

Maternal Healthcare Interventions Implemented Amid the COVID-19 Pandemic in Mmabatho, North-West, South Africa

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Abstract

South Africa has made substantial investments in enhancing maternal and neonatal health services; nevertheless, the country fell short of achieving the Millennium Development Goals (MDGs) for maternal and child health by 2015. Despite having established national maternal and neonatal health policies and objectives, the absence of a unified quality improvement approach poses challenges. The impact of the COVID-19 epidemic has further complicated these difficulties, creating obstacles to healthcare access and hindering the implementation of maternal and perinatal interventions. The purpose of the study was to explore the interventions implemented in maternal healthcare in Mmabatho, North-West, South Africa, amidst the challenges posed by the COVID-19 pandemic. The study employed a qualitative research design, specifically utilizing key informant interviews as the primary method of data collection. The findings underscore the pivotal role played by community-based interventions, particularly the involvement of community health workers, in providing information and support for maternal healthcare. Although awareness of digital health programs varied among participants, they were commended for disseminating knowledge about maternal healthcare. Recommendations include the development of mHealth initiatives, the expansion of community-based interventions, the involvement of males in maternal healthcare, and the implementation of monitoring and evaluation systems should be considered to assess the efficacy of interventions.

Keywords: *Interventions, Access and Availability, Maternal Health Care, COVID-19.*

Introduction

The South African government adopted Primary Health Care (PHC) as a cost-effective measure to enhance the health status of citizens unable to afford private health care services (Health, 2013). Concurrently, in the same year, free maternal health care services for expectant women and children under the age of 6, along with universal access to primary health care for all citizens, were introduced. The primary focus of these policies was on developing and improving healthcare facilities, especially clinics, and maternal health care-related programs. These programs encompassed immunizations, child nutrition, child and maternal health care, disease management, and Act No 92 of 1996, which granted reproductive-age women the legal right to terminate pregnancies (Nteta et al., 2010). Despite various interventions aimed at improving maternal healthcare access, these initiatives often fail to align with women's experiences in seeking maternal healthcare. Among these interventions, community-based strategies have been identified as pivotal components capable of reducing maternal mortality, particularly in remote areas of developing countries.

Over the past three decades, South Africa has grappled with a complex disease burden, including colliding epidemics such as Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and Tuberculosis. Child and maternal mortality have had profound effects on the health and well-being of citizens. The emergence of the HIV/AIDS epidemic in the early 2000s, following apartheid, significantly disrupted the country's health system (Achoki et al., 2022; Gray et al., 2016; Wiysonge et al., 2011).

Literature Review

Maternal health has been declared a global crisis, recognizing that the lives of millions of women can only be saved through the provision of safe and quality maternal healthcare services. In 2016, the South African Demographic and Health Survey reported a maternal mortality ration of 536 deaths per 100,000 live births, with a confidence level range of 270 to 802. This is an alarming increase in comparison to the maternal

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mortality ratio recorded by SADHS in the year 1998, which was around 150 deaths per 100,000 live births with a confidence range of 77 to 223 (National Department of Health & ICF, 2019). In light of the above statement, Statistics South Africa indicates an improvement in maternal healthcare compared to the 7-year period before the 2017 South African Demographic Health Survey, where the maternal mortality ratio was 119 pregnancy-related deaths per 100 000 live births (Selman, 2023). This improvement is supported by Govender et al.'s (2020) study on the contextualized implications of the Coronavirus pandemic in Eastern and Southern Africa. Despite progress, challenges persist in South Africa's healthcare system, dating back to the apartheid era. Statistics South Africa notes improvements in maternal healthcare, but efforts to enhance utilization and access face obstacles, including prolonged waiting times due to understaffed healthcare workers, poor hygiene, inadequate infection control measures, and a persistent shortage of medication and health equipment since 1994 (Brown & Sprague, 2021; Maphumulo & Bhengu, 2019; Muller et al., 2020; Wabiri et al., 2016). Ongoing efforts are necessary to address these challenges and ensure sustained advancements in maternal healthcare in South Africa.

Maternal healthcare services, encompassing maternal and infant healthcare attendance from pregnancy through delivery, are pivotal factors for ensuring a healthy and safe pregnancy and childbirth (Bomela, 2020; Organization, 2016; Psaros et al., 2020). It is imperative for women of reproductive age to have unfettered access to these services, including antenatal care, the presence of skilled healthcare workers, and infant vaccinations and immunizations. Regular antenatal care visits afford healthcare workers the opportunity to identify health-related issues during pregnancy, thereby reducing the likelihood of perinatal morbidity and mortality. The World Health Organization (WHO) recommends a minimum of four antenatal care check-ups throughout pregnancy.

