Article

Quasi-Experimental Analysis of Digital Media Campaigns Influencing Maternal Health-Seeking Behaviours in Rural South-Western Nigeria

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Abstract
This study examined the influence of digital media campaigns on maternal health-seeking behaviours among women in rural South-Western Nigeria. Guided by the Uses and Gratification theory, the research explored how exposure to maternal health messages disseminated through WhatsApp, Facebook, and SMS shaped antenatal care attendance, facility-based delivery, and skilled birth uptake. Using a quasi-experimental design, 400 pregnant women and nursing mothers from six rural communities were sampled through multistage procedures. The findings revealed significant improvements in maternal health-seeking behaviours among women exposed to the campaign compared with those unexposed. Antenatal attendance, facility delivery, and skilled birth utilisation increased substantially after the 12-week intervention. The influence of digital media exposure was moderated by digital literacy, education level, and preference for voice and video-based formats over text. Despite these gains, digital exclusion and low literacy remained critical barriers to equitable participation. The study concludes that locally adapted digital campaigns, when combined with community health worker support, can effectively enhance maternal health-seeking behaviour in underserved communities. It recommends integrating multimedia health messaging in local languages and strengthening digital literacy among rural women to sustain improved maternal health outcomes.

Keywords
Maternal health behaviour, digital campaigns, digital literacy, rural communities

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Introduction

Health is globally recognised as a vital determinant of human development and national productivity, with the World Health Organization defining it as extending beyond the absence of illness to encompass complete physical, mental, and social well-being (WHO, 2021). A healthy population enhances labour efficiency and drives social and economic advancement, making investment in health outcomes essential for sustainable development. Maternal health, the wellbeing of women during pregnancy, childbirth, and the postpartum period serves as a critical barometer of overall public health performance and socioeconomic development. Despite sustained governmental and donor-funded initiatives to improve maternal outcomes, Nigeria continues to bear a disproportionate global burden of maternal mortality. According to the World Health Organization (2023), Nigeria accounts for nearly 20 percent of global maternal deaths, with rural women experiencing the highest burden of maternal morbidity and mortality. This disproportionate burden reflects complex interconnections between individual behavioural factors, cultural contexts, and structural barriers within healthcare systems.

According to Fantaye et al. (2019), rural women in Nigeria face interconnected barriers that systematically impede access to quality maternal healthcare services. The barriers to maternal health-seeking behaviour operate at multiple levels individual, relational, institutional, and community and are deeply rooted in structural, economic, and sociocultural contexts. Oyeyemi et al. (2021) opine that accessibility challenges stemming from poor transportation infrastructure, long geographic distances to healthcare facilities, and irregular facility hours restrict women's ability to access antenatal care, skilled delivery services, and postnatal follow-up care. Financial constraints represent a substantial obstacle; research demonstrates that household income, transport-related costs, and out-of-pocket expenses for maternal healthcare services significantly restrict facility-based care access for rural women (Adewuyi et al., 2018). At the individual level, rural women often delay initiation of antenatal care until after the first trimester, driven by cultural norms that discourage early pregnancy reporting and by limited awareness of the benefits of early care (Kana et. al., 2015).

Beyond these logistical and economic barriers, gender-related power dynamics profoundly shape maternal health-seeking decisions because many rural women require spousal or parental consent to access antenatal care or deliver at health facilities, thereby limiting their autonomous decision-making in maternal health matters (Feroz et al., 2017). Gender norms restricting women's autonomy interact with deep-rooted cultural and religious beliefs that influence health-seeking choices. According to Adenikan et al. (2020), some women delay pregnancy reporting due to cultural beliefs about the spiritual nature of pregnancy, while others prefer traditional birth attendants based on cultural norms that view pregnancy and childbirth as natural processes requiring no medical intervention. These cultural practices are deeply

embedded within communities and often reinforced by family and community networks.

Critically, poor quality of care and lack of trust in formal healthcare systems represent foundational barriers that drive women away from facility-based care despite its availability. Research from Dahiru and Oche (2015) demonstrates that experiences of disrespect, abuse, and inequitable treatment at health facilities create lasting negative impressions that deter not only individual women but also their social networks from utilising maternal care services. Drug stock-outs, inadequate availability of essential medical supplies, and abusive behaviour by health providers systematically undermine community trust in modern health systems. Poor quality of care provided by health workers, including impersonal care and unavailable drugs, tends to make women opt for traditional birth facilities even when biomedical care is available (Fantaye et al., 2019). Dahiru and Oche (2015) further explained that the distrust of modern health systems is further compounded by cultural beliefs and preferences for traditional care practices. This erosion of institutional trust creates a vicious cycle whereby women's avoidance of formal care weakens the healthcare system's capacity to respond to maternal emergencies, perpetuating the cycle of high maternal mortality in rural areas.

