Arab American University – Jenin

Faculty of Graduate Studies

The Impact of Antenatal Mobile Applications on Women's Knowledge, Practices, and Satisfaction

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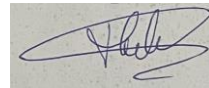# The Impact of Antenatal Mobile Applications on Women's Knowledge, Practices, and Satisfaction

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Declaration

This thesis was submitted in partial fulfillment of the requirement for the Master's degree in Health Informatics.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

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Dedication

I dedicate this research project to my mother and father for their tremendous support and encouragement throughout this journey. I would also like to thank my friends for their moral support and encouragement throughout the past two years. Finally, I would like to extend my gratitude to my colleagues and my manager at the hospital, which made it possible for me to conduct this research study while working full-time.

Acknowledgment

First and foremost, I would like to praise Allah the Almighty, the Most Gracious, and the Most Merciful, for His blessing given to me during my study and in completing this thesis. May Allah's blessing goes to His final Prophet Muhammad (peace be up on him), his family, and his companions. I would like to express my gratitude and sincere thanks to Dr . Hala Allabadi, who has given me valuable guidance, advice, and encouragement so I could complete this thesis in time. Furthermore, I also express my deepest gratitude to my co-promotor, Dr. Faisal Awartani, who has given me guidance, corrections, comments, and suggestions in completing this thesis. My great honor is also bestowed upon all lecturers and staff of Master Health Informatics for their invaluable knowledge and assistance they have given to me. Moreover, let me thank the Manager of hospitals, who has given me the opportunity and permission to conduct this study in their setting,

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Abstract

Introduction: The primary objective of obstetric care is to safeguard the health of the mother and child by administering appropriate prenatal care and preventing complications. Because of the advent of new technologies, women of reproductive age are becoming increasingly dependent on technology; according to studies on pregnant women, mobile technology can improve maternal outcomes. Healthcare information distribution via mobile apps is the use of mobile-device-specific computer software to enhance health management, health care services, and health research. It has been proposed that mobile applications may improve perinatal outcomes by facilitating access to health information, altering the demand for services, and enabling the delivery of focused treatment; since pregnant women are required to make their own health decisions, technology can empower patients to make informed selections also Mobile applications are beneficial for identifying and mitigating maternal risk factors, hence decreasing unfavorable maternal and foetal outcomes

Objectives: The main aim of this study was to evaluate the use of Antenatal Care (ANC) mobile applications and their effect on maternal health knowledge, change in maternal/prenatal practices and behaviors, antenatal care (ANC) attendance, and delivery in the hospital among a sample of Palestinian women in the West Bank and East Jerusalem. In addition, we also aimed to compare knowledge, changes in practices and behaviors, and ANC attendance between women using and not using ANC mobile applications.

Methods: This is a descriptive, comparative, cross-sectional study conducted on Palestinian women who had deliveries at selected maternal and obstetric wards in the Jerusalem Directorate between June and July 2022. Two hundred three participants were surveyed for their demographic

characteristics, use of ANC applications, maternal health knowledge from ANC applications, change in maternal practices, satisfaction with ANC applications, as well as ANC attendance. Statistical analyses were conducted with Statistical Package for the Social Sciences version 25.

Results: The source of information for maternal health care during pregnancy mainly was from health care practitioners, with 96.1% and 81% from family and friends, respectively; 96.6% of the sample agreed that the information was clear, 93% having smart phones and 50.7% having a mobile application for pregnancy and childbirth; also women perceived high level of knowledge and practiced toward antenatal care, with higher among antenatal app users, also women perceived high level of satisfaction toward antenatal apps they used.

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List of Acronyms and Abbreviations

AAUJ: Arab American University Jenin

ACOG: American College of Obstetricians and Gynecologists

ANC: Antenatal Care

EHealth: Electronic Health

HBM: Health Belief Model

HCP: Health Care Providers

IMR: Infant Mortality Rates

IMR: Infant Mortality Rates

MCH: Maternal and Child Health

MDGs: Millennium Development Goals

M-health: Mobile Health Applications

MMR: Maternal Mortality Rate

PDAs: Personal Digital Assistants

SDG: Sustainable Development Goal

SPSS: Statistical Package for Social Sciences

WHO: World Health Organization.

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Chapter one: The introduction

1.1 Background

One of the main goals for many governments and health organizations worldwide is to improve maternal health. Pregnancy is a critical time in any woman's life. To achieve positive health outcomes, access to adequate health care and information is necessary (Ghiasi & medicine, 2021; Javanmardi et al., 2019). During pregnancy, the mother's immunological makeup, physiology, and psychology are all susceptible to alteration. These alterations frequently prompt pregnant women to inquire about their health (Feroz et al., 2017).

Antenatal care is among the most prevalent preventive health strategies (Marko et al., 2019). In addition, classifying pregnant women as low-risk or high-risk can ensure that women bearing high-risk pregnancies receive the necessary intense care. Low-risk pregnant women tend to attend more prenatal visits than the American College of Obstetricians and Gynecologists (ACOG) recommends, decreasing the time available for high-risk women. During prenatal appointments, monitoring blood sugar levels and weight is among the medical procedures performed. Access to the necessary prenatal care can be improved by the use of health applications that allow remote monitoring of blood sugar levels and weight, which can be especially beneficial for high-risk pregnant women. Creating prenatal care models that provide high-risk moms with access to the necessary care is therefore essential for lowering maternal mortality.

During and immediately after pregnancy, pregnant women use a range of information sources and channels to address their health needs (Song et al., 2013). In affluent nations, mobile devices are widespread and generally integrated into daily life. The proliferation of smartphones has led to the development of several mobile applications. These health apps are efficient for

managing health, educating patients, providing self-care information, setting and achieving health goals, efficiently completing routine tasks, providing faster access to health information, and allowing real-time communication from anywhere in the world at any time (Osma et al., 2016).

Incorporating mobile technology into prenatal care could be beneficial for enhancing mother's health outcomes. The vast majority of women of reproductive age own cellphones, which makes the integration of this technology into prenatal care inexpensive and readily accessible, granting patients access to health information and linking patients with clinicians at the click of a button (Haddad et al., 2019). The following will address the effects of technology-reliant health care delivery on maternal health outcomes.

M-health apps provide patients with a flexible consultation model by delivering health care in a portable, convenient, and easily accessible manner. It also has the possibility of quickly connecting patients with clinicians. It provides quick and timely access to an abundance of online health information, access to the personal experiences of other people with similar health concerns, and access to upgraded high-definition audio and video health content (Daly et al., 2018; Lupton et al., 2016). Healthcare practitioners are the primary source of information for pregnant women regarding their health. They rely on them for preventive care and to address their health demands during and immediately after pregnancy (Akanbi & Fourie, 2018). However, numerous studies indicate that most pregnant women still have unmet health information needs (Akanbi & Fourie, 2018; Kamali et al., 2018; Robinson et al., 2018). The lack of understanding regarding their health status prompts individuals to consult additional sources of information. Before the rise of the Internet, pregnant women typically obtained pregnancy-related information through traditional and print sources such as physicians, health magazines, pamphlets at the doctor's office, books, and experienced family members (Daly et al., 2018). With the introduction of mobile and internet

technology, pregnant women have adjusted their information-seeking behaviors to rely on online resources to meet their health needs (Taylor, 2022). Many pregnant women prefer mobile-friendly online resources for their health needs throughout pregnancy.

However, there are severe concerns over the health information quality, accuracy, utility, and authenticity of content supplied to pregnant women via mobile health applications. According to a recent assessment and content analysis, mobile applications failed as antenatal tool for educating pregnant women about fetal movement information. It provided erroneous information and invalid recommendations regarding decreasing fetal movement (Daly et al., 2018). Similarly, a second study indicated that using health applications by pregnant women can reduce their activation level, i.e. their level of collaboration and involvement with clinicians (Ledford et al., 2016). Consequently, the success and uptake of mobile interventions for pregnant women are contingent on various circumstances. Users should consider the application's comprehensiveness, the correctness of its material, and practicality. In addition, a study confirmed that pregnant women view app interface aspects such as navigational assistance, typography, and layout as quality indicators and motivators for adopting pregnancy apps throughout pregnancy (Mao et al., 2012).

Mobile interventions are an essential and recommended technique for enhancing patient compliance (Jeffrey et al., 2019; Lau et al., 2018). In comparison, Lee and Moon's (2016) research on the utilization and content evaluation of mobile apps for pregnancy, childbirth, and child care revealed that pregnancy-related applications might result in patient noncompliance. Some pregnancy apps promote insufficient health advice based on unscientific and unverified clinical expertise. Some apps contain health suggestions and facts that contradict one another.

Poor app descriptions are another obstacle for health apps. Frequently, the app descriptions intended to help consumers make informed judgments about app downloads lack the safety

information necessary to make informed decisions about app behaviors and utility. This frequently causes user dissatisfaction. Users usually engage in trial-and-error behaviors, such as downloading and deleting various applications, before discovering a health app that meets their needs. This may explain why users adopt mobile applications so slowly (Kuznetsov et al., 2016).

To make sense of this period, they seek health care and information from health care practitioners, internet health information, online forums, family members, and traditional media (Javanmardi et al., 2018). Pregnant women confront various obstacles when attempting to maintain their health during pregnancy (Robinson et al., 2018). This period and its obligations can be stressful for many women and families if they lack access to the appropriate health care and information (Kamali et al., 2018).

The World Health Organization (WHO) has said that the rise in maternal mortality results from unequal access to high-quality health care services.

The World Health Organization (WHO) defines maternal death as "the death of a woman during pregnancy or within 42 days of termination of pregnancy, regardless of the duration and location of the pregnancy, from any condition caused by pregnancy or its management, but excluding incidental or accidental causes" (Abboud, 2020).

The maternal mortality rate (MMR) is one of the indicators used to evaluate a country's women's health. MMR is the number of maternal deaths per 100,000 live births (Zelop, 2018). Globally, the MMR has decreased by 30 percent. The United States' MMR has increased by 56 percent, from 16.9 in 1990 to 26.4 in 2015 (Zelop, 2018). The majority of women die from complications arising during pregnancy and after childbirth. Mogos et al. (2020) found that the MMR increased by 150 percent between 1987 and 2014 in the United States (Mogos et al., 2020).

According to Abboud (2020), the United States is the most dangerous developed country for pregnant women to give birth, with maternal death rates ranking 50th (among developed nations). Approximately 800 pregnant women die annually in the United States (Abboud, 2020).

Preeclampsia, eclampsia and infections, problems during birth, and severe hemorrhage are the leading causes of maternal mortality, accounting for 75% of maternal deaths. Significant causes of maternal mortality include hemorrhage, cardiovascular illness, cardiomyopathy, and infections (Collier & Molina, 2019). Pre-eclampsia, eclampsia, and embolism are the primary causes of maternal mortality in non-Hispanic Black women, while mental health disorders are the leading cause in non-Hispanic White women (Collier & Molina, 2019). With a good healthcare system, these ailments are manageable. Providing universal prenatal care to pregnant women, providing standardized care for all in hospital settings, improving communication among health care teams, team training, and providing risk-appropriate maternal care are some of the identified solutions for enhancing maternal health outcomes in the United States (Collier & Molina, 2019; Marko et al., 2019).

1.2 Obstetric Care in general:

Obstetric care often refers to the care provided to the mother and the developing fetus. This encompasses prenatal care (antenatal care), labour and delivery, and postpartum care (postpartum care). Depending on the mother's and child's health, postpartum care is typically provided to new moms for up to six weeks following birth. If the woman experiences health difficulties such as opening incisions, blood clot formation, etc., or if the baby's health is precarious, obstetric care may be continued beyond six weeks (Walker et al., 2016).

