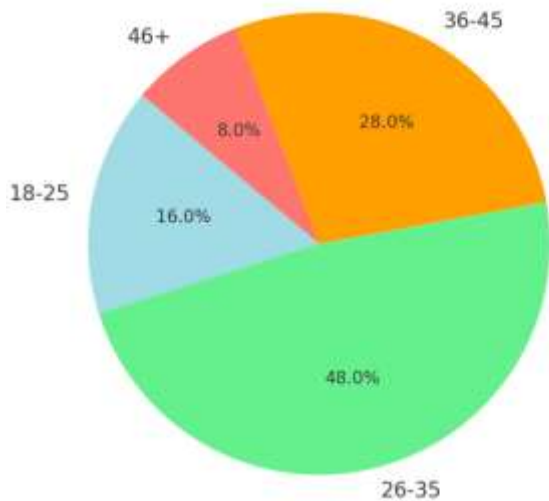


Figure 1. Age Distribution of Pregnant Women

Figure 1. shows that majority of the pregnant women in the sample (48%) were aged 26-35 years, followed by 28% in the 36-45 age group. Only 16% were aged 18-25, and 8% were over 46 years old. This age distribution is consistent with findings from previous studies that suggest younger individuals (18-35) are more likely to adopt technology (Wallington & Noel, 2022).

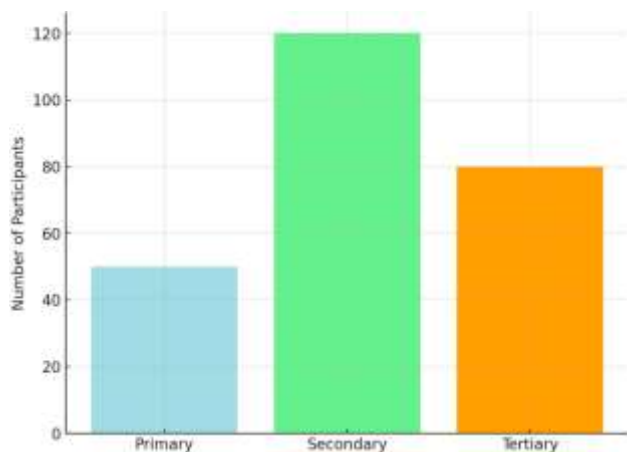


Figure 2. Educational Level of Pregnant Women

Figure 2. above indicates that educational attainment was found to significantly influence technology adoption. The majority of the participants (48%) had secondary education, while 32% had tertiary education and 20% had only primary education. Pregnant women with higher education levels are more likely to engage

with m-Health applications, which reflects similar findings in other contexts (Tawfiq et al., 2023).

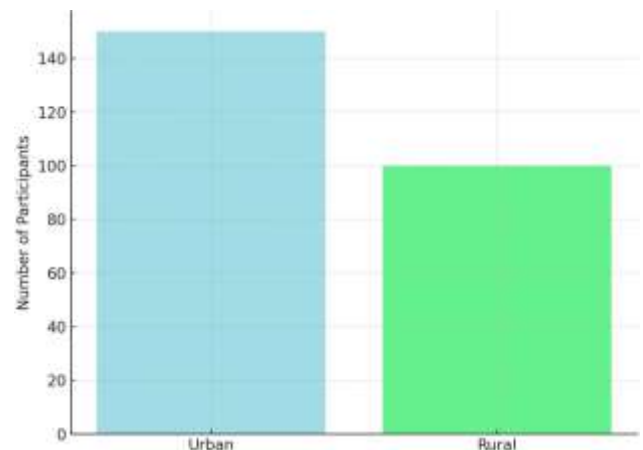


Figure 3. Urban vs. Rural Distribution of Participants

The sample was composed of 60% urban and 40% rural participants. Urban areas, such as Damaturu, Yobe's capital, showed higher adoption rates due to better access to mobile devices and internet connectivity as revealed in **Figure 3**. Conversely, rural areas faced barriers like poor infrastructure and lower levels of technological literacy, which limited the adoption of m-Health applications (Udenigwe et al., 2022).