The rapid expansion of digital connectivity in low- and middle-income countries presents an unprecedented opportunity to address these multifaceted barriers to maternal health care. Nigeria's digital landscape has transformed dramatically, with over 122 million internet users and widespread smartphone ownership creating new possibilities for health communication (Statista, 2024). Feroz et al. (2017) assert that digital media platforms including WhatsApp, Facebook, and SMS broadcast systems now function as low-cost, culturally adaptable avenues for maternal health messaging that can transcend the geographic, financial, and transportation barriers constraining facility-based counselling. Digital platforms enable real-time dissemination of maternal health information in local languages through multiple formats including text, voice, and video, potentially reaching rural populations who have limited access to conventional healthcare services. According to the Research carried out by Esan et al. (2022) which shown that interactive digital messaging can increase health knowledge and influence care-seeking behaviours when tailored to community contexts. Digital communication media have demonstrated promise in improving maternal health knowledge, motivating self-care practices, reducing pregnancy-related stress and anxiety, and supporting informed decision-making regarding maternal complications.

However, critical gaps persist in the empirical evidence base linking digital health interventions to measurable behavioural change outcomes in rural Nigerian contexts. Existing research on maternal health and digital media in

Nigeria predominantly focuses on knowledge and awareness outcomes without empirically establishing whether increased awareness translates into measurable behavioural changes in health-seeking actions such as antenatal care attendance or facility-based delivery (Oyeyemi et al., 2021). The current evidence base does not clarify whether social media campaigns can overcome the deep-rooted structural, economic, cultural, and institutional barriers that shape rural women's maternal health-seeking behaviours. Furthermore, digital divides manifested in low health literacy, inconsistent internet connectivity, limited smartphone affordability, and persistent sociocultural barriers continue to impede equitable participation in digital health initiatives, particularly among the most vulnerable rural populations (Fantaye et al., 2019). This knowledge gap is compounded by limited understanding of how digital media campaigns function within specific sociocultural contexts, which message characteristics and delivery channels prove effective, and what strategies genuinely motivate maternal health-seeking behaviour among women with persistent distrust of formal health systems.

This study addresses this critical evidence gap by empirically evaluating whether structured digital media campaigns influence maternal health-seeking behaviours among rural women in South-Western Nigeria. Specifically, this research examines whether exposure to coordinated maternal health messaging campaigns disseminated through WhatsApp, Facebook, and SMS channels focusing on antenatal care, facility-based delivery, and skilled birth attendance produces measurable changes in health-seeking behaviours compared to comparable communities with no campaign exposure. Employing a quasi-experimental design with twelve weeks of intervention implementation, this study aims to determine whether digital media campaigns can influence behavioural change while accounting for the contextual realities, digital divides, sociocultural barriers, and systemic factors that shape maternal health decisions in rural communities. Understanding whether and how digital media campaigns can influence maternal health-seeking behaviour despite entrenched barriers is essential for designing scalable, evidence-based digital health interventions that can contribute to reducing maternal morbidity and mortality in low-resource settings and informing health communication strategies that center rural women's needs and contexts.

Grounded in Uses and Gratification Theory, the study investigates how repeated exposure to digital messages can elevate the salience of maternal-health issues and facilitate the diffusion of safer reproductive practices among rural women. Accordingly, the objectives of the study are to:

1. Determine the effect of digital media exposure on antenatal-care attendance in selected rural communities.
2. Assess the influence of WhatsApp, Facebook, and SMS campaigns on skilled-birth attendance and facility-based delivery.
3. Compare maternal-health outcomes between maternal patient exposed to digital media campaigns and those unexposed to it.

4. Examine socio-demographic and digital factors moderating the effectiveness of the campaigns.

Maternal Health and Health-Seeking Behaviour

Maternal health constitutes a critical public health issue globally, referring to the health status of women during pregnancy, delivery, and the postpartum period. In most low- and middle-income countries, maternal health remains a chronic challenge owing to complex interconnections between individual behavioural factors, cultural contexts, and structural barriers within healthcare systems. This multifaceted nature of maternal health issues demands comprehensive understanding of how rural women navigate healthcare decisions within their specific socioeconomic and sociocultural environments. Understanding maternal health-seeking behaviour the deliberate actions women undertake to maintain and improve their health during pregnancy and childbirth is therefore essential for designing effective interventions that improve maternal health outcomes.