The primary objective of obstetric care is to safeguard the health of the mother and child by administering appropriate prenatal care and preventing complications. Maternal (MMR) and infant mortality rates (IMR) remain high despite governmental efforts to provide obstetrical care to every pregnant woman. According to the WHO, over 830 women die every day from problems related to pregnancy or childbirth. Approximately 2.7 million newborns die annually, and another 2.6 million are stillborn. Only 58% of pregnant women worldwide receive at least four antenatal care services (Tsai et al., 2017). In developing regions, hemorrhage and hypertension were the top maternal mortality causes in 2006. In rural locations, maternal and infant mortality rates are typically greater than in metropolitan areas. Care delays for early labor difficulties are common in places with few or no obstetrical services because women must travel to a distant location that offers primary prenatal care and delivery (Kitui et al., 2013).

Consequently, reducing the global total of 3.82 million newborn fatalities, significantly the 3 million who die in the first week of life (the early neonatal period), is essential for achieving Sustainable Development Goal 3. (SDG). The solutions for minimizing newborn fatalities, particularly in the early stages, are inextricably tied to maternal health and the delivery of appropriate maternity and neonatal health services. Consequently, addressing current global gaps for care at birth is essential for achieving SDG 3, which is to reduce MMR to less than 70 per 100,000 live births and end preventable deaths of newborns and children under five years of age, with all countries aiming to reduce neonatal mortality to at least 12 per 1,000 live births and under-5 mortality to at least 25 per 1,000 live births by 2030. (Seebregts, et al., 2017).

1.3 M-Health in Obstetric Care:

M-Health encompasses "the use of portable electronic devices with software applications to provide health services and manage patient information," despite the lack of a universally

accepted definition (Free et al., 2010). It is the delivery of healthcare services via mobile communication devices. In the global health sector, health comes in various forms that perform multiple functions. According to the United Nations Foundation, common applications for M-health include education and awareness, remote monitoring, communication and training, disease and epidemic outbreak tracking, diagnostic and treatment support, and remote data gathering (Mehregany & Saldivar, 2020).

Since mobile health (M-health) is an emerging topic, numerous researchers have begun researching and developing health-related mobile applications. Concerning this, significantly fewer studies on M-health applications have been conducted in the developing world compared to those shown in the industrialized world. These studies on developed communities may not be suitable for revealing the health difficulties in developing countries, where communal resources are shared (Coetzer, 2018).

In obstetric care, M-health technologies have the potential to have a significant impact. The following graph illustrates the prospective advantages of M-health application in obstetric care (Grady et al., 2018).

Numerous M-health applications available on the market assist pregnant women in being healthy and fit so that complications can be avoided and a healthy baby can be born. These applications include fitness, nutrition, and pregnant journey apps. One example is Pear Fitness, which functions as a virtual personal trainer. The app consists of pre-pregnancy, trimester-by-trimester, and post-baby workouts. In addition, it provides access to a close-knit network of other parents and moms-to-be, as well as the most recent parenting news and health information (Jusoh, 2017).

M-health is an expansion of eHealth that presents new possibilities. M-health can provide customized information to specific populations (Fiordelli et al., 2013). In addition, it offers a unique opportunity to contact individuals frequently and in the context of their behaviors, as most people carry their phones with them (Fiordelli et al., 2013). While the Internet digital divide may have hindered the ability of eHealth interventions to reach individuals in lower socioeconomic categories (Fiordelli et al., 2013; Latulippe et al., 2017), the usage of mobile phones has become widespread across socioeconomic and demographic groups. As traditional health promotion strategies frequently fail to reach disadvantaged groups, such as ethnic and cultural minorities, M-health is a valuable tool for achieving these populations (WHO, 2011). WHO is interested in using M-health to help low- and middle-income countries accomplish the health-related Millennium Development Goals (MDGs) (WHO, 2011). The application of M-health is being evaluated in various contexts, including maternity and child health, and programmed to lower the disease burden associated with poverty (such as HIV/AIDS, malaria, and tuberculosis) (WHO, 2011).

In response to the favorable attention M-health and self-monitoring have gotten in the medical and public health literature, critical discourses on M-health usage are emerging (Lupton et al., 2016). Critics of M-health assert that most published research on M-health and medical applications has taken an instrumental approach, focusing on the effectiveness of behavior change, the medical correctness of the content, and legal and regulatory considerations. In contrast, little is known about how individuals utilize or incorporate them into their daily lives.

1.4 Statement of the problem

Adoption, practice, and maintenance of healthy behaviors throughout pregnancy may improve mother and child health. Adverse prenatal healthcare outcomes, such as emergency cesarean section, premature births, preterm birth, and death (Lawn et al., 2016), are connected with

maternal risk factors that may be modified via mother behavior modifications (Aune et al., 2016). Many women attempt to live a healthy lifestyle throughout pregnancy and in preparation for motherhood (Ginja et al., 2018). Mobile applications – computers programmed to run on mobile devices such as mobile phones and tablet computers — are used by pregnant women to receive information, monitor fetal development, track specific health indicators, and provide reassurance. Hundreds of millions of pregnancy apps have been downloaded, and many pregnant women rely on them as a primary source of information (Daly et al., 2018). Using a familiar device to access, store, and share information, pregnant women may feel enhanced support for informed decision-making and a sense of agency (Ginja et al., 2018).

In 2017, approximately 325,000 health, fitness, and medical apps were available, with pregnancy apps constituting a significant subgenre (Tricco et al., 2015). These applications may provide health information, motivating messaging, monitoring, and tools for behavior modification. The content of mobile applications can be modified based on demographic data such as gestational age, maternal age, language, and adverse outcomes. Application developers may deploy strategies such as "push communication" and notifications to persuade users to follow a prompt to engage users (e.g., read, listen, view content, or perform an activity). Pregnancy apps may also connect to a camera, glucose meter, fitness activity tracker, Kegel "exerciser," fetal heartbeat "listener," or other monitoring equipment. Some devices associated with an app are marketed directly to consumers and evade regulatory scrutiny. In contrast, other devices may be provided as part of clinical care by a woman's health care practitioner (Feroz et al., 2017).

Health systems and maternity care institutions are examining whether and how to integrate digital patient support modalities into care and seek data to back their decisions. It has been proposed that mobile applications may enhance perinatal outcomes by facilitating access to health

information, altering the demand for services, and enabling the delivery of focused treatment (Nasution & Hariyati, 2018).

1.5 Significance of the study

Mobile technology can facilitate access to individualized health information and improve healthcare providers-patient contact. Thus, mobile technology can potentially improve the lives of mothers and infants by expanding access to medical services and care and promoting healthy lifestyle choices at a minimal cost.

Mobile applications are beneficial for identifying and mitigating maternal risk factors and decreasing unfavorable maternal and fetal outcomes. Various studies have investigated the use of mobile interventions for managing maternal risk factors, such as overweight, diabetes mellitus, diet/nutrition, mood disorder, and stress management. Notably, pregnant women prefer mobile applications because they enable faster access to health information, disease management, adoption of behavioral changes that could lead to healthier lifestyles, and medication adherence. In addition, they prefer health applications over other information sources because applications support remote monitoring of their well-being and virtual prenatal care, participatory patient education, tracking of mental and emotional well-being (Mo et al., 2018), alerting and aesthetic pleasure, and capabilities to link pregnant women with other women w/similar experiences (Daniel et al., 2021).

Numerous mobile health application features provide the personal monitoring of health biometrics that would otherwise be observed exclusively at the clinician's facility. Mobile health applications may be practical for enhancing patient health and treatment plan adherence.

This study will also contribute to the current body of knowledge on pregnant women and technology, patient compliance through app technology, and scientific design recommendations that can facilitate the use of mobile technology as an effective antenatal intervention for pregnant women.

To the best of our knowledge, this would be the first survey in Palestine to evaluate the effect of utilizing ANC mobile applications during pregnancy on maternal/prenatal health behavior, learning, ANC attendance, and hospital delivery procedures. This study's findings will assist policymakers in Palestine in implementing recommendations for using ANC mobile applications and raising awareness about the benefits, positive uses, and impact of these applications on maternal/prenatal outcomes and care.

1.6 Aim and objectives

The main aim of this study was to evaluate the use of Antenatal Care (ANC) mobile applications and their effect on maternal health knowledge, change in maternal/prenatal behaviors, ANC attendance, and delivery in the hospital among a sample of Palestinian women in the West Bank and Jerusalem.

1.6.1 Specific objectives:

1- To describe the effectiveness of ANC mobile applications used for obstetric care.

2- To examine the relationship between using ANC mobile applications and maternal health knowledge.

3- To determine the association between using ANC mobile applications and changes in maternal behaviors (nutrition, exercise, etc.) during pregnancy.

4- To compare knowledge and practices of women using and not using ANC mobile applications.

5- To findout the level of satisfaction among M-health application users about the app they use.

6- To determine if ANC mobile applications help to reduce in-person prenatal care visits while maintaining patient and provider satisfaction.

1.7 Research Hypothesis

- There are significant differences in knowledge and practice toward ANC between women using applications comparison with women not using M-Health applications at $\alpha \leq 0.05$.

- There is an association between using ANC mobile apps and improved maternal behaviors such as nutrition and physical activity.

- There is an association between using ANC mobile apps and decreased in-person ANC visits.

- There is a significant association between socio-demographic variables and the use of ANC mobile apps.

1.8 Theoretical Framework

This study's conceptual framework consists of self-efficacy constructs of Bandura's social learning theory (Ghasemi et al., 2019) and health belief model constructs (Akanbi, 2022). Consideration will be given to the four sources of self-efficacy identified by Bandura (1977) (performance accomplishment, vicarious experience, verbal persuasion, and emotional arousal), as well as three constructs from the health belief model (perceived susceptibility, perceived

severity, and cues to actions). These seven concepts will aid in comprehending the impact of mobile application design on pregnant women (Bandura, 1977).

1.8.1 Self-Efficacy Theory

Perceived self-efficacy is a person's ability or inability to do a behavioral task. Personal efficacy is the cognitive process of engaging in an action based on the perception of one's abilities to execute the behaviors successfully. It occurs when a desired objective or behavior is achieved despite difficulties or adverse experiences. It is the perceptual ability to exert control to attain a particular purpose or behavior. It could also be viewed as an individual's self-assurance that they will accomplish success in an activity or habit despite continuous obstacles (Bandura, 1977; Ghasemi et al., 2019). Likewise, Greiner, Croff, Wheeler, and Miller (2018) defined self-efficacy as the belief that it is necessary to do an activity (Greiner et al., 2018). Perceived self-efficacy is the perception that a person can execute specified required tasks or health goals or engage in certain health practices in the face of obstacles. It is also the primary motivator and predictor of health goal attainment or behavioral change. It generates the required motivation and action to complete a particular goal. A patient's perceived self-efficacy is an essential factor influencing their adherence to treatment methods (Ghasemi et al., 2019).

In light of this, a pregnant woman's perceived self-efficacy is her perception that she can influence events that could affect her life throughout pregnancy and after delivery, as well as her attempts to have a good pregnancy. Perceived self-efficacy can significantly impact a patient's adherence to a physician's advice and recommendations, resulting in the achievement of painful health behaviors and objectives. Pregnancy is a unique health state that necessitates self-sacrificing efforts and unnaturally healthy selections. Some pregnant women require self-control or motivation to stick to their treatment regimes (Ghasemi et al., 2019; Greiner et al., 2018). Perceived

self-efficacy is a significant determinant of the effort to adhere to physicians' instructions. Women with greater personal efficacy are more likely to stick to treatment regimens and have higher commitments to achieving health objectives. In contrast, low self-efficacy may reduce adherence to treatment methods (Ghasemi et al., 2019).

Additionally, a woman's perception of a situation might be affected by her perceived self-efficacy. Women with poor personal efficacy have less willingness to engage in challenging behaviors and are more likely to give up at the first sign of trouble (Eshghi Motlagh et al., 2019). A qualitative study on developing a healthy lifestyle mobile application for obese pregnant women confirmed a correlation between obesity and negative health consequences (Lau et al., 2018). The concept of the social cognitive theory of self-regulation was utilized to design and build a mobile intervention app for obese pregnant women. The study claims that self-awareness and self-monitoring are essential for promoting a balanced diet during pregnancy and potentially benefit the mother's health. The discovery of self-awareness is possible through mobile applications. Perceived self-efficacy is influenced by four primary factors that pertain to women of reproductive age (Edwards et al., 2019).