2) Perceived Effort Expectancy and Performance Expectancy

To assess effort expectancy (ease of use) and performance expectancy (usefulness), participants rated the perceived ease and benefits of using m-Health applications on a Likert scale (1 to 5). The following figures present the findings:

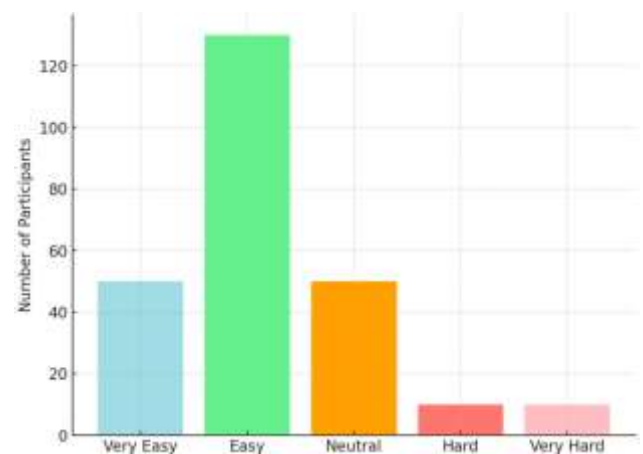


Figure 4. Effort Expectancy of m-Health Applications

Figure 4. above revealed that majority of respondents (52%) found m-Health applications

"easy" to use, while 28% rated them "very easy" to use. However, 8% found them "hard" to use, and 12% rated them as "neutral." These results suggest that simplicity in design is a key factor in adoption, which aligns with previous findings by (Asadollahi et al., 2025).

Figure 5. below depicts that 48% of pregnant women believed that m-Health applications were "useful" in managing their pregnancy, while 40% considered them "very useful." Only 8% were neutral, and 4% found them "not useful." These findings highlight the perceived benefits of m-Health applications in improving pregnancy management, which is consistent with studies by (Prio et al., 2021).

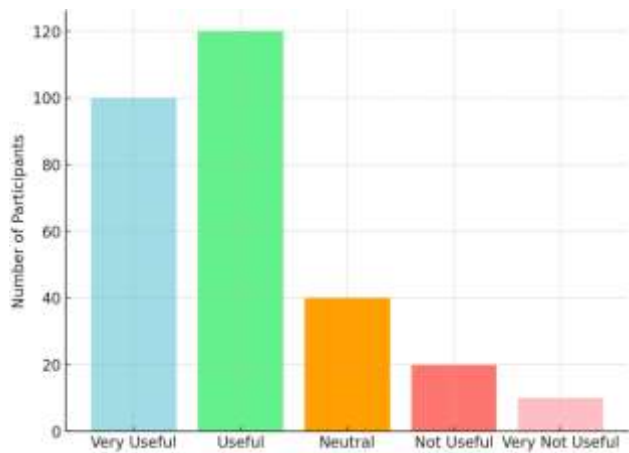


Figure 5. Performance Expectancy of m-Health Applications

3) Privacy Concerns and Trust in Technology

Privacy was identified as a major concern for pregnant women regarding the use of m-Health applications as revealed in below figures.

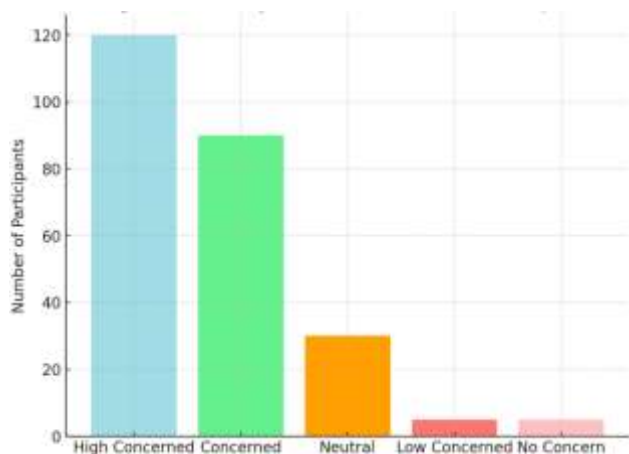


Figure 6. Figure 6 Privacy Concerns in m-Health Adoption

Figure 6. shows that nearly 48% of respondents reported being "very concerned" about privacy, while 36% were "concerned." Only 12% were neutral, and 4% were not concerned. Privacy concerns are a significant

barrier to m-Health adoption, especially in a context where data security is a major issue (Tovino, 2020).

Figure 7. 24% of pregnant women viewed m-Health applications as "very trustworthy," while 48% considered them "trustworthy." However, 20% were neutral, and 8% expressed distrust. This indicates that while a majority of participants trust m-Health technology, a significant portion remains hesitant, likely due to concerns about data protection (Sowon & Chigona, 2020).