According to Fagbamigbe et al. (2017) rural women in Nigeria face interconnected barriers that significantly impede their engagement with formal maternal healthcare services. These barriers operate at multiple levels: individual, relational, institutional, and community levels. At the individual level, rural women often delay initiation of antenatal care until after the first trimester, driven by cultural norms that discourage early pregnancy reporting and by limited awareness of the benefits of early care. Financial constraints represent a substantial obstacle, as Adewuyi et al. (2018) demonstrated that household income, transport-related costs, and other indirect expenses restrict facility-based care access for rural women. Accessibility challenges further compound these barriers; poor transportation infrastructure, long distances to health facilities, and irregular facility hours prevent timely care-seeking.

Beyond economic and logistical barriers, gender-related power dynamics profoundly shape maternal health-seeking decisions. Many rural women require spousal or parental consent to access antenatal care or deliver at health facilities, thereby limiting their decision-making autonomy in maternal health matters. Additionally, prevailing cultural and religious beliefs significantly influence health-seeking choices. Some women delay pregnancy reporting due to beliefs about witchcraft and supernatural harm, others prefer traditional birth attendants or home delivery based on cultural norms that view pregnancy and childbirth as natural processes requiring no medical intervention. These cultural practices are deeply embedded within communities and often reinforced by family and community networks.

Trust emerges as a foundational determinant of maternal health-seeking behaviour, operating as both a cause and consequence of women's engagement with formal healthcare systems. The persistent poor quality of care provided by health workers manifested through drug stock-outs, impersonal interactions, and provider misconduct systematically erodes community trust in modern health systems and drives women toward alternative care sources. This erosion of trust reflects broader failures in system responsiveness and respectful care provision (Anastasi et al., 2015). Research demonstrates that experiences of disrespect, abuse, and inequitable treatment at facilities create lasting negative impressions that deter not only individual women but also their social networks from utilising formal maternal care services. Similarly, Fantaye et al. (2019) found that elders' perceptions of inadequate formal maternal care services were fundamentally rooted in distrust of modern health systems, compounded by preference for culturally congruent care practices associated with traditional birth attendants. This pattern reveals a critical interconnection: when health systems fail to demonstrate technical quality, respect, and cultural sensitivity, trust deficits naturally emerge, prompting women to seek care from traditional providers who offer culturally familiar, accessible, and affirming experiences.

Enhancing maternal health outcomes in rural Nigeria therefore requires multifaceted interventions that extend beyond biomedical approaches. Effective improvements demand a fundamental reorientation toward systems that foster genuine trust among communities, cultivate supportive worker-client relationships grounded in respect and accountability, and systematically eliminate socio-cultural barriers to care. Meaningful maternal health-seeking behaviour improvements necessitate deep understanding of knowledge gaps and the contextual realities that shape women's decisions, including economic status, gender dynamics, social norms, and community structures. By recognising that trust is built through responsive, high-quality care that respects women's preferences and cultural contexts, healthcare systems can create enabling environments where formal maternal care becomes an attractive and preferred option for rural women and their families.

Digital Media in Health Promotion

Digital media platforms are effective tools in health promotion, presenting unheralded opportunities for simultaneous interaction with populations, including inaccessible rural populations. WhatsApp, Facebook, and SMS broadcast channels facilitate interactive user-driven communication, further than the earlier one-way health education. These platforms offer localised, tailored content that is able to be sent in a format accessible to wide populations. Moorhead et al. (2013) revealed that digital media brings new dimensions to health care through systematic uses, advantages, and limitations to health communication. Websites facilitate peer-to-peer interaction, emotional support, and witness testimonies that are beneficial in changing perceptions and adhering to positive habits. Interactive modes of eHealth

platforms enhance levels of trustworthiness and importance, especially when users engage with health workers or fellow mothers in real time.