Performance accomplishment, vicarious experience, verbal persuasion, and emotional stimulation are the key sources of self-efficacy (Bandura, 1977). Repeatedly succeeding at a particular task or experience contributes to one's performance accomplishment. It is established via personal proficiency experiences, as seen by the confidence levels of women who have given birth and those who have not. Lee and Moon (2016) discovered that first-time mothers use more pregnancy-related applications than second-time mothers. First-time mothers have poor confidence in their pregnancy because they have never been pregnant. Typically, they have more queries regarding physical changes than other women. Due to their lack of experience and

uncertainty, first-time mothers are more engaged in their search for health information than mothers with prior pregnancies. Self-efficacy is a crucial psychological trait that influences the pregnancy experience of first-time mothers positively (Edwards et al., 2019). Consequently, access to high-quality health information via mobile applications can boost the confidence of pregnant women.

1.8.2 Health Belief Model (HBM)

Rosenstock and colleagues created the health belief model (HBM) in the 1950s to increase patient utilization of preventive health treatments. In addition, the HBM aims to comprehend people's motivation for participating in health initiatives and those who are not motivated. The model consists of six constructs; however, only three will be utilized in this study: perceived vulnerability, perceived severity, and cues to action. The HBM has been used in numerous health domains to predict health behaviors (Akanbi, 2022).

This model hypothesizes that a person's likelihood of engaging in a particular action is predicted by their perception of the disease's susceptibility and severity (Kahsay et al., 2019). A health problem's perceived threat is the sum of its perceived susceptibility and severity. In pregnancy, perceived susceptibility refers to the subjective perception of a pregnant woman's likelihood of developing a disease during pregnancy. In contrast, perceived severity refers to the subjective perception of having a severe illness during pregnancy and the condition's impact on the mother and baby. Knowledge of a disease's vulnerability and severity encourages behavioral modification.

Cues to action motivate an individual to engage in the desired behavior. Cues to action may be external or internal stimuli required to initiate an action (Akanbi & Fourie, 2018). In this

context, cues to action are external and internal motivators that encourage pregnant women to engage in the intended health activity or attain the desired health goal. For instance, physiological and psychological trackers (mobile application features that routinely monitor, record, and offer automated alerts) enable users to self-monitor and self-manage their health. These characteristics may contribute to improved health outcomes and patient adherence (Ledford et al., 2017). Similar to Sbaffi and Zhao (2020) and Johnson, Rowley, and Sbaffi (2015), Sbaffi and Zhao (2020) and Johnson, Rowley and Sbaffi (2015) argue the impact of information characteristics (such as ease of use, credibility, and content, usefulness, style, and brand) on user perceptions of online information quality. These informational qualities may function as external inducers for the utilization of a particular health intervention (Sbaffi et al., 2020).

1.9 Conceptual framework

E-Health (Electronic health) is the combined use of electronic communication and information technology in health care (Jensen et al., 2012).

Mobile health (M-health) is a category of eHealth. It is defined as medical and public health practice by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices' through the means of text, video, or call (Entsieh et al., 2015).

Antenatal Care: Method of preventive health care to provide regular checkups that allow doctors or midwives to treat and prevent potential health problems through the course of a woman's pregnancy (World Health Organization, 2015)
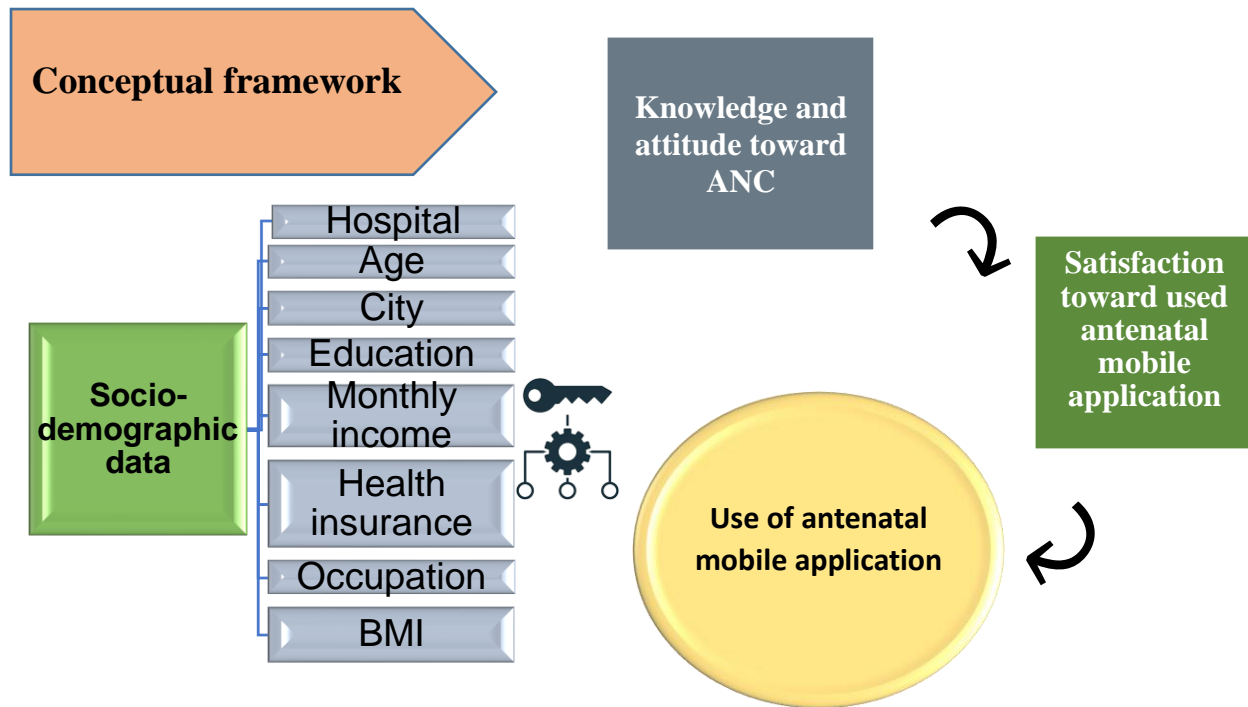
Figure 1. Study Conceptual Framework

Chapter two: Literature review

2.1 Introduction

This chapter explores previous literature about the use of antenatal care and mobile applications

and their effectiveness on maternal health knowledge, outcomes, behaviors, and ANC

attendance.

2.2 Technology-Mediated Health Care Delivery

Typically, health care is delivered either in the patient's place or at a local clinic. Both types

of health care delivery are still in use; however, in many parts of the world, people obtain care by

visiting a hospital or medical office. Hospitals provide access to medical equipment, medical staff

with various specializations, and a clean environment (Entsieh et al., 2015). However, hospital and

home visits each have their advantages and disadvantages. Home visits pose the risk of inadequate medical equipment and a contaminated environment, but hospital trips can be irritating due to long wait times for appointments (Entsieh et al., 2015).

There is a steady shift in the roles and duties of physicians and patients in the health care industry. Previous research in the medical sciences has shown the transition from paternalistic to patient-centered care. In the former model, physicians made all health choices with minimal or no patient input (Osei-Frimpong et al., 2018). This shift in roles affects the patient-physician interaction in terms of care delivery. Patients are increasingly obliged to actively participate in the decision-making process regarding their health, therapies, and collaboration with their clinicians for optimal health outcomes (Lu & Zhang, 2019).

Technology-mediated health care delivery facilitates the use of online health communities, emails, text messaging, the web, and mobile technology in health care delivery. Technology improves flexible and cost-effective techniques for delivering and receiving health care (Lu & Zhang, 2019). Using mobile technology, technology-mediated healthcare delivery can circumvent certain obstacles inherent to hospital and home care delivery.

Technology can improve patient-physician engagement and communication through virtual consultations, eliminating implicit bias in health care. Mobile technology enables simple patient-physician contact, remote monitoring, access to medical resources, and rapid diagnosis and test results. This is particularly beneficial for pregnant ladies (Cannon, 2018).

2.3 Impact of Technology-Mediated Healthcare on Maternal Health Outcomes

More patients now have flexible options for receiving healthcare and connecting with any healthcare professional, anywhere in the globe, at any time, thanks to the development of the

internet and mobile technologies (Olayiwola et al., 2020). Because of the advent of new technologies, women of reproductive age are becoming increasingly dependent on technology. These technologies included mobile technologies, social networking, instant messaging, real-time virtual audio and video communication, and medical device integration with mobile apps (Cannon, 2018). To understand more about their health concerns, more women can now easily self-examine themselves before scheduling an appointment with a doctor and immediately after that (DeNicola et al., 2020).

Because of its adaptability and convenience, technology-based health care delivery is advantageous for pregnant women. It decreases the time required to receive care, offers tailored messaging, and provides alerts for high-risk signals. Without coming to the hospital, mobile technology enables the tracking of ultrasound recordings and monitoring of physiological and psychological biometrics (Li et al., 2020). To avoid bad health outcomes for the mother and fetus, pregnancy necessitates changes in lifestyle, particularly for women with preexisting health issues (Li et al., 2020). According to studies on pregnant women, mobile technology can improve maternal outcomes in smoking cessation and breastfeeding (DeNicola et al., 2020). In addition, the success of this technology has been reported in the contexts of postnatal depression, gestational diabetes, and personal efficacy in prenatal care (Dyurich & Oliver, 2020).

A study found that the Wired Mothers' mobile phone intervention improved maternal health. This study demonstrated a correlation between mobile phone intervention and decreased maternal mortality in low-resource settings (Gbadamosi et al., 2018). More research in low- and middle-income countries has demonstrated the efficacy of a mobile intervention in improving maternal health outcomes (Gbadamosi et al., 2018).

Another study conducted in Wuhan, China, on the effectiveness of lifestyle intervention supported by technology for women with gestational diabetes indicated that the lifestyle intervention helped the women lower their gestational weight gain (Li et al., 2020).

Similarly, a randomized controlled trial assessing the effect of a technology-enhanced prenatal food and lifestyle intervention on pregnant women in the United States revealed substantial differences in gestational weight growth between the intervention and control groups. Women in the intervention group dropped more weight than those in the control group, with no adverse effects on mother or child health (Van Horn et al., 2018).

Since pregnant women are required to make their own health decisions, technology can empower patients to make informed selections alongside their doctors (Ledford et al., 2016). However, the efficacy of mobile health interventions on maternal mental health in wealthy nations remains unknown (Dol et al., 2020). This may be due to the lack of evidence-based evaluations of present mobile software.

There is more mobile software than empirical evidence(DeNicola et al., 2020; Jusoh, 2017). Patients, even pregnant women, rely on web and app technology to manage their health concerns. Since pregnant women are consumers of internet health information and content, it is essential to understand how they utilize web and app technologies throughout pregnancy.

2.4 Health Information Delivery through App Technology.

The Global Observatory for eHealth of the World Health Organization (2017) defines mobile health as "medical and public health practice assisted by mobile technology such smart phones, patients monitoring systems, digital assistants, and other wireless devices" (Morse et al., 2018).

Healthcare information distribution via mobile apps uses mobile-device-specific computer software to enhance health management, health care services, and health research (Daly et al., 2018; Morse et al., 2018). The development of mobile health applications enhances the quality of life by expediting access to the health information on various health concerns. More patients rely on the application of healthcare information to make educated health decisions and to engage in collective decisions with their providers (Daly et al., 2018). Smartphones and mobile applications are becoming increasingly prevalent in developed and developing nations. As of 2018, it is predicted that 66 percent of the global population owns a smartphone, with more than 175 billion mobile applications downloaded in 2017. (Mo et al., 2018). Globally, the adoption of mobile applications is on the rise. Deloitte Australia estimated a 5% increase in smartphone adoption in Australia since 2016 and a 50% increase in time spent on mobile applications from 2016 to 2018. (Khurram & Sardar, 2020).