Psaros et al. (Psaros et al., 2020) posit that in South Africa, antenatal care services are not optimally utilized, and women accessing maternal healthcare services in the country often encounter substandard treatment (Organization, 2016; Psaros et al., 2020). According to the South African Demographic and Health Survey of 2016, while 76% of women got at least four ANC visits, only 47% had one during the first trimester, as advised. This represents a significant improvement from 1998, when just 28% of women received ANC throughout the initial stage of pregnancy (National Department of Health & ICF, 2019). Despite concerted efforts to decrease maternal mortality, South Africa grapples with a high maternal mortality rate. The National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD) delineates maternal mortality rates per province, with Limpopo province being the sole province displaying a decline in maternal mortality rates. Infections unrelated to pregnancy and childbirth constituted the largest category of maternal mortality between 2002 and 2013. Bomela (Bomela, 2020) reports that despite numerous attempts by the South African government to mitigate maternal mortality, socio-demographic factors, including women's household income, education level, social support, and marital status, continue to impact high mortality rates.

The NCCEMD, analysing seven reports since 1997, highlights the root cause of maternal mortality as the duration and severity of complications during childbirth (Bomela, 2020). Additional factors include a shortage of healthcare professionals and facilities, often damaged, neglected, or unavailable. Dysfunctional emergency medical services and unreliable transport within and between provinces further contribute to high maternal mortalities. Soma-Pillay et al. (Soma-Pillay et al., 2020) report that about 60% of maternal deaths in South Africa could have been prevented with improved healthcare quality.

(Bomela, 2020) argues that various interventions have been implemented to address and combat the high rate of maternal deaths, but the outcomes have not met expectations. Despite a significant 2.46% decline in maternal mortality rates in developing countries in 2017, the rates have increased with maternal age (Organization, 2016). Ongoing efforts are needed to enhance the quality of maternal healthcare services and address the multifaceted challenges contributing to maternal mortality in South Africa.

The provision of maternal healthcare can be evaluated based on the availability of interventions for women before and after childbirth. To reduce the risk of prenatal mortality and enhance the pregnancy experience, WHO (Organization, 2016) recommends that women receive at least eight antenatal care (ANC) contacts. However, maternal healthcare interventions often adhere to a rigid and hierarchical functional framework,

instead of aligning with the socio-cultural and economic realities of the communities they serve, as noted by Sharma (Sharma et al., 2018). Studies (Abraham & Melendez-Torres, 2023; Sharma et al., 2018) conducted indicate a substantial increase in maternal care interventions, primarily centred on antenatal care availability, with an average rise of 20% globally. Significant improvements have been observed in Asia, with a 13% increase between 1990 and 2000, although antenatal care uptake remains the lowest in this region. In Sub-Saharan Africa, the rise over the same period did not exceed 4%, despite 75% of women using antenatal care services.

The high maternal mortality rate in Sub-Saharan Africa may suggest inadequate quality of care at antenatal care, among other institutional and community-based factors. Quality care during both pregnancy and childbirth is crucial for maternal and infant survival. The utilization of antenatal care in remote areas is influenced by social and cultural factors. Increased access to antenatal care, the availability of competent birth attendants, and local pregnancy care awareness campaigns all contribute to healthier pregnancies and deliveries (Sharma et al., 2018). Various models have been designed to address the different levels of healthcare required for a woman's reproductive cycles, including prenatal and postnatal stages. One widely used model is the Three Delays model, emphasizing the presence of a skilled birth attendant linked to a functioning health system in community-based interventions in maternal healthcare.

Findings from a study on support for the safe motherhood program in Nepal by Barker et al. (Barker et al., 2007) indicate that community-based maternal health interventions led to more women receiving antenatal care, utilizing experienced childbirth attendants, and improving their use of sanitary practices compared to women in the absence of intervention. Over a four-year period, the intervention area experienced fewer maternal deaths (69/100,000 live births) compared to the control group (341/100,000). This underscores the potential improvement in childbirth outcomes and healthy behaviours by focusing on a continuum of community-based to health-care facility-based care. Additionally, Barker et al. (Barker et al., 2007) advocates for more community-based interventions, recognizing that a high percentage of women continue to give birth at home in low-income countries, where maternal death rates are highest. In Malawi, a randomized controlled trial (RCT) involving a sample of 150,000 women investigated various community-based health promotion strategies, encouraging women to address challenges related to their health and demand for healthcare while strengthening services at the facility level.