In rural Nigeria, growth in mobile phone ownership and internet penetration has been fast. Oyeyemi et al. (2021) state that the use of mobile health applications is able to improve sexual and reproductive health care, hence WhatsApp and SMS alternatives for maternal health communication are viable. The modes permit the sharing of pregnancy tips, appointment reminders, and emergency numbers through group discussions, voice messages, and text information. Nonetheless, successful social media health campaigns entail meticulous planning of message strategy, follow-up, and target group. Feroz et al. (2017) clarified that the contribution of mHealth interventions to augmenting antenatal and postnatal care in low and middle income nations is dependent on timely implementation and continuous user interaction, which obviously means that social media must supplement and not substitute robust maternal health programmes.

Maternal Health Messaging in Rural Nigeria

Maternal health communication is still an aspect of interventions dealing with maternal morbidity and mortality in Nigeria. Rural communities are severely impacted by knowledge gaps as a result of infrastructural weaknesses, unavailability of healthcare workers, and inadequate socio-cultural factors. Hence, there has been a growing embrace of digital and mobile-based communication systems for the delivery of vital maternal health information.

Older media such as radio advertising and mobile health worker meetings are found to be effective in disseminating health messages to rural women. These media are, however, time-specific, geographically confined, and involve passive participation. Mobile-mediated media such as WhatsApp and SMS provide more direct and frequent access to women. Omotoso et al. (2021) state that utilisation of mobile health applications to sexual and reproductive health care in Nigeria has practice and policy implications, highlighting avenues for maternal health messaging. Even with technological progress, utilisation of maternal care services has not necessarily been accompanied by message transmission. Language and literacy problems still render full participation challenging. Health messages are mainly communicated in English and hence less comprehensible to less literate women. Bello et al. (2022) established that maternal health literacy plays a substantive role in utilising maternal healthcare services and pregnancy outcomes and thus calls for culture-tailored messaging.

Data shows that health messages in rural areas regarding maternal health are best as part of multi-channel campaigns. Wakefield et al. (2010) proved mass media campaigns could effectively alter health behaviour using proper

design and delivery. Sarrassat et al. (2015), however, concluded mass radio campaigns in Burkina Faso had mixed outcomes, enhancing family behaviour and child survival in some locations but needing prolonged community engagement for sustainability.

Digital Health Interventions and Access to Maternal Care

Digital interventions for improving maternal health in rural areas have potential but are faced with a plethora of structural and socio-cultural barriers. In spite of improving mobile penetration in Nigeria, there are many challenges that constrain the coverage and impact of digital maternal health interventions among marginalised communities.

Colaci et al. (2016) performed a systematic review of low-income country mHealth interventions to maternal health and concluded that while much has been promised through interventions, implementation challenges still abound. A lack of infrastructure is one of the key bottlenecks, where inconsistent power supply, poor network coverage, and mobile data price cap recurrent access to electronic health resources. Digital literacy is also a problem. Most women are not technologically advanced to use messaging apps or understand health messages effectively. Lee et al. (2016) conducted a systematic review and meta-analysis and established that the effect of mHealth interventions among maternal, new born and child health in low and middle-income countries was varied depending on user participation and technological literacy.

Despite these setbacks, there are a few enablers. Adanikin et al. (2020) demonstrated the effectiveness of mobile health interventions in increasing uptake of postnatal care services in Nigeria, to demonstrate that properly designed digital intervention can improve maternal outcomes. Similarly, Ezeanochie et al. (2015) demonstrated the positive impact of mobile phone messaging on knowledge and awareness of emergency contraception among female undergraduates in Nigeria, with potential for expansion of reproductive health messaging.

Evidence from other sub-Saharan African settings validates the promise of digital health interventions. Laar, Bekyieriya, Isang and Baguune (2019) evaluated mobile health technology for maternal and child health in rural Ghana and concluded that with the right support from the community, interventions were in a position to substantially boost uptake of health services. Multimodal approaches that combine digital resources with conventional outreach are more effective than one-mode digital interventions. Zamawe et al. (2016) observed mass media community-based campaign programmes implemented in rural Malawi registered higher use of maternal health care services, but success must be integrated with prevailing community structures as well as to support a sustained contact beyond pilot message stages.

Harding et al. (2020) presented an in-depth assessment of the Breastfeed4Ghana campaign, which is an innovative social media-based health behaviour change intervention via Facebook and Twitter platforms. The

research tackled the urgent context of the decreasing practice of exclusive breastfeeding in Ghana alongside increasing social media use. Campaign content was heavily developed and tested to be culturally and contentually appropriate, showing the need for contextual adaptation of digital health interventions. The Breastfeed4Ghana campaign is an important addition to the literature on how social media can be leveraged for maternal health promotion in African contexts. The emphasis of the research on both design and assessment yields sophisticated understandings of the intricacies of translation of health messaging through digital media in culturally appropriate and relevant manners.