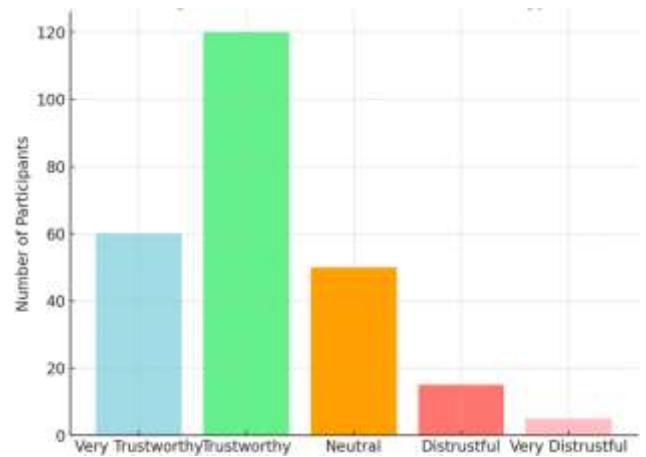


Figure 7. Trust in m-Health Technology

4) Adoption of m-Health Applications Among Pregnant Women

The adoption rate of m-Health applications was one of the central aspects of the study, revealing the extent to which pregnant women in Northeastern Nigeria, particularly Yobe State, are using mobile health tools for antenatal care.

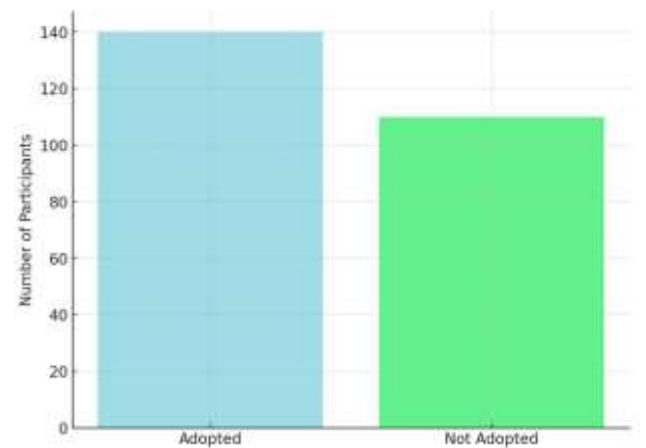


Figure 8. Overall Adoption Rates of m-Health Applications

Figure 8. shows 56% of pregnant women reported using m-Health applications for antenatal care, while 44% had not adopted them. The relatively high adoption rate among urban participants, where infrastructure and mobile access are better, suggests that m-Health applications hold

significant potential to improve maternal health outcomes when access barriers are addressed.

Role of Community Health Workers (CHWs)

Community health workers (CHWs) were asked to provide their perspective on the feasibility of m-Health applications for antenatal care.

Figure 9. revealed that CHWs' Views on m-Health Feasibility 60% of CHWs considered m-Health applications "feasible" for antenatal care, while 28% rated them as "neutral" and 12% found them "not feasible." CHWs highlighted infrastructural challenges, such as poor internet connectivity and electricity shortages, as major obstacles to

implementing m-Health solutions in rural areas (Goh et al., 2025).

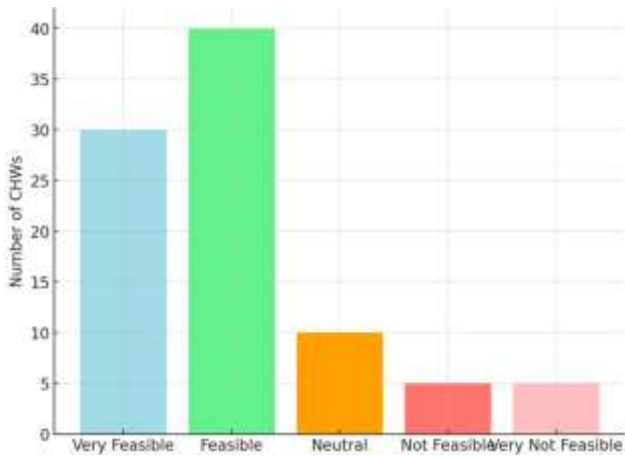


Figure 9. CHWs' Views on m-Health Feasibility

5) *Geographical and Environmental Barriers*

Yobe State faces significant infrastructural and environmental barriers that affect the adoption of m-Health applications. These challenges are particularly pronounced in rural areas, where access to technology is limited