Both public and private sectors should implement interventions that enhance accessibility for community members and families through outpatient and community-based initiatives, emphasizing a full life cycle approach to health services. These interventions should aim for comprehensive coverage and high-quality integrated healthcare packages, establishing functional links across various levels of care to enhance the effectiveness of related programs. Such measures would further advance maternal and newborn healthcare programs, providing guidance to healthcare workers in adopting optimal practices and ensuring the delivery of a holistic package of maternal and newborn healthcare.

Theoretical Framework

This study employs the Health Belief Model, a widely utilized theoretical framework in public health and healthcare research, to investigate how individuals perceive health risks and the factors influencing their health-related decision-making. Originally formulated by Rosenstock in 1974, the Health Belief Model has since been extensively applied in studies on health behaviour and public health, providing insights into how individuals perceive and respond to health threats and interventions. The model has been purposefully chosen for this research on maternal healthcare measures during the COVID-19 pandemic in Mmabatho, North-West Province, South Africa, owing to its adaptability and modifications over time to suit diverse health-related contexts and behaviours (Anuar et al., 2020; Huang et al., 2020; Rosenstock et al., 1988; Shmueli, 2021).

The Health Belief Model primarily focuses on examining people's perceptions and beliefs about health risks and the benefits of taking action to mitigate those risks. Several key elements are explored within the model:

Perceived Susceptibility: This centres on an individual's perception of their vulnerability to a specific health condition or risk. In the context of this study, it involves assessing how pregnant women in Mmabatho perceive their susceptibility to maternal health issues, including the potential impact of COVID-19.

Perceived Severity: This refers to an individual's assessment of the seriousness of a health condition or risk. In line with this study, it involves exploring how pregnant women perceive the severity of maternal health issues and the potential consequences of not seeking appropriate care during the COVID-19 pandemic.

Perceived Benefits: This examines the individual's belief in the effectiveness of a recommended health action or intervention. In the context of this study, it involves examining how pregnant women during the COVID-19 era perceived the benefits of various maternal healthcare interventions, such as community-based programs, digital health initiatives like MomConnect, and health system improvements. Additionally, examining the identified barriers and obstacles they anticipated in taking up health-related actions, including barriers to accessing maternal healthcare services during a pandemic, such as the fear of contracting COVID-19 or logistical challenges.

The Health Belief Model also acknowledges the roles of cues to action that prompt individuals to take specific health-related actions. In this study, factors serving as cues to action for pregnant women in Mmabatho to seek maternal healthcare services during the pandemic are explored. These may include the role of community health workers, text messages from MomConnect, or other external influences.

Methodology

The study employed a qualitative research design, specifically utilizing key informant interviews as the primary method of data collection. The phenomenological approach was chosen to capture rich and detailed descriptions of participants' experiences. Through in-depth interviews, phenomenology facilitated the exploration of various facets of individuals' experiences related to maternal healthcare during the COVID-19 pandemic.

Study Area

The study was undertaken in Mmabatho, North West, South Africa. Mmabatho was chosen because, despite the North-West Province being identified as the worst performer in maternal health (Mohulatsi et al., 2024), there is limited research on interventions for maternal healthcare in this specific setting. A study on intervention for mothers and babies to reduce maternal and prenatal mortality was conducted in three South African provinces (Chetty et al., 2023). The study aimed to examine the effectiveness of the Mpatlalatsane initiative (Maternal healthcare intervention) on neonatal mortality and stillbirth rates and assess if the experiences of patients with healthcare and neonatal care were affected by the COVID-19 pandemic. The rise in institutional infant and maternal deaths in Eastern Cape, Limpopo, and Mpumalanga corroborates with previous findings from Pillay (Pillay et al., 2021), additionally pointed out that hiked maternal and neonatal mortality was a direct effect of COVID-19-related deaths in pregnant women as well as a secondary outcome due to inadequate access to healthcare amid the outbreak of the pandemic. The study compared the implementation of the Mpatlalatsane initiative in three provinces to national reports by (Pillay et al., 2021; Soma-Pillay et al., 2020). During the COVID-19 pandemic, the stillbirth rate in three provinces appeared to be rather stable. Even though there have been studies conducted on interventions for maternal healthcare, there is a lack of knowledge regarding practical interventions for maternal health care services in Mmabatho during disease pandemics. While the study's findings may not be universally applicable, obtaining an emic perspective on interventions for maternal healthcare in Mmabatho is crucial for developing comprehensive maternal health programs. This approach can help safeguard women in rural settings from the impact of disease pandemics.