Hirschhorn et al. (2024) highlighted the use of SMS-based digital health technologies by pregnant and postnatal women who live in Kenyan informal settlements, illustrating that digital health interventions can enhance care-seeking behaviours and knowledge among exceedingly vulnerable populations. The research is also timely because maternal mortality in informal settlements in Kenya stands for at least 560 deaths per 100,000 live births, and the situation is likely to be more deplorable in the slums because of widespread poverty and inaccessibility to quality health services. The research uncovers both the possibilities and limitations of digital health innovations in accessing marginalised communities. Despite the success of the intervention, the authors suggested that additional research is necessary to tailor and target interventions to individuals who were less likely to sign up for the PROMPTS system, insofar as digital divides and accessibility are still formidable obstacles to universal coverage.

MomConnect is one of Africa's most successful large-scale mHealth programmes, initiated by South Africa's National Department of Health to expand antenatal services and strengthen maternal health across the country, reaching more than 1.5 million pregnant women. The programme has been sending twice-weekly health information text messages to pregnant and postpartum women and a helpdesk for patient complaints and questions, scaling to reach more than 95% of public health facilities in only three years. Peter, Benjamin, LeFevre, Barron, and Pillay (2018) shared ten critical lessons from MomConnect implementation, offering significant learning on scaling digital health innovations. The success of the programme illustrates the potential for scaling up large-scale digital health programmes to national reach with the backing of government dedication and clever implementation approaches.

Coleman et al. (2020) undertook a multicentre cohort intervention study that analysed the impact of maternal mHealth text messages on the use of maternal and child health care services in South Africa. This study adds to the knowledge of how digital messaging can be embedded in current health

systems to enable greater use of services. The fact that the study is multicentre offers strong evidence for the efficacy of text messaging interventions in a variety of health settings, adding to the body of evidence for mobile health interventions in low-resource settings.

Adepoju et al. (2017) undertook an extensive scoping review of mHealth clinical decision support applications in sub-Saharan Africa, synthesising systematic evidence on the state of the art and prospects for mobile health technologies in facilitating healthcare delivery throughout the region. This systematic review offers essential context for understanding the big picture of digital health interventions outside of discrete programme evaluations.

Braun et al. (2013) undertook a systematic review of literature on community health workers and mobile technology with a specific focus on how information and communication technologies can be utilised to enhance the performance of community-based health care delivery. The research has particular relevance to African contexts where community health workers play critical roles in extending healthcare to rural and underserved populations. The integration of mobile technology and community health workers is a novel strategy for reducing healthcare access disparities, especially in rural and resource-scarce environments where there is no organised healthcare infrastructure.

Lau et al. (2014) undertook a mixed methods study of antenatal health promotion using short message service in a midwife obstetrics unit in South Africa. Their study offered a glimpse into the integration of SMS-based interventions in the provision of regular antenatal care, the everyday uses of mobile health technologies in the prevailing healthcare setting.

Theoretical Framework

This study is anchored on the Uses and Gratifications Theory (UGT), a foundational audience-centered communication framework that aligns with the methodological focus on understanding how rural women actively engage with digital media for maternal health information. The Uses and Gratifications Theory, developed by Katz, Blumler, and Gurevitch (1974), represents a paradigm shift in mass communication research by focusing on "what people do with media" rather than "what media does to people". UGT recognises that individuals are active, goal-oriented media users who deliberately select and use media content to satisfy specific needs and desires.

Within the context of this study, UGT provides an appropriate lens for examining how rural women actively seek out, select, and utilise digital media to fulfil specific maternal health-related needs. The theory posits that audiences are motivated by various gratifications, which McQuail, Blumler, and Brown (1972) categorised into key dimensions: information-seeking (acquiring knowledge about antenatal care, safe delivery practices, and postnatal care), personal identity (reinforcing confidence in maternal health decisions and empowerment), social integration (connecting with other mothers, healthcare

workers, and support networks), and entertainment/diversion (engaging with health content in accessible and relatable formats).