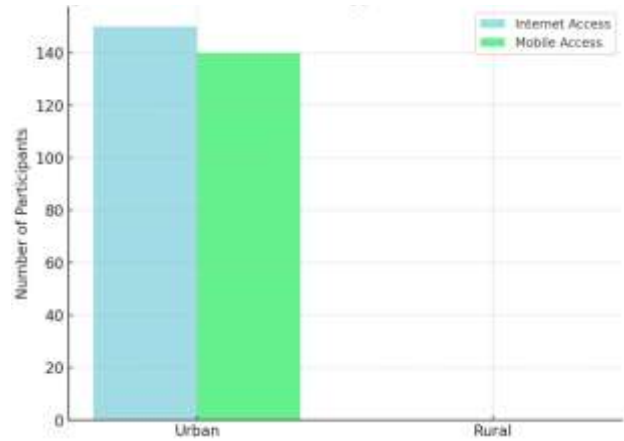


Figure 10. Access to Technology and Infrastructure

Figure 10. While 80% of urban participants had reliable access to mobile devices and the internet, only 40% of rural participants had similar access. The findings underscore the digital divide between urban and rural areas and the importance of improving infrastructure in rural regions to support the adoption of m-Health technologies (Oke & Sibomana, 2025).

Correlation Between Socio-Demographic Factors and m-Health Adoption

To examine the relationship between socio-demographic factors and the likelihood of adopting m-Health applications, regression analysis was conducted.

The analysis showed a positive correlation between education level and m-Health adoption. Participants with tertiary education were more likely to adopt m-Health applications compared to those with primary or secondary education as depicted in **Figure 11.** This aligns with previous research on the role of education in enhancing digital literacy and technology adoption (Liu et al., 2019).

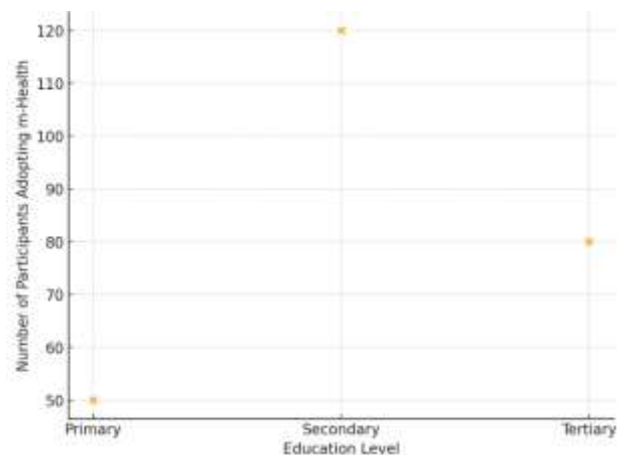


Figure 11. Correlation Between Education Level and m-Health Adoption

G. Qualitative Results

The thematic analysis of the semi-structured interviews with 30 pregnant women and 20 Community Health Workers (CHWs) revealed the following key themes.

1) Privacy Concerns

Privacy was a major concern for both pregnant women and CHWs. Many participants feared that their sensitive health data might be misused or accessed without their consent. One pregnant woman stated, "I am worried that my personal information could be misused. How secure is the data?" This aligns with Tovino et al. (2019), who identified privacy concerns as a significant barrier to m-Health adoption.

2) Trust in Technology

Trust in m-Health applications was varied. Some participants expressed skepticism about the reliability of these technologies, with one respondent mentioning, "I don't trust technology for my health. I prefer to see a doctor face to face." However, some participants acknowledged that healthcare provider endorsements could improve trust. CHWs also emphasized the need for trustworthy apps to build user confidence as emphasized by Choudhury et al., (2021).

3) Perceived Usefulness

Many pregnant women saw m-Health applications as useful for managing their

pregnancy. One participant shared, "It would be helpful to get reminders for my doctor's appointments or when I need to take my medications." This highlights the performance expectancy of m-Health, where perceived benefits such as health reminders and symptom tracking encourage adoption as discovered by (Prio et al., 2021).

4) Social and Cultural Influences

Social influences were significant in shaping m-Health adoption. Some pregnant women preferred traditional healthcare methods and felt uncomfortable with digital tools. One CHW mentioned, "Some women feel more comfortable with the traditional methods they've always used. They see technology as something foreign." This reflects the cultural barriers to adoption, as traditional practices are deeply rooted in many communities (Akinmoladun et al., 2020).

5) Technological Barriers

Both pregnant women and CHWs highlighted technological barriers, such as limited access to smartphones and unreliable internet, particularly in rural areas. One participant from a rural area said, "In my village, there is no good network, so I don't think I can use an app regularly." This reinforces the need to address infrastructure challenges in underserved areas (Udenigwe et al., 2022).