Between 2016 and 2018, the global rate of application downloads increased by over 35 percent. Specifically, downloads of mobile health applications have increased by 35 percent in the United States, the United Kingdom, France, and Brazil. India and Indonesia have increased by 65% and 110%, respectively (Khurram & Sardar, 2020). Recent research has proven mobile applications as the newest method for pregnant women to acquire health information. They use mobile applications to access, store, exchange, and track pregnancy-related information (DeNicola.et al., 2020; Dalton et al., 2018; Hussain et al., 2017). In health care settings, mobile applications provide a more practical, inexpensive, effective, and transportable mode of communication (Daniel et al., 2018).

Mobile applications are beneficial for identifying and mitigating maternal risk factors and decreasing unfavorable maternal and fetal outcomes. Various studies have investigated the use of

mobile interventions for managing maternal risk factors, such as being overweight (Lau et al., 2018), diabetes mellitus (Tumminia et al., 2019; Carolan-Olah et al., 2017), diet/nutrition (Storr, Maher, & Swanepoel, 2016), mood disorder (Faherty et al., 2017), and stress management (Jallo et al., 2017). Notably, pregnant women prefer mobile applications because they enable faster access to health information, disease management, adoption of behavioral changes that could lead to healthier lifestyles, and medication adherence (DeNicola et al., 2020; Cannon, 2018). In addition, they prefer health applications over other information sources because applications support remote monitoring of their well-being and virtual prenatal care (Marko et al., 2019; Marko et al.,2016), participatory patient education (Dalton et al., 2018), tracking of mental and emotional well-being (Mo et al., 2018), alerting and aesthetic pleasure (Deka, 2016), and capabilities to link pregnant women with other women w/similar experiences (Marko et al. (Daniel et al., 2018).

Numerous mobile health application features provide the personal monitoring of health biometrics that would otherwise be observed exclusively at the clinician's facility. Mobile health applications may be effective for enhancing patient health and treatment plan adherence.

2.5 Patient compliance and Positive Health Outcomes through App Technology

Patient compliance refers to patients' adherence to physician-recommended instructions or treatment programs. Numerous individuals actively or passively disobey medical instructions and recommendations, which is a big issue in the field of health sciences. Typically, treatment programs are prescribed to hasten recovery from illness, manage diseases, and prevent diseases from worsening (Lu et al., 2018). Medication, follow-up consultations, diet, exercise, health gadgets, and health interventions are included in treatment programs (Sanford & Rivers, 2020; Lu & Zhang, 2019).

Noncompliance among patients has been a primary concern for over fifty years. It has a significant impact on health care expenses and life quality. According to the World Health Organization, hardly fifty percent of persons with chronic diseases in wealthy countries adhere to their treatment plans. Six in ten American citizens are likely to be undertaking treatment regimens to manage their health concerns, given that 60% of adults in the United States suffer from chronic diseases (Audrain-Pontevia et al., 2019). Unfortunately, patient noncompliance with treatment protocols is prevalent. Patient avoidance of a healthy lifestyle is associated with adverse health effects. Medication adherence is important for obtaining excellent health outcomes among pregnant women, particularly women with underlying illnesses. Pregnant women are typically encouraged to take vitamins to prevent embryonic developmental difficulties. 80-90 percent of pregnant women worldwide take over-the-counter or prescribed drugs during pregnancy (Munoz et al., 2020).

However, many women do not stick to their prescribed pharmaceutical regimens. Some instances of disobedience with medication programs among pregnant women are due to fundamental concerns regarding the drug's safety for the unborn (Dathe & Schaefer, 2019).

Another recent study confirmed inadequate drug adherence among pregnant women with chronic illnesses (Munoz et al., 2020). Medication adherence can be improved by utilizing mobile health applications for patient education and information delivery. Apps provide a unique platform for educating and informing millions of pregnant women about pregnancy safety practices. According to numerous studies, pregnant women utilize mobile health applications to manage various health issues, including gestational diabetes, hypertension, and depression (Coetzer, 2018).

Therefore, app technology is beneficial for medicine administration. Compliance is a complicated and dynamic process, including joint patient and physician responsibility for

achieving targeted health results. Moreover, it is essential for illness and health management (Laugesen et al., 2015). The importance of patient autonomy cannot be overstated in light of the current patient-centered care model in health care, which requires patient participation in treatment plan decisions alongside clinicians (Audrain-Pontevia et al., 2019). Mobile health applications are quite effective in promoting patient autonomy.

Wyoming researchers found that mobile health applications boosted user involvement and adherence to prenatal treatment (Bush et al., 2017). Prenatal care is a preventive treatment offered to women to ensure a healthy pregnancy. The American College of Obstetricians and Gynecologists recommends it as a treatment plan for all pregnant women (Marko et al., 2019). Despite this, some pregnant women miss prenatal appointments. Several factors have been found in the literature influencing noncompliance with prenatal appointments. Inadequate patient-physician communication, hectic work schedules, difficulties in arranging appointment times, far distance, unequal access to health care, physician shortage, and poverty discourage prenatal visits among women (Abraham, 2020; Wheeler et al., 2020; Dahlem et al., 2015).

Mobile applications' specific and attractive characteristics help patients define and achieve health goals. They give customers frequent updates on the progression of their aims. App technology supports the personal efficacy of being in charge of and sticking to treatment regimens for positive health results. Thus, app technology provides an ideal platform for communicating with pregnant women and disseminating health information (Buzzi et al., 2019; Lu & Zhang, 2019).

The use of app technology facilitates access to medical services, such as scheduling appointments with physicians from anywhere at any time and obtaining more affordable health care. Mobile health provides midwives and gynecologists with a unique chance to deliver prenatal

care beyond on-site care. The aggregation of data points from several sensors (made possible by mobile apps) can readily alert all key stakeholders to take immediate action, ultimately enhancing patient health outcomes (Miah, Gammack & Hasan, 2017).

2.6 Utility of App Health Information for Pregnant Women

Considering the increasing maternal mortality and morbidity rates, unequal access to health care, and unfiltered online health information regarding pregnancy, maternal health remains a public health concern (Abboud, 2020; Collier & Molina, 2019). Due to disparities in health care and a lack of obstetricians and gynecologists, mobile and app technologies can facilitate access to medical resources that might otherwise be difficult to reach.

However, there is limited study on the use and validity of these technologies for improving maternal health outcomes in the United States (DeNicola et al., 2020; Shi & Singh, 2019). Mobile applications are software designed to run on mobile devices. This mobile application enables the efficient performance of a variety of tasks on mobile devices (Mehralizade et al., 2017). It is also a set of computer instructions that run on a mobile device to accomplish a specific objective (Daly et al., 2017). Accessing health information via mobile devices is popular in both developed and developing nations. Due to the global proliferation of mobile devices, more individuals now have access to health information via their smartphones than ever before (Harpel 2018; Osma, Barrera & Ramphos, 2016). Over 70% of the world's population possesses a smartphone (Santur, Santur, and Karakose, 2020).

The number of app downloads from app stores and the amount of time spent using mobile applications indicates that the number of mobile technology users has increased. 89 percent of users reported spending time online through mobile apps, compared to 11 percent who used mobile

web (Osma, Barrera & Ramphos, 2016). The Institute for Health Care Informatics reported that more than 160,000 mobile health apps were accessible on both the Android and iOS app stores in the previous year, of which 7% were categorized as health and pregnancy apps (DeNicola et al., 2020; Sedrati et al.,2016). Almost 85 percent of persons in the United States own a mobile phone, with 53 percent using their devices to research various health subjects and 19 percent downloading mobile applications (Kim, Paige Powell & Bhuyan, 2017).

Recent research has uncovered many important milestones for mobile health applications. This technology improves the lives of patients by enhancing health management (Niela-Vilen et al., 2019; Mehralizade et al., 2017). The validity and usefulness of mobile applications are also demonstrated by their capacity to provide individualized patient education that promotes patient empowerment (Dalton et al., 2018; Ledford et al., 2017). It also encourages healthier lives, treatment plan adherence, simpler access to health information, improved patient-physician communication and interaction, and monitoring of health biometrics, which is difficult with other communication modalities (Lyford & Lash, 2019; Osma, Barrera & Ramphos, 2016). Mandatory patient participation in health decision-making is a pragmatic solution to the alarming rise in maternal fatalities in the United States (Moore, 2016). Mobile applications can facilitate shared decision-making about prenatal options. As a mode of communication, mobile apps can boost pregnant women's levels of activation and engagement (Ledford et al., 2017).

The availability of mobile technologies facilitates access to health information, as information is just a click away and may be readily integrated into daily activities. It also permits the simultaneous execution of multiple applications on a single device (Santur, Santur & Karakose, 2020; Jallo et al., 2017; Mehralizade et al., 2017).

Mobile applications can provide a cost-effective means of getting health information from any area of the world at any time, bypassing geographical and systemic hurdles, given the costs connected with doctor's visits and the dearth of trustworthy health information (Silva et al., 2015). Women from low socioeconomic backgrounds can use health apps for behavioral change and keeping well and informed, according to a study of the health-e Babies app, a mobile application that provides antenatal education to socially disadvantaged pregnant women (Dalton et al., 2018). Smartphone sensors can monitor and disclose sensitive physiological and psychological data, such as blood pressure level, blood sugar level, and mood, for which patients would have normally had to spend more time traveling to a doctor (Dol et al., 2019; Gan et al., 2016). It also enables simple appointment scheduling, expedited professional consultation, simple access to test findings, personalized messages, and remote monitoring of the mother and fetus (Ginja et al., 2018; Lu & Zhang, 2018; Gan et al., 2016). Therefore, mobile applications have the potential to enhance the effectiveness and quality of patient care.

Recent studies have demonstrated the utility of mobile applications for enhancing maternal health in terms of giving health information to resolve doubts; however, from a physician's perspective, the trustworthiness and quality of material remain a worry (Wommack, Anderson & Ledford, 2018; Dalton et al., 2018). According to Lee & Moon's (2016) review of the characteristics, contents, and credibility of mobile applications used for pregnancy, birth, and child care, apps are effective for providing answers to women's health questions and accessing quick physician opinions; however, 39 percent of respondents reported that the apps they used lacked credibility. The effectiveness of maternal care-specific mobile applications as a supplementary source of health information was revealed by a 2018 content analysis; nevertheless, the apps offered inconsistent risk advice and lacked clinical evidence to back their contents (Wommack,

Anderson & Ledford, 2018). Even among the most popular apps, slightly contradicting recommendations were discovered. As just 57% of the applications were built in the United States, the discrepancies may be due to disparities in the apps' countries of origin, according to the researchers. The remaining apps were from nations with distinct mother care traditions and practices. However, fifty percent of the apps mentioned their recommended sources.

A study on the drinking habits of pregnant women in Australia revealed that their information sources influenced their alcohol consumption decisions (Gibson et al., 2020). As information sources, women of reproductive age favored mobile applications (Harpel, 2018). In research, the potential of app technology has not been completely explored. Few studies have demonstrated the usefulness of mobile applications for improving maternal health outcomes (Jusoh, 2017; Mehralizade et al., 2017). There is a scarcity of empirical research on the effectiveness of mobile health applications utilized by pregnant women (DeNicola et al., 2020; Daly et al., 2017; Sedrati et al., 2016).

Chapter Three: Methodology.

3.1 Introduction

This chapter discusses the research methodology including population, study setting, sample, tools, data collection procedure, data analysis, and ethical considerations.

3.2 Study Design

This study used a descriptive, comparative, cross-sectional design to achieve the objectives of the study.