The theory's emphasis on audience agency is particularly relevant for understanding maternal health-seeking behaviours in rural communities. Rural women are not merely passive consumers of health messages; rather, they actively choose which digital platform to use, what health content to engage with, and how to interpret and apply that information based on their individual circumstances, psychological needs, and social contexts. This active selection process is driven by their perceived needs for maternal health information, their readiness for behaviour change, and the extent to which social media content gratifies their specific health-related concerns.

Furthermore, UGT accounts for the motivational factors that influence health communication behaviour, recognizing that different individuals may use the same social media content for different purposes some seeking practical information, others seeking emotional support, and still others seeking validation for their health decisions. By examining the uses and gratifications of digital media use among rural women, this study can better understand the relationship between media consumption patterns and maternal health-seeking behaviours, thereby providing insights into how digital media interventions can be optimized to meet the diverse needs of this population.

Methodology

This study employed a quasi-experimental design with pre-test and post-test control groups to evaluate the impact of digital media campaigns on maternal health-seeking behaviours in rural South-West Nigeria. Six communities across three states (Ondo, Ogun, and Oyo) were purposively selected based on similar socioeconomic characteristics, functional primary health centres, and comparable mobile phone penetration rates, then randomly allocated through stratified randomisation into intervention groups Ifedore (Ondo), Ijoun (Ogun), and Oke-Iho (Oyo) and control groups Idanre (Ondo), Imeko (Ogun), and Ayetoro (Ogun). The target population comprised pregnant women and nursing mothers within 12 months postpartum, representing the critical continuum of maternal care. Using Slovin's formula with a population estimate of 24,000 from PHC records and 5% margin of error, a sample of 400 respondents was determined and proportionally distributed across communities using multistage sampling with systematic random selection of eligible participants. Data were collected using a validated structured questionnaire comprising sociodemographic variables and 15 items assessing media exposure, maternal health knowledge, and health-seeking behaviours. Following baseline data collection, a 12-week digital media intervention

delivered maternal health messages in English and Yoruba via WhatsApp groups, Facebook pages, and SMS, moderated by trained community health workers, while control communities received routine care only. Final data were collected post-intervention from all participants. Quantitative data were analysed using SPSS version 26 through descriptive statistics, paired sample t-tests for within-group changes, difference-in-differences estimators for intervention effect, and propensity score matching to minimise selection bias.

Presentation of Findings

Research Question 1: What is the effect of Digital Media exposure on antenatal care (ANC) attendance in selected rural communities?

Table 1: Difference-in-Differences (DiD) Analysis of Maternal Health Outcomes

Outcome	Pre-Intervention	Post-Intervention	DiD Effect (95% CI)	p-value
ANC Attendance				
- Intervention	58.0%	78.5%	17.3% (11.2, 23.4)	<0.001
- Control	56.5%	61.0%		
Facility Delivery				
- Intervention	42.0%	65.5%	19.8% (13.1, 26.5)	<0.001
- Control	44.5%	49.0%		
Skilled Birth Attendance				
- Intervention	48.5%	70.0%	18.2% (11.7, 24.7)	<0.001
- Control	46.0%	52.5%		

Adjusted for baseline differences using PSM

Analysis: This reveals that exposure to digital media messaging significantly increased antenatal care attendance by 17.3 percentage points (95% CI: 11.2-23.4; $p<0.001$), facility-based deliveries by 19.8 points (95% CI: 13.1-26.5; $p<0.001$), and skilled birth attendance by 18.2 points (95% CI: 11.7-24.7; $p<0.001$). Crucially, the control group showed minimal changes (4.5-6.5 point increases), confirming that observed improvements resulted specifically from the intervention. These findings demonstrate that targeted social media campaigns effectively bridge information gaps in rural settings, directly answering whether such exposure influences health-seeking behaviours.

Research question 2: What is the influence of Digital Media campaigns on Skilled Birth Attendance and Facility-based Delivery?

Table 2: Influence of Digital Media campaigns on Skilled Birth Attendance and Facility-based Delivery

Outcome	Pre-Intervention	Post-Intervention	DiD Effect (95% CI)	p-value
ANC Attendance				
- Intervention	58.0%	78.5%	17.3% (11.2, 23.4)	<0.001
- Control	56.5%	61.0%		
Facility Delivery				
- Intervention	42.0%	65.5%	19.8% (13.1, 26.5)	<0.001
- Control	44.5%	49.0%		
Skilled Birth Attendance				
- Intervention	48.5%	70.0%	18.2% (11.7, 24.7)	<0.001
- Control	46.0%	52.5%		

Analysis: The analysis shows that the facility-based deliveries and skilled birth attendance improved sharply among women exposed to the campaign. Facility deliveries rose from 42.0% to 65.5% (DiD = 19.8 pp; $p<0.001$), while skilled birth attendance increased from 48.5% to 70.0% (DiD = 18.2 pp; $p<0.001$). The control group recorded only minimal improvements (4.5–6.5 pp), indicating that the gains were attributable to the intervention.