Table 1. Theme Summary Table

Theme	Sub-Themes	Illustrative Quotes
Privacy Concerns	Data security fears	- "I am worried that my personal information could be misused."
Trust in Technology	Reliability & endorsement	- "I don't trust technology for my health. I prefer to see a doctor face to face."
Perceived Usefulness	Health reminders & tracking	- "It would be helpful to get reminders for my doctor's appointments."
Social & Cultural Influences	Traditional healthcare preference	- "Some women feel more comfortable with the traditional methods they've always used."
Technological Barriers	Internet & device access	- "In my village, there is no good network, so I don't think I can use an app regularly."

IV. DISCUSSION

The findings from this study highlight several key determinants influencing pregnant women's acceptance of m-Health applications for antenatal care in Northeastern Nigeria. These determinants are primarily shaped by privacy concerns, trust in technology, socio-

demographic factors, and technological barriers, which collectively affect the willingness of pregnant women to adopt these applications for managing their maternal health.

1) *Privacy Concerns: A Major Barrier to Acceptance*

Privacy concerns emerged as one of the most significant barriers to acceptance of m-Health applications. Nearly 48% of pregnant women expressed strong concerns about the security of their personal health data. This finding aligns with Tovino et al. (2019), who emphasized the impact of privacy concerns on acceptance of health technologies globally. In the context of this study, women were hesitant to engage with m-Health applications due to fears that their sensitive health information could be misused or accessed without their consent. From the researcher's perspective, these concerns must be addressed directly by developers, ensuring that m-Health applications are designed with robust data protection measures. Clear privacy policies and transparent data usage practices would likely reduce these concerns and increase the acceptance of such applications.

2) *Trust in Technology: The Role of Healthcare Providers in Building Acceptance*

Trust in technology was also identified as a crucial determinant influencing acceptance. While some participants were open to using m-Health applications, many stated that they would be more likely to use them if trusted healthcare providers endorsed the technology. This supports the findings of Goh et al. (2025), who noted that healthcare providers play a pivotal role in influencing patient acceptance of technology (Goh et al., 2025). One participant in this study shared, *"I would feel more comfortable using the app if my doctor recommended it."* This underscores the importance of endorsements from healthcare professionals in building trust and facilitating the acceptance of m-Health applications. CHWs, who directly interact with pregnant women, are well-positioned to advocate for these technologies and improve acceptance through education and reassurance about the benefits of m-Health applications.

3) *Socio-Demographic Factors: Age, Education, and Location*

The study revealed that socio-demographic factors, particularly age, education level, and urban vs. rural location, significantly affect the acceptance of m-Health applications. Younger women and those with higher education levels were more likely to use m-Health applications, consistent with prior studies (Rajah et al., 2025; Wallington & Noel, 2022). Moreover, urban women had higher acceptance rates due to better access to mobile technology and internet connectivity, which supports the findings of Udenigwe et al. (2022).

From the view of this study, these determinants suggest that targeted interventions should focus on educating pregnant women in rural areas and improving digital literacy to overcome the barriers to acceptance. Enhancing digital infrastructure, especially in underserved regions, will be essential to increase access and foster acceptance of m-Health solutions.

4) *Technological Barriers: Infrastructure and Access*

The technological barriers identified in this study—such as limited access to smartphones and unreliable internet connectivity—are significant obstacles to acceptance of m-Health applications, especially in rural areas. A rural participant noted, *"In my village, there is no good network, so I don't think I can use an app regularly."* This finding reflects the challenges highlighted by Oke & Sibomana, (2025), who noted that poor infrastructure limits the potential for m-Health adoption. Therefore, addressing these technological barriers will be crucial for increasing acceptance. Policymakers, in collaboration with mobile network providers, should prioritize improving internet access and mobile device availability in rural areas to enhance the accessibility and acceptance of m-Health applications.

5) *Social and Cultural Influences: Tradition vs. Technology*

Social and cultural influences were also identified as key determinants of acceptance. Many pregnant women, particularly in rural areas, expressed a preference for traditional healthcare practices over digital health tools. One CHW noted, *"Some women feel more comfortable with the traditional methods they've always used. They see technology as something foreign."* This finding echoes the work of Akinmoladun et al. (2020), who emphasized the cultural barriers to m-Health adoption in traditional societies. For m-Health applications to gain broader acceptance, they must be culturally sensitive and tailored to the local health beliefs and practices of pregnant women. Integrating local languages and community-based health content could improve acceptance and engagement with these digital tools.