Population

The study involved 20 black women residing in Mmabatho, North-West South Africa, who accessed maternal healthcare services from March 5, 2020 until July 2022. The choice of this population was justified

by Mmabatho's demographics, with 95.5% being black Africans reliant on public (Mohulatsi et al., 2023). Those who did not access maternal healthcare services during the specified period (From before March 2020 and after July 2022) were excluded. The sample comprised of 10 expectant women, 5 nursing mothers with infants under the age of 1, 5 pregnant women and 10 healthcare professionals. 10 healthcare professionals comprised of 2 obstetricians, 3 midwives, 3 nurses as well as 2 family physicians with more than 2 years' experience in the field, ensuring diverse perspectives on maternal healthcare during the COVID-19 outbreak in the region. 10 healthcare workers were not subjected to the same inclusion and exclusion criteria as women accessing maternal healthcare services.

Sampling Technique

Purposive sampling was employed to select participants with expertise and experience relevant to the research issues. The inclusion criteria aimed to engage a diverse group, including pregnant women, nursing mothers, and healthcare professionals providing maternal healthcare services.

Data Analysis

The study utilized Braun and Clarke's six steps of thematic analysis, involving a meticulous examination and analysis of interview transcripts to identify significant themes, trends, and insights related to maternal healthcare services during the COVID-19 outbreak in Mmabatho. The analysis procedure included getting familiar with the data collected, identifying preliminary codes, coding the data and searching for themes, categorizing and naming themes as well as interpreting the findings. The following Braun and Clarke's 6 steps of thematic analysis were applied:

Step 1: Getting Familiar with Data

The researchers transcribed data by listening to recordings to become familiar with the information gathered. This stage supplied the researchers with their starting point for further (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Step 2: Identification of Preliminary Codes

This step allowed the researchers to discover interesting and important patterns and themes. Despite being more numerous and specific than themes, codes offered an indication of the context to be investigated (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Step 3: Identification of Themes

This step allowed the researcher to group codes initially extracted from the data collected according to the study's objectives while determining the interconnections and connections among codes, themes, and subthemes (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Step 4: Review of Data

The step allowed the researcher to review the relationship between the codes and themes initially extracted from the data collected (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Step 5: The Definition of Themes

This is the step before the production of the report. This step allowed the researcher to define and assign names to themes in line with the objectives of the study (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Step 6: The Production of the Report

The step allowed the researcher to turn the analysis of the data gathered into a report in line with the research objectives, questions, and themes as well as the literature evaluated (Braun & Clarke, 2006; Mohulatsi et al., 2023).

Triangulation was implemented to enhance the validity and dependability of the results. This involved cross-referencing data from interviews with individuals representing different viewpoints, such as pregnant women, nursing mothers, and healthcare professionals. Triangulation ensured the confirmation of findings and a comprehensive understanding of the topic. In summary, the combination of purposive sampling, phenomenological interviews, content analysis, and triangulation provides a robust and thorough approach for exploring the multifaceted experiences and perceptions of maternal healthcare during the challenging context of the COVID-19 pandemic in Mmabatho.

Presentation and Discussion of Findings

The subsequent section outlines the socio-demographic characteristics of the study participants, encompassing age, marital status, employment status, and educational level. The research findings indicate that participants aged 26-30 were more prominently featured, constituting 45% of the overall population. Conversely, individuals within the 36-55 age bracket constituted the minority of respondents, comprising only 10%. Marital status distribution revealed a higher participation rate among married women, accounting for 60%, while both separated and single participants were each represented by 15%, and divorced individuals comprised 10%.

Maternal Age and Access to Maternal Healthcare

The study conducted by He et al. (He et al., 2022) suggests a positive correlation between maternal age and access to maternal healthcare services. The research findings indicate a significant association between maternal age and access to maternal healthcare services in Mmabatho, North-West South Africa, with women aged 26-30 being more likely to access such services compared to those aged 36-55. Women in the 36-55 age group were less inclined to utilize maternal healthcare services, possibly due to the assumption that they have previous childbirth experience, making them more knowledgeable about maternal healthcare. This contrasts with the results of a study on access and utilization of maternal health in rural Ghana by Nuamah et al. (Nuamah et al., 2019), which found that older women over the age of 30 were more likely to have access. Additionally, a study by Mekonnen et al. (Mekonnen et al., 2019) affirmed that mothers below the age of 30 faced challenges in accessing maternal healthcare compared to their older counterparts.