These outcomes underscore the role of digital media as an effective tool for altering maternal-health-seeking behaviour. The campaigns' frequent reminders, community-based WhatsApp groups, and audio-visual storytelling evidently reinforced the importance of skilled delivery, thereby promoting behavioural change.

Research question 3: What is the outcome of maternal health between communities exposed to campaigns and those not exposed?

Table 3: Logistic Regression for Factors Influencing Campaign Effectiveness

Predictor	ANC Attendance (aOR)	Facility Delivery (aOR)	Skilled Birth (aOR)
Digital Media Exposure	**2.45 (1.78, 3.38)**	**2.87 (2.02, 4.08)**	**2.62 (1.85, 3.71)**
Age > 30 years	1.12 (0.82, 1.53)	0.97 (0.70, 1.35)	1.05 (0.75, 1.47)
Tertiary Education	*1.78 (1.15, 2.76)*	**2.04 (1.28, 3.25)**	*1.92 (1.19, 3.09)*
High Digital Literacy	**2.31 (1.62, 3.29)**	**2.67 (1.82, 3.92)**	**2.52 (1.71, 3.72)**
Joint Decision-Making	*1.63 (1.12, 2.38)*	**1.82 (1.23, 2.69)**	*1.71 (1.15, 2.55)*
Voice/Video Preference	**1.97 (1.41, 2.76)**	**2.24 (1.57, 3.20)**	**2.12 (1.48, 3.04)**

p<0.01, p<0.05; aOR = adjusted Odds Ratio; Reference groups: No social media exposure, Primary education or less, Low digital literacy, Spouse-only decisions, Text-based content

Analysis: The analysis reveals that digital media exposure more than doubles the odds of positive outcomes (aOR=2.45-2.87), while high digital literacy increases odds by 2.31-2.67 times. Content format emerged as critical: voice/video messages had nearly double the impact of text-based content (aOR=1.97-2.24). Joint family decision-making increased facility delivery odds by 82% compared to autonomous decisions. Crucially, tertiary education amplified effects (aOR=1.78-2.04), while age showed no significant influence. These findings provide actionable insights for designing future campaigns to maximise reach and effectiveness among vulnerable populations.

Research Question 4: What is the socio-dynamic and digital factors moderating the effectiveness of the campaigns?

Table 4: Subgroup Analysis of Intervention Effects

Subgroup	ANC Attendance (DiD%)	Facility Delivery (DiD%)	p-interaction
Digital Literacy			
- Low (n=142)	9.2%	11.5%	0.013
- High (n=258)	22.7%	25.3%	
Education			
- ≤ Primary (n=221)	12.1%	14.8%	0.038
- ≥ Secondary (n=179)	21.5%	24.9%	
Decision Maker			
- Autonomous (n=128)	18.3%	20.1%	0.217
- Joint/Family (n=272)	19.5%	22.4%	

DiD% = Percentage-point difference in Difference-in-Differences estimates

Analysis: The analysis identifies a pronounced digital divide whereby high-literacy women showed 2.5 times greater ANC improvement (22.7% vs. 9.2%; p-interaction=0.013) than low-literacy peers. Similarly, women with secondary and above education had nearly double the facility delivery improvement (24.9% vs. 14.8%; p=0.038) compared to those with primary education or less. Decision-making structures showed no significant differential effects (p=0.217), indicating consistent impact across household decision-making models. These results highlight the need for complementary digital literacy training and underscore how socio-educational factors moderate campaign success.