3.3 Setting

This study was conducted at the maternity wards in the East Jerusalem Directorate, including Al-Makassed Hospital, The Red Crescent Society Hospital - Jerusalem, and St. Joseph's Hospital.

- ❖ **Al-Makased Hospital:** Makassed Islamic Charitable Society Hospital was established in East Jerusalem in 1968, consists of 250 beds, and is considered one of the most important and leading medical institutions in Palestine.

- ❖ **The Red Crescent Society Hospital in Jerusalem:** The Red Crescent Society Hospital in Jerusalem was founded in the year 1953, It is located within the walls of the Old Holy City, and it includes Labor/ delivery section, Surgical section, Neonatal Normal Nursery unit, Neonatal intensive care unit, Postnatal Department, and Emergency & Ambulance Department.

- ❖ **St. Joseph's Hospital is a hospital in Jerusalem:** St. Joseph's Hospital is a hospital in East Jerusalem, established in 1956 at the initiative of the sisters of St. Joseph of

the Apparition, as a replacement for their St. Louis Hospital that remained on the Israeli side of divided Jerusalem

3.4 Population

The study population included Palestinian pregnant women which had given birth at one of the previously mentioned maternity wards in the Jerusalem Directorate during the study period.

Inclusion criteria

❖ Women who underwent any type of delivery at one of the selected hospitals included in the study were considered eligible.

Exclusion criteria

❖ Women discharged against medical advice in 1st 24 hours

❖ Women not gave informed consent

3.5 Sampling

This study used convenient sampling to recruit participants from the maternity wards in the Jerusalem directorate. The total sample consisted of 203 women, which met the inclusion criteria of the study.

3.6 Study duration

Data collection occurred between June and July 2022. Collection of data on all days of the week on the Morning and evening shifts.

3.7 Study tool

Data was collected using a structured questionnaire which was developed using tools from previous literature. The questionnaire was divided into four sections:

- Section A: Socio-demographic characteristics of respondents

Table 3.1: Socio-demographic characteristics of respondents

- The hospital

- The age

- place of residence

- Living place of women

- Educational level

- The monthly income of the family

- Do you have health insurance?

- Occupation

- BMI before pregnancy

- BMI after delivery

Section B: The pregnancy and delivery profile

- The mode of delivery in the current pregnancy

- Gravida

- Para

- Abortion

- type of clinic in which I make checkups during the current pregnancy

- The number of clinic visits during the current pregnancy

- **Section C: Knowledge on ANC**: recruited from the previous studies with modifications as study aim and objectives. This divided into two sections, the first was Yes, No question and the second part is five answer Likert scale start from (1- I don't know, 2- I know little, 3- I know, 4- I know enough, 5- I know a lot).

- This scale analyzed according to mean divided to 3 categories (Low knowledge, Intermediate and high knowledge)

- In this part knowledge related to routine care visits, danger signs, nutrition, knowledge related to delivery, developmental of fetus, maternal complications. This retrieved from (Mohamoud et al., 2022; liu et al., 2021)

- **Section D: ANC practices:** recruited from the previous study with modifications as study aim and objectives related to mother practices during their pregnancy with five choices for the answer (Likert scale) (1- Strongly disagree (SD), 2- Disagree (D), 3-Neither agree nor Disagree (Neutral), 4- Agree (A), 5-Strongly Agree (SA))

- **Questions related to Vitamins and minerals, nutrition, exercise and antenatal care visits.**

Section D: Satisfaction with ANC mobile applications

Recruited from the previous study of Frid, et al., (2021) with modifications as study aim and objectives.

- Likert scales allow the respondent to choose the degree of agreement with each item in the questionnaire. When it comes to the stimulus purpose, the different items were measured on 5- a point Likert scale to check the participant's degree of convenience with the statement or not, as (Likert scale) (1- Strongly disagree (SD), 2- Disagree (D), 3-Neither agree nor Disagree (Neutral), 4- Agree (A), 5-Strongly Agree (SA))

3.8 Tool Validity

3.8.1 Virtual Validity

Validity is "the accuracy of an assessment"; in other words, do the used instruments measure what they are supposed to measure? And to have confidence about the validity of the questionnaire before distributing it to the last respondent, the instrument's content validity was ensured through previous literature and from my supervisor (Dr. Hala Allabadi and Dr. Faisal Awartani). The data collection tool was translated into Arabic, and then the content was reviewed by two supervisors to ensure validity, readability, clarity, and comprehensiveness.

3.9 Pilot Study

A pilot study was conducted on 5% of the sample size and was excluded from the sample size. It was conducted to determine the questionnaire's clarity and estimate the time required for the data collection, content validity, and reliability.

3.10 Reliability

To determine the reliability of the questionnaire, the reliability coefficient (Cronbach alpha) was calculated as an indicator of the homogeneity of the level of the instrument. An accepted level would be more than (70%). The reliability of the tool used for this study was 0.797.

3.11 Data Collection procedure

In first ethical approval from AAUP University, an approval letter was sent to the included hospitals to get their permission to conduct this study in their healthcare centers.

The hospital visit was conducted with facilitating letter from the university (Annex II). After introducing myself to the director of nursing, I informed them about the aim of the study and procedure and population, then met the head nurse in the obstetric department to facilitate access to women. Then with an assistant of midwives, planned visits on shifts A and B were conducted.

Women who met inclusion criteria were asked to participate after discussing with them all matters related to the research and informing them about the research purposes, there was no need for their names or any information related to their identity, women who accepted to participate were interviewed using an online version of questionnaire built on Questioner website by using apple iPad to fill the data collection tool

Women not using the ANC application filled in just the Demographic Data, Knowledge, and practice part, Women using the ANC application complete the questionnaire to the end with an additional satisfaction part toward using the application.

3.12 Statistical analysis

Statistical analyses were conducted with the Statistical Package for the Social Sciences (SPSS), (SPSS Inc., Chicago, IL, USA). Absolute values and percentages as well as mean and standard deviations were used to describe the sample characteristics. Statistical tests including One-way ANOVA and Pearson Correlation were used to assess the relationship between the use of ANC mobile applications and knowledge, practices/behaviors, and satisfaction. An Independent t-test

was used to assess differences between women using and not using mobile applications. Statistical significance was set at $P \leq 0.05$.

3.13 Ethical Consideration

Ethical permission for performing the study was obtained from an Institutional Ethics Committee. The study was undertaken after authorization was acquired to gather data from each hospital nursing director. Once this authorization was secured, we contacted the unit mangers of the hospitals and described the research procedure and goal. No researchers were actively involved in the dis-attribution and collecting of the survey questionnaire. The unit managers delivered the surveys and collected them upon completion. The nurse unit managers communicated the goal and contents of this study to participants as well as their right to confidentiality and privacy protection. They also stressed that participation in this research was optional and would not affect the treatment they would get during their hospital stay. If a person chooses to quit at any stage, she may do so. Written informed permission was acquired from each patient.

Chapter Four: Results and data analysis

4.1 Results

The main aim of this study was to evaluate the use of Antenatal Care (ANC) mobile apps and their effect on maternal health knowledge, change in maternal/prenatal behaviors, antenatal care (ANC) attendance, and delivery in the hospital among a sample of Palestinian women in Jerusalem governorate in comparison with women not using M-Health applications.

In this chapter, the data analysis will be divided according to descriptive and inferential statistics. Data will be presented according to the frequency and percentage of each item or means and standard deviations

Table 1: Sample Characteristics (N=203)

Variables	characteristics	N	%
Hospital	Al-Makassed Hospital	82	40.39%
	Saint Joseph Hospital	51	25.12%
	Red Crescent Hospital / Jerusalem	70	34.48%
Age	18 - 24 years	81	39.9%

Variables	characteristics	N	%
	25 - 34 years	96	47.3%
	35 - 44 years	26	12.8%
Place of residence	City	108	53.2%
	Village	78	38.4%
	Camp	17	8.4%
Governorate	Jerusalem	138	68%
	Bethlehem	17	8.4%
	Hebron	29	14.3%
	Ramallah	7	3.4%
	Nablus	8	3.9%
	Tulkarem	1	0.5%
	Tubas	3	1.5%
Educational level	Illiterate	3	1.5%
	primary	2	1.0%
	preparatory	21	10.3%
	secondary	78	38.4%
	university level	99	48.8%
Monthly income	Less than 2500 Nis	11	5.4%
	2500 -3999 Nis	42	20.7%
	4000 -5500 Nis	93	45.8%
	More than 5500 Nis	57	28.1%

Variables	characteristics	N	%
Health insurance	Yes	197	97%
	No	6	3.0%
Occupation	House wife	151	74.4%
	employee	44	21.7%
	private job	8	3.9%
BMI before pregnancy	Underweight	2	1%
	Normal range	139	68.5%
	Overweight	53	26.1%
	Obese	9	4.4%
BMI after delivery	Normal range	25	12.3%
	Overweight	110	54.2%
	Obese	68	33.5%

Table (3.1) shows the characteristics of the sample. Overall, 40% of the sample was recruited from Al-Makassed Hospital, 25.1% from Saint Joseph Hospital, and 34.48% from Red Crescent Hospital in Jerusalem. Among the total sample, 47.3% of women are between 25 - 34 years old, 53% of women reside in cities, 68% are from Jerusalem, 48.8% have university level degrees, 45% have a monthly income between 4000 -5500 Nis, 74% of women are housewives, and 68% of women had a normal weight before pregnancy.

Table 4.2: Pregnancy and delivery status history (N=203)

Variables		N	%
Mode of delivery in the current pregnancy	normal delivery	123	60.6%
	Cesarean section	67	33%
	Vacuum or forceps delivery	13	6.4%
Type of clinic in which I make checkups during the current pregnancy	Private clinic	57	28.1%
	governmental clinic	141	69.5%
	UNRWA clinic	5	2.5%
Number of ANC visits during the current pregnancy	2 - 5 visits	19	9.4%
	6 - 9 visits	51	25.1%
	more than nine visits	133	65.5%
	Overweight	110	54.2%
	Obese	68	33.5%

Table (4.2) shows the delivery profile for included women, which showed that 60.6% had a normal delivery in the current pregnancy, and 33% had a Caesarean section delivery. 65.5% of the sample reported more than nine clinical visits for a routine checkup during the current pregnancy.

Table 4.3. Source of information on maternal health during pregnancy

	N	%
Family and friends	165	81.3%
Health clinic workers (doctor, nurse, midwife ... etc.)	195	96.1%
Internet	118	58.1%
Mobile Applications	103	50.7%
Books and magazines	6	3%

Table 4.3 hows the source of information on maternal health care during pregnancy mainly was from HCP (96.1%) and family and friends (81%).

Table 4.4. History on previous pregnancy (N=203)

	Yes N (%)	No N (%)
Was the information you received on your pregnancy and childbirth clear to you?	196 (96.6%)	7 (3.4%)
Do you have a smartphone?	189 (93%)	14 (7%)

Do you have a mobile application for pregnancy and childbirth	103 (50.7%)	100 (49.3%)

Table (4.4) shows that 96.6% of the sample agree that the information was clear, 93% of women have smartphones, and 50.7% use mobile applications for pregnancy and childbirth.

Table 4.5: Use of Smartphones

	Frequency	Percent
Less than two years old	26	12.8%
From two to three years	38	18.7%
More than three years	139	68.5%

Table (4.5) shows 68.5% of the sample has been using smartphones for more than three years.