Marital Status and Access to Maternal Healthcare

The marital status of women significantly influences access to maternal healthcare services, as supported by the study's findings. According to the research, 50% of married women in Mmabatho, North-West South Africa, were more likely to access maternal healthcare services compared to the 10% of divorced women. Married women reported better access to maternal healthcare, attributing it to spousal support. A robust support system is crucial for accessing maternal healthcare. These empirical findings align with the results of a study by Samba et al. (Samba et al., 2020), indicating that married women utilize maternal healthcare services more than single women. The study also emphasized that single pregnant women tend to use fewer maternal healthcare services due to limited financial resources. Furthermore, in Indonesia, single pregnant women face social stigma, hindering them from accessing and utilizing maternal healthcare services (Wulandari et al., 2020).

Employment Status and Access Maternal Healthcare

The study's findings indicate that employed women are more likely to access maternal healthcare services, aligning with the research of Nuamah et al. (Nuamah et al., 2019), which establishes a positive relationship between access to maternal healthcare and a woman's employment status. Supported by the study's results,

around 50% of employed women were more likely to access maternal healthcare services. Moreover, employed women exhibited a higher likelihood of affording maternal healthcare services from private institutions during temporary clinic closures due to COVID-19 infections. They were also more capable of covering transportation costs to and from various healthcare facilities compared to unemployed women and students. The study further underscores those women from the highest household wealth index quartile demonstrated increased odds of accessing maternal healthcare services compared to women from the lowest quartile. Another study by Furuta and Salway (Furuta & Salway, 2006) contends that employed women with a household income have financial control, facilitating their ability to afford healthcare services and gain exposure to essential information related to maternal and child health compared to other women.

Educational Level and Access to Maternal Healthcare

The study's findings reveal that over 50% of women with matric or equivalent qualifications were more likely to access maternal healthcare services compared to those with only grade 9 or below. Additionally, women with matric or equivalent qualifications were more inclined to access maternal healthcare services based on their understanding of the importance of all the services offered throughout pregnancy. Furthermore, women with matric and Master's degrees were also more likely to access maternal healthcare services due to their understanding of the importance of acquiring more knowledge about the necessary tools of maternal healthcare services. This includes the significance of socialization among different women as a means of sharing experiences. Therefore, the higher the level of education, the greater the likelihood of a change in attitude towards the use of maternal healthcare services. These findings align with a study by Tsawe et al. (Tsawe et al., 2015) conducted in Swaziland, which revealed that literate women were more likely to access maternal healthcare services compared to women with no education.

Education level exerts a powerful influence on healthcare, and this is evident in maternal healthcare as well. Women with formal education have been associated with higher odds of accessing and utilizing maternal healthcare services compared to women with no formal education. The utilization of maternal healthcare is closely tied to a woman's level of education. For example, 69.3% of women without formal education were less likely to access antenatal services compared to the 69.8% of women with formal education who were more likely to access antenatal services (Mlambo et al., 2023). Women with formal education can access knowledge about the importance of antenatal health and other maternal healthcare-related services, unlike women without formal education. Most women obtained credible information about the COVID-19 pandemic, and their decision to seek maternal health services was not hindered by prevailing myths and misconceptions about COVID-19. Accessing maternal healthcare services provides healthcare workers with the opportunity to detect health issues that might arise during pregnancy, contributing to the early detection of possible complications, which plays a significant role in preventing maternal mortality. Thus, the level of women's education plays a crucial role in the rate of maternal mortality.

Interventions in place for access and availability of maternal healthcare services during COVID-19 in Mmabatho, North West

Community Healthcare Workers initiative

Based on the study's results, community health professionals play a crucial role in maternal healthcare by offering essential information to women during pregnancy. Some of these professionals are experienced mothers who serve as support networks for expectant mothers in Mmabatho. The findings align with Le Roux et al. (Le Roux et al., 2020), who asserted that the engagement of community health workers has yielded positive outcomes in various regions of South Africa. This is further substantiated by the following excerpts from interviews.

"Community-based interventions made a significant difference, even though it was difficult for our community workers to go out and assist health care providers with patients due to the virus." However, it is an effective initiative that has benefited the maternal healthcare industry."

(Interviewee No. 16; October 13, 2021).