Discussion of Findings

This study investigated to know if digital media usage affected antenatal care visits in women residing in rural area or not. It established that there was indeed a notable rise in ANC visits for the women exposed to the social media campaign, from 58.0% to 78.5%. This is a difference of 17.3 percentage points ($p < 0.001$). This large increase, as compared to the small increase for the unexposed, shows that messages conveyed through WhatsApp, Facebook, and SMS helped in the promotion of ANC uptake. This finding agrees with Feroz, Perveen, and Aftab (2017), who asserted that digital media can be utilised in creating awareness, removing myths, and facilitating people in using maternal health services if used properly. The theory states that exposure to relevant health messages has the ability to change what people view as important and highlights the importance of maternal care. This is also in accordance with Wakefield, Loken, and Hornik (2010). They argue that mass media campaigns can modify health behaviour if they are well developed and disseminated. The findings reveal that the social media campaign had a significant effect on both facility-based delivery and skilled birth attendance. Among those exposed to social media campaign, facility delivery rose from 42.0% to 65.5%, and skilled birth attendance rose from 48.5% to 70.0%. Both results are statistically significant ($p < 0.001$). The findings demonstrate that the campaign was able to affect key maternal health decisions above and beyond antenatal care. This is in line with Adanikin et al. (2020), which proved that mobile health interventions can lead to more use of postnatal care among more people in Nigeria. They proved that well-designed digital interventions can lead to better outcomes among mothers. The results also confirm the Diffusion of Innovations Theory because social media messages acted as the new idea diffusing over networks and encouraging safer delivery practices.

This is also consistent with the findings of Laar, Bekyieriya, Isang, and Baguune's (2019) study on mobile health technology-based community mobilisation for child and maternal health in rural Ghana. They confirmed that with adequate support from the community, these interventions had great potential in increasing the use of health services. For the third study question, that of comparing the health results of mothers in areas which were exposed to a social media campaign and those that were not, the evidence indicated that the former category of mothers had significantly better gains across all outcomes. The areas that were not exposed to the campaign had minimal gains of below 7 percentage points. This analysis provides evidence that social media use was the leading reason for this change in behaviour. The findings align with what Harding, Matias, Manu, Yameogo, Ali, and Pérez-Escamilla (2020) penned about the Breastfeed4Ghana campaign and how imperative it

was to customise digital health interventions for local environments as well as how social media can support improving maternal health on the African continent. This is also in agreement with the work by Coleman, Bohlin, Thorson, Black, Mechael, Mangxaba, and Kallander (2020). They analysed numerous centres and checked how maternal mHealth text messages impacted health. They established strong evidence that text messaging is beneficial in various health scenarios. This study's intervention design is successful since the messages are not complex and are culturally relevant. This shows that we should link digital strategies to what the community needs. Bello, Esan, Akerele, and Fadare (2022) highlight the importance of using messages that are culturally relevant.

The final research question considered the socio-demographic and online predictors of campaign effect. Logistic regression found that use of social media doubled the chances of ANC visits, facility births, and skilled care reception (aOR = 2.45–2.87, $p < 0.01$). Strong digital literacy, a university education, partner decision-making, and voice and video preference were all predictors for desired outcomes. Women with higher digital literacy and education reacted positively, with more than twice the increase in ANC and delivery compared to women who had low literacy or lower education. This agrees with the finding of Lee, Nurmatov, Nwaru, Mukherjee, Grant, and Pagliari's (2016) systematic review and meta-analysis that mHealth interventions in maternal, child, and newborn health in low and middle-income countries functioned differently based on user engagement and familiarity with technology. The finding also supports Ezeanochie et al.'s (2015) proof that mobile phone messaging positively affects knowledge and awareness among Nigerian women. This can be scaled up for reproductive health messaging. Decision-making process did not, however, change the outcomes greatly ($p = 0.217$). This suggests that the intervention worked for all categories of household decision-making. This is contrary to the popular belief that women's access to care is controlled by men. Fantaye, Okonofua, Ntoimo, and Yaya (2019) indicated this in reference to cultural beliefs and how gender roles function. The likely reason for this surprise result is that controlled WhatsApp group and home messaging managed to cut through traditional barriers and stretched the campaign's reach. This validates Ntoimo, Hazlett, Harrison, Carroll, Irwin, and Hoving's (2013) postulation that healthiness is a result of people receiving adequate health information and following expert advice through easily accessible channels.

Conclusion and Recommendations

This study concluded that a socially adapted maternal health campaign on social media can greatly increase the percentage of rural women who received antenatal care, delivered in facilities, and received skilled attendance at delivery, compared to women who did not. The results show that targeted utilisation of digital media, especially using local language and multimedia

information, can change how people access health care in underserved areas. It was therefore suggested that those working in healthcare should utilise social media campaigns more alongside other physical communication, created by community health workers, to encourage better health-seeking behaviour among mothers in rural Nigeria.

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