Table 4.6. Knowledge of antenatal care (ANC)

	Yes	No	I don't know
Every pregnant woman needs to go to a healthcare clinic to give birth in a health facility.	201 (99.0%)	1 (0.5%)	1 (0.5%)
A pregnant woman should make her first visit to an antenatal clinic after she has missed her period for two consecutive months	44 (21.7%)	156 (76.8%)	3 (1.5%)
Pregnant women can obtain health care services for childbirth in the health facility from doctors, midwives and	201 (99.0%)	2 (1.0%)	0 (0.0%)
There is no limited number of visits to antenatal clinics during the entire pregnancy and pregnant women can go at any time	161 (79.3%)	40 (19.7%)	2 (1.0%)
A pregnant woman should have an ultrasound every time she visits the clinic	171 (84.2%)	31 (15.3%)	1 (0.5%)
Pregnant women should be given health education every time they visit the clinic	175 (86.6%)	27 (13.4%)	0 (0.0%)
When visiting a pregnant woman for the first time, the following danger signs of pregnancy are explained:	110 (54.2%)	93 (45.8%)	0 (0.0%)
Maternal weight, blood pressure, and height are important factors that should be measured routinely	180 (88.7%)	23 (11.3%)	0 (0.0%)
I know why my baby is moving, and I can feel it	161	40	1

	(79.7%)	(19.8%)	(0.5%)

Around 99% of women agree that it is essential that every pregnant woman to go to a health care clinic to give birth in a health facility. 21.7% agree that a pregnant woman should make her first visit to an antenatal clinic after she has missed her period for two consecutive months, 99% agree that pregnant women can obtain health care services for childbirth in the health facility from doctors, midwives, 79% agree that there is no limited number of visits to antenatal clinics during the entire pregnancy and pregnant women can go at any time, 84.4% agree that a pregnant woman should have an ultrasound every time she visits the clinic. 86.6% agree that pregnant women should be given health education every time they visit the clinic, 54.2% agree that when during a pregnant's women first clinic visit, the following danger signs of pregnancy are explained, including maternal weight, blood pressure, and height are important factors that should be measured routinely. Approximately 79.7% of women agree that they know why their baby is moving and they can feel it

The following scale was used to consider the level of impact mean scores degree to assess the level of diabetic patients' oral hygiene; attitude, and practices, this scale depends on interval length=range/number of intervals, interval length= (5-1)/3=1.33. The following scale represents the result: 1 less than 2.33 is low; 2.33- less than 3.66 is medium, and 3.66-5 is high. According to the level of diabetic patients' oral hygiene; knowledge, we will find the percentage of the correct answer according to every statement and, overall, the total average. The following scale represents the result: less than 60% is low, between 60% and less than 70% is medium, and 70% and more is high.

We can use the key in the following table to understand the study.

Mean	scale
1- 2.33	low
2.34 – 3.66	intermediate
3.67 - 5	high

Table 4.7. knowledge of Women's toward maternal health

Knowledge score		
Statement	**Mean**	**SD**
I have sufficient knowledge of nutrition during pregnancy.	3.50	±0.81
I have sufficient knowledge about the methods of childbirth and the advantages and disadvantages of each.	3.43	±0.93
I have enough knowledge to take care of myself after childbirth.	3.69	±0.74
I have good knowledge about the checkups that I have to do during my pregnancy.	3.12	±1.04
I have enough knowledge about breastfeeding and the importance and benefits of breastfeeding	4.43	±0.68
I have enough information about the stages of development of the fetus inside the womb	3.27	±1.54
I've been imagining what my baby looks like inside the womb at every point in time	3.12	±1.74
I have enough knowledge about the complications that can affect the pregnant mother such as gestational diabetes, pressure, poisoning	3.50	±0.96
I have enough knowledge about how to deal with minor symptoms during pregnancy	3.35	±0.92
I can differentiate between the signs of a dangerous pregnancy and the minor signs of pregnancy complications	3.27	±0.94

Table 4.7 shows that women's perception of knowledge was high, with a total mean of 3.46, women have enough knowledge about breastfeeding and the importance and benefits of breastfeeding, with a mean of 4.43 ±0.68, and women have enough knowledge to take care of themselves after childbirth. With a mean of 3.69 ±0.74, women have sufficient nutrition knowledge during pregnancy; with a mean of 3.50 ±0.81.

women have enough knowledge about the complications that can affect the pregnant mother, such as gestational diabetes, pressure, and poisoning, with a mean of 3.50 ±0.96, women have sufficient knowledge about the methods of childbirth and the advantages and disadvantages of each with a mean of 3.43 ±0.93, women have enough knowledge about how to deal with minor symptoms during pregnancy with a mean of 3.35 ±0.92.

women have enough information about the stages of development of the fetus inside the womb with a mean of 3.27 ±1.54, women being able to differentiate between the signs of a dangerous pregnancy and the minor signs of pregnancy complications with mean 3.27 ±0.94, women have good knowledge about the checkups that women have to do during my pregnancy with a mean of 3.12 ±1.04, women have been imagining what their baby looks like inside the womb at every point in time with a mean 3.12 ±1.74.

Table 4.8: Practices and behaviors towards ANC mobile applications

	Disagree	Neutral	Agree	Mean	SD

I prepared myself for the birth well in terms of the necessary information, practices, and equipment.	3 (1.5%)	59 (29.1%)	141 (69.5%)	3.77	0.65
I took iron and vitamins during pregnancy.	3 (1.5%)	28 (13.8%)	172 (84.7%)	4.01	0.64
I took folic acid pills 3 months before pregnancy.	146 (71.9%)	13 (6.4%)	44 (21.7%)	2.04	1.41
I took folic acid pills during the first months of pregnancy.	11 (5.4%)	21 (10.3%)	171 (84.2%)	4.00	0.81
I prepared myself to be a good mother to my child.	1 (0.5%)	51 (25.2%)	150 (74.3%)	3.94	0.71
I am fully committed to healthy nutrition.	8 (3.9%)	27 (13.3%)	168 (82.8%)	3.97	0.69
I do safe exercise for an hour a day during pregnancy.	176 (86.7%)	14 (6.9%)	13 (6.4%)	1.45	0.90
I take over-the-counter medicines during pregnancy.	187 (92.1%)	6 (3.0%)	10 (4.9%)	4.28	0.79
I see a doctor according to the appointments specified by the attending physician.	5 (2.5%)	77 (37.9%)	121 (59.6%)	3.64	0.67
Total mean				**3.12**	**0.81**

The table above showed that practice toward iron and vitamins during pregnancy with a mean of 4.01 ± 0.64, took folic acid pills during the first months of pregnancy. With a mean of 4.00 ± 0.81, fully committed to healthy nutrition. With a mean of 3.97 ± 0.69, prepared t to them to be a good mother to my child. A mean 3.94 ± 0.71, prepared me for the birth well in terms of the necessary

information, practices, and equipment. With a mean of 3.77 ± 0.65, see the doctor according to the appointments specified by the attending physician. With a mean 3.64 ± 0.67, taking folic acid pills 3 months before pregnancy. With a mean of 2.04 ± 1.41, do safe exercise for an hour a day during pregnancy. With mean 1.45 ± 0.90, take over-the-counter medicines during pregnancy. With mean 4.28 ± 0.79, Total mean 3.12 ± 0.81.

Table 4.9: Satisfaction of ANC mobile applications

	Never	Some time	Always	Mean	SD
Was this app meeting your needs?	3 (2.9%)	5 (4.9%)	94 (92.2%)	4.38	0.76
Was using the app easy and simple for you?	0 (0.0%)	4 (3.9%)	99 (96.1%)	4.72	0.53
Are you satisfied with the services you expected from the application during pregnancy?	3 (2.9%)	7 (6.8%)	93 (90.3%)	4.24	0.71
Are you satisfied with the services you expected from the application during delivery?	33 (32.0%)	34 (33.0%)	36 (35.0%)	3.12	1.26
Are you satisfied with the services you expected from the application during the postpartum period?	78 (75.7%)	8 (7.8%)	17 (16.5%)	2.16	1.26
Did the application affect your choice of birth type?	94 (91.3%)	5 (4.9%)	4 (3.9%)		

	Disagree	Neutral	Agree		
Am I able to get all the required information using the app?	9 (8.7%)	14 (13.6%)	80 (77.7%)	3.75	0.86
Found using the app fun?	3 (2.9%)	10 (9.7%)	90 (87.4%)	4.25	0.75
I think that my use of the application helps to access more information about the health of the mother?	2 (1.9%)	11 (10.7%)	90 (87.4%)	4.19	0.70
I recommend others who are interested in maternal health to use this app	4 (3.9%)	8 (7.8%)	91 (88.3%)	4.30	0.78
I intend to continue using the app for my maternity information needs	6 (5.8%)	7 (6.8%)	90 (87.4%)	4.22	0.85
Using the app has greatly increased my knowledge of mother's health	3 (2.9%)	6 (5.8%)	94 (91.3%)	4.25	0.74
I am able to use the app easily	0 (0.0%)	1 (1.0%)	102 (99.0%)	4.46	0.52
I find the app design and layout easy to understand and use	1 (1.0%)	1 (1.0%)	101 (98.1%)	4.51	0.58
I am able to browse the application with ease	0 (0.0%)	4 (3.9%)	99 (96.1%)	4.52	0.58
The information from the app is accurate and reliable to me	4 (3.9%)	22 (21.4%)	77 (74.8%)	4.00	0.82

Sections of the application can be accessed whenever you request it	2 (1.9%)	9 (8.7%)	92 (89.3%)	4.25	0.70

Table 4.10 showed that app meeting needs with mean 4.38 ± 0.76 , ,Was using the app easy and simple with mean 4.72 ± 0.53 , satisfied with the services you expected from the application during pregnancy with mean 4.24 ± 0.71 , satisfied with the services you expected from the application during delivery? with mean 3.12 ± 1.26 , satisfied with the services you expected from the application during the postpartum period? with mean 2.16 ± 1.26, able to get all the required information using the app with mean 3.75 ± 0.86 , Found using the app fun with mean 4.25 ± 0.75 , use of the application helps to access more information about the health of the mother with mean 4.19 ± 0.70 , recommend others who are interested in maternal health to use this app with mean 4.30 ± 0.78 , intend to continue using the app for my maternity information needs with mean 4.22 ± 0.85 , Using the app has greatly increased knowledge of mother's health with mean 4.25 ± 0.74 , able to use the app easily with mean 4.46 ± 0.52 , the app design and layout easy to understand and use with mean 4.51 ± 0.58 , able to browse the application with ease with mean 4.52 ± 0.58 , The information from the app is accurate and reliable with mean 4.00 ± 0.82 , Sections of the application can be accessed whenever you request it with mean 4.25 ± 0.70 ,

Overall satisfaction – Mother review / 10	7.80	1.78
Knowledge Mean	3.47	0.70
Practice Mean	3.69	0.47
Satisfaction Mean	3.89	0.61

4.2 Inferential statistics

Table 4.10: Relationship of use of ANC mobile applications and mean maternal health knowledge score

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Knowledge_score	Yes	103	74.0022	14.39100	1.41799	71.1896	76.8147
	No	100	66.3333	13.06645	1.30664	63.7407	68.9260
	Total	203	70.2244	14.24863	1.00006	68.2525	72.1963
Self_assessment_k	Yes	103	71.8689	15.17350	1.49509	68.9034	74.8344
	No	100	51.1000	13.10081	1.31008	48.5005	53.6995
	Total	203	61.6379	17.57046	1.23320	59.2063	64.0695

Table 4.11: ANOVA Test between maternal health knowledge score with practices

		Sum of Squares	df	Mean Square	F	Sig.
Knowledge_score	Between Groups	2984.000	1	2984.000	15.773	.000
	Within Groups	38026.765	201	189.188		
	Total	41010.764	202			
Self_assessment_k	Between Groups	21886.157	1	21886.157	108.686	.000
	Within Groups	40475.481	201	201.371		
	Total	62361.638	202			

There is significant relationship between using of M-Health application and total knowledge score, knowledge was high among application users, P-value 0.000

Table 4.12: Relationship between maternal health knowledge score and education level

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Knowledge score	Yes	23	72.9469	15.65125	3.26351	66.1788	79.7150
	No	81	66.1180	13.48310	1.49812	63.1366	69.0993
	Total	104	67.6282	14.19970	1.39240	64.8667	70.3897
Self_assessment_k	Yes	23	71.3043	17.73975	3.69899	63.6331	78.9756
	No	81	50.6790	13.12210	1.45801	47.7775	53.5805
	Total	104	55.2404	16.58136	1.62594	52.0157	58.4650

a. Educational Level = Secondary education or less

ANOVA[a]

		Sum of Squares	df	Mean Square	F	Sig.
Knowledge_score	Between Groups	835.372	1	835.372	4.275	.041
	Within Groups	19932.672	102	195.418		
	Total	20768.044	103			
Self_assessment_k	Between Groups	7620.466	1	7620.466	37.553	.000
	Within Groups	20698.524	102	202.927		
	Total	28318.990	103			

a. Educational Level = Secondary education or less

Our findings showed that there was a significant relationship between mother's maternal knowledge scores and education level, which indicates knowledge scores increase with higher educational levels (p-value= 0.041 and 0.000)

Table 4.13: Relationship between maternal health knowledge score and practices

		Knowledge Mean	Practice Mean
Having Mobile app	Yes	3.88	3.34
	No	3.05	2.90
P-value		0.000	0.000

Among our sample of women, maternal health knowledge and practice scores were high among ANC application users. Our results showed there is a significant relationship between use of ANC mobile application and maternal knowledge score and practice score (P-value=0.000).