The study's results demonstrated that the support from community healthcare workers was essential and was seen as a support mechanism to the role of family members. Participants' indicated challenges in receiving the necessary support from their spouses or families in general but were hindered by the Covid-19 restrictions of movement. The community healthcare workers initiative acted as replacement for family support, this translated to women accessing maternal healthcare in facilities. This finding is consistent with Barker et al. (Barker et al., 2007) to found that community-based maternal health interventions were important and effective in encouraging women to obtain antenatal care. This adds an important dimension to the Health Belief Model theory which is the importance of social support in determining perceived vulnerability and benefit. The excerpts below attest to this:

“As much as I knew that I needed to attend all my prenatal appointments, for the sake of the baby and my well-being, I still needed my family to fully support me. It was not an easy journey especially because of the preventive measures of COVID-19. I had wished to fully experience pregnancy with my partner by my side but it was rather almost impossible”

(Interviewee No. 22, 26 October 2021).

The study's findings align with the outcomes of Uwambaye et al. (Uwambaye et al., 2020) research on COVID-19: Pandemic adaptability in prenatal care for improved pregnancy outcomes. As Uwambaye et al. (Uwambaye et al., 2020) emphasized, the engagement of Community Health Workers (CHWs) and the utilization of mobile health assistance are instrumental in averting pregnancy complications and addressing various maternal health issues. The interview excerpts provided above illustrate the effectiveness and utility of maternal healthcare interventions during the pandemic. These programs are particularly crucial in developing countries like South Africa.

The Role of Digital Health in Improving Access to Maternal Healthcare Services

The study results indicate that many pregnant women experience forgetfulness, and initiatives such as telehealth can be beneficial (Barron et al., 2016). This initiative also aids healthcare personnel in organizing their daily responsibilities in alignment with scheduled appointments in the system. Telehealth, akin to MomConnect, was among the few interventions utilized during the COVID-19 pandemic. Short messaging services were employed in the Department of Health's mHealth programs to deliver essential information to women seeking maternity healthcare services amid the pandemic. The initiative functions by sending reminders to women utilizing maternal healthcare services about upcoming visits with healthcare workers, including dates for baby immunizations, infant and maternal wellness, and other maternal health issues. The rationale behind implementing this initiative is rooted in the understanding that some women may forget appointments and are hesitant to visit multiple clinics for maternal healthcare services due to concerns about contracting the virus and a fear of not receiving necessary information during pregnancy. This sentiment was affirmed by interviewees in one of the conducted interviews.

"At first, I thought it was spam because I did not understand how I could be receiving text messages about maternity information from numbers I did not recognize during COVID-19." I inquired about it at my next checkup, and the nurses on duty explained everything. However, the text messages were quite useful because it is easy to forget appointments, especially in such a hectic situation."

(Interviewee No. 22, 26 October 2021).

MomConnect Initiative During COVID-19 Pandemic in Mmabatho

Based on the findings outlined in the interview excerpts below, MomConnect proved helpful in providing information about maternity healthcare facilities to some women. Despite its imperfections, the application played a role in disseminating maternal healthcare information, thereby improving women's experiences with maternal health care. However, it was noted that several women seemed unaware of the MomConnect initiative. In subsequent interviews, participants confirmed that, despite its flaws, MomConnect is deemed an excellent and highly useful platform.

"I am not sure about other parts of South Africa or other women, but a friend told me about MomConnect, and it worked wonders for me." Text messages provide you with all of the information you need about immunization and other maternal healthcare services"

(Interviewee No. 8, 2 October 2021).

In addition to the above, the study findings indicate that the MomConnect App provides essential information that can lead to a decrease in maternal mortality. However, a lack of knowledge and awareness about the MomConnect initiative can hinder the effectiveness of the intervention. In spite of this, there is evidence of word of mouth as a tool for spreading awareness about the App. However, this poses a concern about those who may not be part of a network of those who hold knowledge. The excerpts below highlight the points above:

"As a young woman staying in the rural part of Mmabatho. mHealth came in handy. I told myself that I would look for information for myself for the sake of my well-being and that of my baby, instead of waiting for someone God knows from where to inform me about everything related to pregnancy and motherhood. I told myself that If I could spend half of my day on social media platforms, surely, I could use health digital platforms too. It seems like a lot of people did not know about digital platforms where to can get health-related information. I asked my cousin who was also pregnant, and she said she did not know it. I think more effort should be put into letting people know about these apps even though sometimes they might have glitches but overall, I am grateful that I discovered MomConnect".

While acknowledging that further efforts are required to ensure that the utilization of mHealth, especially mobile technologies during disease outbreaks, does not compromise patient safety and confidentiality, the empirical results of the study also underscored insights within Andersen's extended behavioral model. Women's attitudes toward the use of maternal healthcare services were identified as influential factors shaping their knowledge.