V. RECOMMENDATIONS

1) *Enhance Data Security and Build Trust in Technology*

Developers of m-Health applications should prioritize data security by integrating robust encryption measures and clear privacy policies that explicitly detail how personal health data will be protected. In addition, developers should provide regular updates on security features to reassure users about their privacy. Privacy concerns are a key barrier to the acceptance of m-Health applications, and addressing these concerns through transparency and data protection measures will likely increase user trust and willingness to engage with these technologies.

2) *Engage Healthcare Providers in Promoting m-Health*

Healthcare providers, especially community health workers (CHWs), should actively endorse and educate pregnant women about the benefits and safety of using m-Health applications for antenatal care. Training healthcare providers to become m-Health advocates will play a significant role in fostering trust and encouraging acceptance. Trust in m-Health applications is often influenced by healthcare providers' recommendations, and when trusted medical professionals endorse the use of such technologies, pregnant women are more likely to feel comfortable using them.

3) *Improve Digital Literacy and Access in Rural Areas.*

Policymakers and technology providers should invest in digital literacy programs targeting pregnant women, especially in rural areas. These programs should focus on building confidence in using mobile devices and navigating m-Health applications. Additionally, improving internet connectivity and mobile access in underserved areas is crucial. Rural women face barriers due to limited access to smartphones and reliable internet, and by improving digital literacy and infrastructure, more women in rural areas will be able to access and benefit from m-Health tools.

4) *Create Culturally Appropriate m-Health Solutions*

m-Health applications should be designed with local languages, cultural practices, and health beliefs in mind. Engaging local communities in the development of these applications ensures they align with traditional healthcare practices while incorporating modern medical advice. Cultural factors significantly influence the acceptance of m-Health applications, and when women see that the application is in their language and respects their cultural norms, they are more likely to use it.

5) *Develop User-Friendly and Low-Cost m-Health Applications.*

m-Health developers should ensure that the applications are easy to use for women of all education levels, particularly those with lower literacy. Additionally, the apps should be low-cost or free, with affordable data usage to ensure accessibility for women with limited financial resources. Ease of use and cost are significant determinants of acceptance and ensuring that the applications are simple to navigate and affordable will increase their adoption among a wider range of women, especially those in low-income communities.

6) *Increase Awareness and Community Engagement*

Conduct awareness campaigns through local media, community centers, and healthcare providers to inform pregnant women about the benefits of m-Health applications. These campaigns should focus on addressing privacy concerns, emphasizing data security, and showcasing success stories of women who have benefited from using m-Health tools. Awareness and community engagement are essential for increasing the adoption of m-Health applications. When women are well-informed about the benefits and safety of these technologies, they are more likely to embrace them.

7) *Collaborate with Local and International Partners for Infrastructure Development*

Government agencies, telecom companies, and non-governmental organizations (NGOs) should work together to improve the telecommunication infrastructure in rural areas, focusing on providing reliable internet and affordable mobile devices. Partnerships with international organizations that have expertise in healthcare technology can also help bring best practices and funding to the region. Without access to reliable internet and mobile devices, many pregnant women, particularly in rural areas, will continue to face significant barriers to using m-Health applications. Collaborative efforts are needed to bridge this gap and increase access to m-Health solutions.

8) *Monitor and Evaluate the Impact of m-Health on Maternal Health*

Regularly monitor and evaluate the impact of m-Health applications on maternal health outcomes, including antenatal visits, early detection of complications, and maternal satisfaction. This data should be used to improve the apps and provide evidence to policymakers and healthcare providers about their effectiveness. Continuous evaluation is crucial to understanding how m-Health applications affect maternal health and to identify areas for improvement. Positive outcomes can further

encourage acceptance and adoption of m-Health solutions.

VI. CONCLUSION

This study provides important insights into the determinants influencing the acceptance of m-Health applications for antenatal care in Northeastern Nigeria. The findings highlight that privacy concerns, trust in technology, socio-demographic factors, technological barriers, and social and cultural influences are crucial factors affecting acceptance. The study emphasizes the need for robust data security measures, endorsements from healthcare providers, and improvements in digital infrastructure to increase acceptance of m-Health applications. Moreover, addressing cultural barriers by designing culturally appropriate and user-friendly applications is essential to ensure broader adoption in Nigeria and similar settings. Future research should focus on overcoming these barriers through policy interventions and community engagement to enhance maternal health outcomes through m-Health solutions.

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