Table 4.1: Hypothesis

- There is a significant association between socio-demographic variables with Knowledge, practice, and satisfaction toward antenatal applications.

		Knowledge Mean	Practice Mean	Satisfaction Mean
Education level	Illiterate	3.37	2.74	No one using mobile application from this groups
	primary	3.10	2.94	
	preparatory	2.83	2.76	
	secondary	3.31	3.00	3.99
	university level	3.74	3.31	3.92
P-value		0.000	0.000	0.34

Income	Less than 2500 Nis	2.76	3.03	3.78
	2500 -3999 Nis	3.33	3.11	3.84
	4000 -5500 Nis	3.43	3.10	4.04
	More than 5500 Nis	3.78	3.18	3.87
P-value		0.000	0.67	0.28

There is significant relationship between income and education level with total knowledge score and practice. Knowledge and practice were higher with education level, P-value 0.000

There is significant relationship between income with total knowledge score, knowledge was higher with higher income, P-value 0.000

There is no significant relationship between income with total practice score, P-value 0.28

Table 4.15. Relationship between use of ANC mobile applications and mode of delivery (in current pregnancy)

		The mode of delivery in the current pregnancy			Total
		normal delivery	Caesarean section	Vacuum or forceps delivery	
Do you have a mobile application for pregnancy and childbirth	Yes	63	31	9	103
		61.2%	30.1%	8.7%	100.0%
	No	60	36	4	100
		60.0%	36.0%	4.0%	100.0%
Total		123	67	13	203
		60.6%	33.0%	6.4%	100.0%
Pearson Chi-Square: 2.3 P- Value: 0.31					

There is no significant relationship between use of ANC mobile applications and mode of delivery.

Table 4.16 Relationship between use of ANC mobile applications and number of ANC visits during current pregnancy

		Do you have a mobile application for pregnancy and childbirth		Total
		Yes	No	
The number of clinic visits during the current pregnancy	2 - 5 visits	12	7	19
		11.7%	7.0%	9.4%
	6 - 9 visits	38	13	51
		36.9%	13.0%	25.1%
	more than 9 visits	53	80	133
		51.5%	80.0%	65.5%
Total		103	100	203
		100.0%	100.0%	100.0%
Pearson Chi-Square: 19.1 P- Value: 0.000				

Table 4.16 shows there is a significant relationship between use of ANC mobile applications and women's number of ANC visits during the current pregnancy (P-value=0.00). Our results showed that the number of women's ANC visits was lower among users of ANC mobile applications.

Table 4.17. Relationship between use of ANC mobile applications and place of living

	Do you have a mobile application for pregnancy and childbirth	Total

		Yes	No	
living location \ address	City	64	44	108
		59.3%	40.7%	100.0%
	Village	32	46	78
		41.0%	59.0%	100.0%
	Camp	7	10	17
		41.2%	58.8%	100.0%
Total		103	100	203
		50.7%	49.3%	100.0%
Pearson Chi-Square: 6.7 P- Value: 0.035				

Table 4.17 illustrates there is a significant relationship between use of ANC mobile applications with place of living (P-value=0.035). Our results showed women whom lived in cities were more likely to be using ANC mobile applications.

Table (4.18): Relationship of Educational level with having a mobile application for pregnancy and childbirth

		Do you have a mobile application for pregnancy and childbirth		Total
		Yes	No	
Educational level	Illiterate	0	3	3
		0.0%	100.0%	100.0%
	primary	0	2	2
		0.0%	100.0%	100.0%
	preparatory	0	21	21
		0.0%	100.0%	100.0%
	secondary	23	55	78
		29.5%	70.5%	100.0%
	university level	80	19	99
		80.8%	19.2%	100.0%
Total		103	100	203

	50.7%	49.3%	100.0%
Pearson Chi-Square: 76.6		P- Value: 0.00	

There is significant relationship between using ANC applications with education level, application users more among higher education, P-value = 0.00

Table (4.19): Relationship between women Occupation with having a mobile application for pregnancy and childbirth

Crosstab				
		Do you have a mobile application for pregnancy and childbirth		Total
		Yes	No	
Occupation	House wife	65	86	151
		43.0%	57.0%	100.0%
	employee	31	13	44
		70.5%	29.5%	100.0%
	private job	7	1	8
		87.5%	12.5%	100.0%
Total		103	100	203
		50.7%	49.3%	100.0%
Pearson Chi-Square: 14.7 P- Value: 0.001				

There is significant relationship between using ANC applications with occupation, application users more among workers, P-value 0.01

Chapter five: Discussion

5.1 Introduction

Organizations such as the World Health Organization and the United Nations have indicated that many maternal and infant fatalities may be traced back to situations that might have been avoided. Achieving SDG 3 will be aided by better obstetric care. There are several uses for M-health in obstetrics, including but not limited to: health education, access to health records, access to emergency obstetric care, electronic medical records, M-health pregnancy apps, and app connectivity with biomedical devices. The purpose of this analysis was to uncover the scope of M-health apps' contribution to prenatal care.

5.2 Knowledge and practice

Adequate prenatal care and prompt obstetric treatment have been shown to reduce perinatal mortality rates significantly. Our results revealed that healthcare providers (HCP) were the most trusted and valuable source of information for pregnant women (96.1%), followed by family and friends (81.1%). Surprisingly, while being seen as less valuable and trustworthy than professional sources, digital sources are one of the most often utilized information sources by pregnant women. As the most prevalent primary providers of maternity care, midwives are highly respected for their expertise and insight. A systematic literature review of 31 studies from 14 countries found that

health professionals, family, friends, and the internet were the most frequently used information sources by pregnant women. Our findings are consistent with these results (Ghiasi et al., 2019). Despite increasing interest in online resources, the midwife remained the most popular informational choice for expectant mothers in the Netherlands (Camacho-Morell et al., 2020). To better understand first-time moms' educational requirements and options, Grammarian et al. Both moms and medical staff stressed the importance of family involvement and support throughout pregnancy. While the advice offered by family members, especially grandmothers, may be out of date and unprofessional, it is often more pertinent to the pregnant women's actual living situations because of this (Gazmararian et al., 2014).

The majority of the women in our sample used at least one pregnancy app, and app usage was highest among younger women with less prior pregnancy experience. These results are consistent with the findings of a mobile analytics analysis that found 47% of all health app users utilized pregnancy applications (Lupton et al., 2016). They are also consistent with the results of a previous study that revealed younger individuals to be more used to using apps (Lupton et al., 2016). Primiparas are more likely to utilize applications, which is consistent with the results (Qian et al., 2021). Because pregnancy is a new experience for them, they frequently suffer anxiety. However, there are smartphone apps that can help women cope with their concerns about childbirth. This may help them see that their worries about getting pregnant and having a kid are common. This indicates that mobile applications may be useful resources for first-time mothers.

Overall knowledge about antenatal care was high among respondents. It is assumed that women's education and ability to make healthcare decisions depend on their level of education and training in this area. According to the results, there is a strong correlation between women's educational attainment and their levels of knowledge and practice. It was discovered that the

women's behaviors and outlooks were influenced by their level of schooling. Women with higher levels of education scored higher on practically every measure of prenatal care knowledge. Women with less education, however, were more likely to put what they learned about nutrition and other topics into practice.

Additionally, women who have a mobile app have a better degree of knowledge than those who do not. Application use during pregnancy has been shown to improve the quality of care, generate positive impacts on maternal and child health, improve health indicators, reduce the number of maternal deaths, aid the practice of nurses in primary health care, and save money for the health care system (Marko et al., 2019). Although the quality of evidence was moderate, it appears that M-health has the potential to boost prenatal and postnatal attendance compared to the usual strategy. This meta-analysis showed that compared to expectant moms who did not get an M-health intervention, those who did show a substantial increase in four or more prenatal care attendance, vaccination, compliance to iron supplementation, and postnatal care attendance. Two systematic evaluations in low- and middle-income countries corroborated these results (Feroz et al., 2017).

Concerning practice during the antenatal period, the practice was high in all aspects such as iron and vitamins, folic acid, and committed to healthy nutrition. prepared for the birth, safe exercise, there was an improvement in prenatal care practice and usage among pregnant women in groups receiving mobile phone interventions this is consistent with many studies (Benski et al., 2017; Entsieh et al., 2015; Larsen-Cooper et al., 2016). Results from the papers regarding the frequency with which mothers get postnatal care were inconsistently Compared to earlier phases of the mobile phone treatments, Battle et al. (2015) found that postnatal care rates in Zanzibar were high overall. In Nigeria, however, Jennings et al. (2015) observed no statistically significant changes in

postnatal care attendance based on cell phone ownership. Many reasons, including the dissimilarity in communal traits and values between the two nations, might account for these results. Each research measured something unique; for example, Battle et al. (2015) examined the effects of a mobile phone intervention, while Jennings et al. (2015) examined the importance of mobile phone access to maternal health. Project groups have shown increases in the percentage of births that occur in healthcare facilities with a trained medical professional present in the vast majority of trials (Battle et al., 2015; Benski et al., 2017; Jennings et al., 2015; Mangwi et al., 2016; Omole et al., 2018; Oyeyemi et al., 2014). That's in no little part because of the empowerment women are gaining from the education and information they're gaining thanks to their smartphones. Pregnant women in these nations can benefit from heightened health literacy thanks to M-health efforts that offer them relevant information through text messages. Providing meaningful incentives has been shown to increase the use of healthcare facilities. Pregnant women were more likely to give birth at a hospital or other medical institution because transportation was arranged for them by Battle et al. (2015). Inconsistent results were found, however, when examining the relationship between facility delivery and residency status. Five times as many urban women had a birth with expert attendance in the intervention group, whereas rural women saw no improvement in this metric, according to research by Lund et al. (2012). Shiferaw et al. (2016) found that the smartphone application enhanced the use of birth and postnatal care regardless of the user's place of residence. Since these two technological interventions occurred in separate nations, we may again attribute the resulting variation to local factors (Zanzibar and Ethiopia). The efficacy of the planned mobile phone intervention is another factor to consider alongside the dependability of the existing technological infrastructure in each context. Numerous articles have discussed how mobile phones have improved upon conventional methods of providing health care by facilitating faster, more

convenient, and more accessible communication and service (Amoakoh-Coleman et al., 2016; Battle et al., 2015). As a result, data may be sent and managed more quickly and reliably. Using mobile phones, the distance between healthcare providers and their district managers was greatly decreased (Amoakoh-Coleman et al., 2016). Males make up a disproportionate share of mobile phone users in these low- and middle-income countries; as a result, M-health initiatives might benefit from targeting men specifically. There has been an uptick in the number of fathers actively involved in their partners' pregnancies and studies reveal that men are open to learning about maternal health (Roberts et al., 2015). (Entsieh et al., 2015). Overall, most M-health initiatives saw an improvement in acceptance rates among pregnant women. The vast majority of women reported feeling satisfied and confident after learning new information through ANC visits and cell phones. In several cases, women reported that they had been encouraged to give birth in a hospital or other medical institution by text messages they had received (Omole et al., 2018). Community acceptance of M-Health programs is correlated with higher rates of knowledge retention and safer maternal behaviors.