Contrary to the study's findings, Besada et al.(Besada et al., 2020) assert that the introduction of Community Health Workers (CHWs) has not led to improvements in the health of pregnant women or the rate of maternal mortality. However, Besada et al.(Besada et al., 2020) indicated that the Community Health Worker effort outperformed other initiatives during the COVID-19 pandemic. They provided essential psychological as well as emotional support to expectant mothers who experienced stress and anxiety due to COVID-19. The support that community healthcare workers offered was vital for the mental health of expectant mothers and pregnant women, even though it did not instantly result in significant health enhancements. Despite a higher risk of virus exposure for both women seeking maternal healthcare and community health workers, positive feedback from interviewed women validates the above statement. In subsequent interviews, participants confirmed that women make autonomous choices regarding maternity healthcare services; nevertheless, collaborative support and input from their loved ones are also essential.

"As much as I knew that I needed to attend all my prenatal appointments, for the sake of the baby and my well-being, I still needed my family to fully support me. It was an easy journey especially because of the preventive measures of COVID-19. I had wished to fully experience pregnancy with my partner by my side but it was rather almost impossible"

(Interviewee No. 22, 26 October 2021).

This aligns with the Health Belief Model theory, particularly, it highlights the influence of familial ties and input on women's perceived susceptibility, severity and benefits in accessing maternal healthcare services. Conversely, some participants highlighted challenges in receiving full support from their partners however, that did not deter them from accessing maternal healthcare services.

In this instance, community health professionals' feedback influenced how women perceived maternal healthcare services. The results of the study substantiate Agarwal et al.(Agarwal et al., 2015) findings, which emphasize that mHealth interventions have the potential to improve newborn survival by promoting and improving the delivery of various interventions, modifying the demand for quality maternal health care services, and validating the provision of targeted care and benefits. In subsequent interviews, participants

confirmed that there are opportunities to use digital health to provide access to maternal health care for women living in remote areas; yet, utilization continues to remain low. In certain circumstances, difficulties in using digital health to get maternal health services are related to common digital health issues.

“As a young woman staying in the rural part of Mmabatho. mHealth came in handy. I told myself that I would look for information for myself for the sake of my well-being and that of my baby, instead of waiting for someone God knows from where to inform me about everything related to pregnancy and motherhood. I told myself that If I could spend half of my day on social media platforms, surely, I could use health digital platforms too. It seems like a lot of people did not know about digital platforms where to can get health-related information. I asked my cousin who was also pregnant and she said she did not know it. I think more effort should be put into letting people know about these apps even though sometimes they might have glitches but overall, I am grateful that I discovered MomConnect”.

(Interviewee No. 2, 11 October 2021).

The study highlights the importance of accessibility to psychological and social supports (such as family support and financial assistance) as crucial to women's overall health and welfare before, during, and after pregnancy. Access to these services was limited during the COVID-19 pandemic, particularly for women without spouses. In subsequent interviews, participants confirmed that

“My pregnancy journey was quite an emotional rollercoaster. It is even hard when you are a first-time mother without any support, be it emotionally or financially. I had a difficult time, especially after being retrenched at work in mid-2020. I was diagnosed with mild depression at 7 months because everything was just overwhelming”

(Interviewee No. 10, 19 October 2021).

Furthermore, the results of the study emphasize the availability of knowledge, where and how women using maternal healthcare services receive all the information required during their pregnancy and delivery journeys, which has an important influence on accessing services. According to the findings, very few pregnant women had access to maternal health information from healthcare professionals. A significant portion of the women were new mothers, and while some had previously visited maternity wards, they were still uninformed regarding pregnancy risk indicators.

The study found that the population's perception of the severity of danger indicators was influenced by a dearth of solid maternal health information on pregnancy risk signs. Most new mothers were clueless about vital information on the first day/month to book for maternity, regular check-ups, and medication collection from healthcare workers. Such information should be disseminated to women using maternal healthcare services. Knowledge of risks impacts perceived susceptibility, severity and subsequently, benefit came through the help of family members, network of mothers, the community healthcare workers initiative, and digital platforms such as the MomConnect initiative. This indicates therefore, the importance of networks and community-based interventions as mitigating factors to the problem of lack of knowledge for some women during Covid-19.

The findings of the study are in line with the Health Belief Model. The key elements of the Health Belief Model were highlighted in the study findings. The aspect of perceived susceptibility is emphasized by the findings of the study as some women highlighted that they were worried about being vulnerable to infections during the period of pregnancy.

Recommendations

Based on the results and discussions presented, the following recommendations can be proposed to further improve maternal healthcare services during disease outbreaks, specifically in the context of Mmabatho, North-West Province, South Africa. The study recommended the following:

Expansion of Community Health Workers (CHWs) Role by:

- Expanding the roles of CHWs and home-based care workers in providing maternal healthcare information and support, particularly during disease outbreaks.
- Recognizing and supporting the positive impact of CHWs on antenatal care attendance and maternal health outcomes.
- Providing adequate training and resources to CHWs to ensure they possess the necessary skills and knowledge to assist healthcare providers and pregnant women effectively, even in challenging circumstances like pandemics.

These findings align with the findings of Gebremeskel et al. (Gebremeskel et al., 2022), which emphasized the significant contributions of programs managed by Community Health Workers to improving public health outcomes in Sub-Saharan Africa.

Refinement of mHealth Initiatives, Specifically MomConnect by:

- Further developing and refining mHealth initiatives like MomConnect to ensure they provide comprehensive and accurate maternal healthcare information.
- Addressing any usability issues and ensuring the platform is user-friendly for all women, including those less familiar with technology.
- Collaborating with mobile network operators to ensure pregnant women in distant locations have access to mobile networks and receive timely maternal healthcare information via SMS or other digital means.
- Communicate knowledge about maternal healthcare services, including appointment scheduling, antenatal care, immunizations, and drug collection, through both community-based interventions and digital health platforms.
- Utilize various communication techniques, such as text messages, phone calls, and community activities, to reach a broader audience and accommodate different information-receiving habits.

Recommendations corresponds with Kabongo et al.(M Kabongo et al., 2020) study, highlighting MomConnect's strengths and limitations and emphasizing the need for further research to fully understand its effects and consequences.

Promotion of Collaborative Support by:

- Recognizing the value of collaborative support from family, partners, and community members to encourage women to use maternal healthcare services.
- Encouraging men to assist with childcare and maternal health, promoting a supportive environment.
- Developing community involvement methods involving various stakeholders, including local authorities, community organizations, and religious institutions.

These recommendations support Mersha (Mersha, 2018) findings, emphasizing that involving men in the maternal health care system promotes health service usage, lowers maternal depression rates, boosts maternal self-esteem, and reduces the likelihood of birthing problems.

Patient Safety and Confidentiality in Mobile Technology Usage by:

- Addressing issues related to patient safety and confidentiality when using mobile technology for maternal healthcare communication.
- Implementing strong security measures to safeguard private health data and ensure women are comfortable using digital platforms.
- Establishing a system for monitoring and evaluating the effectiveness of maternal healthcare interventions during disease outbreaks.
- Collecting feedback from women, healthcare workers, and community members to identify areas for improvement and make necessary adjustments.

This recommendation aligns with Tadayon et al. (Tadayon et al., 2021) indication of the need for encryption and privacy policies in locally used mobile applications.

By implementing to these recommendations, it is anticipated that maternal healthcare services in Mmabatho, North-West Province, South Africa, can be enhanced and better prepared to address challenges posed by disease outbreaks, including the COVID-19 pandemic.

Conclusion

The evidence presented earlier from the study emphasizes that just like other interventions, people will be happy with the initiatives but not necessarily all because people experience different situations differently. Every woman will have reasons as to why a certain intervention was not satisfactory for her or did not work out for her, the same as the few who were satisfied with the intervention. Based on the socio-demographic characteristics of the participants, the study suggests that the experiences of women from low-income backgrounds of such intervention are also influenced by several factors, some women do not have access to cell phones, which makes it harder for them to relate to the progress of such interventions.

This is in line with the aspect of perceived benefits in the Health Belief Model, the findings of the study highlighted how women were able to identify barriers and obstacles they anticipated in taking health related actions. Additionally, the findings of the study are in line with the perceived severity in the Health Belief Model as some women indicated that they almost lost their babies due to their ignorance of not seeking appropriate care during the COVID-19 Pandemic.

Author Contribution

All authors discussed the results and contributed to the final manuscript.

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Institutional Review Board Statement

The study was conducted in accordance with the North West University, and approved by the Basic and Social Sciences Research Ethics Committee (BaSSREC) protocol code NWU-00673-21-A7 and approved on the 20th of September 2021.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data are not available due to privacy or ethical restrictions.

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Conflict of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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