Findings regarding satisfaction with prenatal care apps imply that for many of the women who participated in our study, using pregnancy apps is now an essential part of their pregnancy journey. Several respondents also mentioned using smartphone parenting aids (although far fewer respondents than those who used apps for pregnancy). The most important aspect of using apps for our respondents was sourcing relevant information about pregnancy and fetal and child development.14 This decrease in use may be due to women having less time to spend on apps after the birth of their infants, as well as an increase in the use of mother-baby groups and internet sites for information and support. Respondents also often utilized apps to control and track their health, as well as the health of their unborn and young children. Users were most impressed with

applications that allowed them to keep and maintain data, such as their height and weight or when they slept and ate, to "personalize" the app's outputs. Some experts have found that women are eager to try out mobile applications that cater specifically to their interests and requirements (Johnson, et al. 2018). The focus on visual aids may appeal to women who have literacy issues, but it may also satisfy the requirement for 'titbits' of information on the part of busy moms who do not have time to read pamphlets or books to select the pieces of information relevant to their needs. According to the results, almost all of the respondents turned to the Internet for guidance during their pregnancies or as new parents. Among pregnant women and new parents, app use is highly regarded as a form of digital engagement. Only websites, but not social media sites, were popular enough to challenge applications in this respect. Women and their unborn or young children regularly submit extremely personal and comprehensive information into pregnancy and parenting applications. Various applications gather data on pregnant women's weight, nutrition, mood, exercise routines, due date, initial name, child's name, infant's growth and milestones, ultrasounds, pictures of women and children, and so on.

No statistically significant changes in postnatal care attendance based on antenatal care applications . A number of variables may account for these results; one possibility is that they reflect fundamental differences between the two countries' respective communal traits and ideals. In addition to focusing on distinct outcomes, Battle et al. (2015) and Jennings et al. (2015) examined complementary aspects of maternal health and mobile phone use, respectively. Births attended by a medical professional had increased in the project groups across the majority of studies (Battle et al., 2015; Benski et al., 2017; Jennings et al., 2015; Mangwi et al., 2016; Omole et al., 2018; Oyeyemi et al., 2014). That's in part because of the knowledge and information that mobile phones give women. As part of their mHealth efforts, several of these nations are

distributing important information to pregnant women, raising their level of knowledge and awareness about safer health behaviours. Providing meaningful incentives has been shown to increase the use of health care facilities. A major factor in the rise in facility birth rates was the fact that transportation for the pregnant women had been arranged by Battle et al. (2015). Yet, results were contradictory when it came to the provision of services and residency status. Five times as many urban women had birth with expert attendance in the intervention group as in the control group, according to Lund et al. (2012), whereas the intervention had no effect on rural women. Shiferaw et al. (2016) found that the smartphone application boosted the use of delivery and postnatal care across women of all residential backgrounds. Due to the fact that these two technological innovations occurred in separate nations, we may again ascribe this variation to local circumstances. The efficacy of the suggested mobile phone intervention is yet another factor to consider alongside the dependability of the existing technological infrastructure in each context.

5.3 Satisfaction among M-Health applications.

About 51% of the sample used M-Health applications, those women who had used an ANC app had mostly used only one (77.6%) while 22% had used between 2 and 4 apps and only 1% had used 5 or more. the most common use of parenting apps was for stages of pregnancy and development, obtaining general information about caring for babies, followed by tracking or monitoring their baby growth, and diet and nutrition information, Women demonstrated a high level of satisfaction with a total mean 3.89/5, the high level of satisfaction related to app meeting needs with easy and simple services, able to get all the required information, helps to access more information about the health, the app has greatly increased knowledge of mother's health, The information from the app is accurate and reliable this high level of satisfaction related to a variety of apps and M-health application was very effective to see changes in knowledge and health

outcomes of pregnant women. pregnant women with higher education levels and receiving a high dosage of messages agreed that drinking alcohol would harm the baby. participants placed their trust in-app data this is consistent with previous studies they had obtained or when the data came from what looked to be a reliable source. Although these techniques for determining trustworthiness are acceptable, providers should keep talking to women about app information, promote trustworthy mHealth applications from respectable sources, and frequently evaluate app material to ensure accuracy (Benski et al., 2017;).

 Participants' high levels of agreement about prenatal knowledge and behaviors indicate overall satisfaction. Users of the M-Health app had much higher levels of knowledge and practice, which is in line with the research of (Entsieh et al., 2015; Larsen-Cooper et al., 2016; Jennings et al., 2015; Lund et al., 2014). When comparing maternal care attendance in Nigeria by cell phone ownership, Jennings et al. (2015) found no significant changes. There are several possible explanations for these results, one of which is cultural differences.

Overwhelmingly, the data points to the possibility of a beneficial effect of mobile phones on maternal health. The results revealed that those who used M-health apps had a higher level of knowledge about safe health practices and were more likely to go to medical facilities when they were sick. Available resources in those contexts and the robustness of the suggested research designs can be linked to the influence of M-Health on the residential status and the impact on postnatal care attendance.

This study's conclusions will improve nursing throughout the world. By utilizing M-Health programs, HCP may better serve underserved communities and lessen health inequalities among populations. HCP may utilize mobile phones to spread information about safer health practices to

groups who could benefit the most. The use of mobile phones has improved the speed and efficiency of data management and communication amongst medical facilities of varying levels.

5.4 Recommendations

Based on the findings of this study the following recommendations were drafted:

- There is should be advice for a specific application with accurate and reliable data.

- Long-term follows up and a large study population size is required to identify the long-term effects and foresee the feasibility of the M-health application.

- . It is not possible to determine the long-term effects or predict the viability of the M-health application without extensive follow-up and a sizable research population.

- The integration of M-health programs with telecom providers has the potential to ease the financial and technological burdens now placed on the healthcare system.

- Research in the future should focus on how this type of mobile health software might be used to address other common obstetric concerns for expectant mothers.

- We need additional studies of high quality if we're going to get people talking about how important M-health apps are.

- • To reach targets and decrease rates of maternal and neonatal death and morbidity, policy professionals should think about incorporating M-health initiatives into national health agendas.

5.5 Limitations

It is important to note that this study does not assess the impact on health outcomes, such as reductions in maternal mortality. A study demonstrating impact on outcomes would require a more rigorous research design and a larger sample size, given the prevalence of maternal malpractice. It would be unjustifiable to embark on a trial of that scale without first demonstrating

the feasibility and quality improvement. The most common causes of maternal mortality are related to delivery, including postpartum hemorrhage, and often cannot be predicted. Another limitation of this study is that it is a cross-sectional study in which we cannot assess any type of causation. Additionally, the sample size in this study is low and the study has only been conducted in Jerusalem hospitals, thus our results cannot be generalizable in the entire Palestinian population, including the West Bank.

5.6 Conclusion

This dissertation sheds light on the prevalence and utility of ANC mobile applications as interventions for maternal and child health education and decision-making support. Several gaps in the M-health literature are filled by these results. To begin, the data given in Chapter 4 show that app use is linked to happier people (user ratings). Alternatively, there is a correlation between a decreased propensity to utilize and medical and health & fitness applications.

Participants reported high levels of prenatal care knowledge and practice, as well as a high degree of satisfaction with antenatal care applications.

There are several directions in which these findings may be taken by app creators, medical professionals, public health workers, and average people. As an app is being developed, it may be useful to think about ways to incorporate user feedback. Reviewing and promoting healthcare applications that are built by healthcare organizations and are based on theoretical frameworks may be significant for healthcare professionals. Consumers may benefit from taking some time to consider their app usage objectives before making a final app choice.

Research on the efficacy of MCH apps in influencing positive behavior changes might be the topic of future investigations.

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Annex I: Questionnaire and tool (in English)

Socio-demographic characteristics of respondents

• **The hospital**	• Al-Makassed Hospital
	• Saint Joseph Hospital
	• Red Crescent Hospital / Jerusalem
• **The age**	• 18 - 24 years
	• 25 - 34 years
	• 35 - 44 years
• **place of residence**	• City
	• Village
	• Camp
• **Living place of women**	• Jerusalem
	• Bethlehem
	• Hebron
	• Ramallah
	• Nablus
	• Tulkarem
	• Tubas
• **Educational level**	• Illiterate
	• primary
	• preparatory
	• secondary
	• university level
• **The monthly income of the family**	• Less than 2500 Nis
	• 2500 -3999 Nis
	• 4000 -5500 Nis
	• More than 5500 Nis
• **Do you have health insurance?**	• Yes
	• No
• **Occupation**	• House wife
	• employee
	• private job
• **BMI before pregnancy**	• Underweight
	• Normal range
	• Overweight
	• Obese
• **BMI after delivery**	• Normal range
	• Overweight
	• Obese

Section B: The pregnancy and delivery profile

Variables	characteristics
The mode of delivery in the current pregnancy	normal delivery
	Cesarean section
	Vacuum or forceps delivery
Gravida	
Para	
Abortion	
type of clinic in which I make checkups during the current pregnancy	Private clinic
	governmental clinic
	UNRWA clinic
The number of clinic visits during the current pregnancy	2 - 5 visits
	6 - 9 visits
	more than 9 visits
	Overweight
	Obese

Knowledge of antenatal care (Yes – No questions)

	Yes	No	I don't know
Every pregnant woman needs to go to a healthcare clinic to give birth in a health facility.			
A pregnant woman should make her first visit to an antenatal clinic after she has missed her period for two consecutive months			
Pregnant women can obtain health care services for childbirth in the health facility from doctors, midwives and			
There is no limited number of visits to antenatal clinics during the entire pregnancy and pregnant women can go at any time			
A pregnant woman should have an ultrasound every time she visits the clinic			
Pregnant women should be given health education every time they visit the clinic			
When visiting a pregnant woman for the first time, the following danger signs of pregnancy are explained:			
Maternal weight, blood pressure, and height are important factors that should be measured routinely			
I know why my baby is moving and I can feel it			

Women's Knowledge (Likert scale)

Statement	I don't know	I know little	I know	I know enough	I know a lot
I have sufficient knowledge of nutrition during pregnancy.					
I have sufficient knowledge about the methods of childbirth and the advantages and disadvantages of each.					
I have enough knowledge to take care of myself after childbirth.					
I have good knowledge about the checkups that I have to do during my pregnancy.					
I have enough knowledge about breastfeeding and the importance and benefits of breastfeeding					
I have enough information about the stages of development of the fetus inside the womb					
I've been imagining what my baby looks like inside the womb at every point in time					
I have enough knowledge about the complications that can affect the pregnant mother such as gestational diabetes, pressure, poisoning					
I have enough knowledge about how to deal with minor symptoms during pregnancy					
I can differentiate between the signs of a dangerous pregnancy and the minor signs of pregnancy complications					

Practices and behaviors towards ANC mobile applications

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I prepared myself for the birth well in terms of the necessary information, practices, and equipment.					
I took iron and vitamins during pregnancy.					
I took folic acid pills 3 months before pregnancy.					
I took folic acid pills during the first months of pregnancy.					
I prepared myself to be a good mother to my child.					
I am fully committed to healthy nutrition.					
I do safe exercise for an hour a day during pregnancy.					
I take over-the-counter medicines during pregnancy.					
I see a doctor according to the appointments specified by the attending physician.					

Satisfaction toward antenatal mobile applications

	Never	Some time	Always
Was this app meeting your needs?			
Was using the app easy and simple for you?			
Are you satisfied with the services you expected from the application during pregnancy?			
Are you satisfied with the services you expected from the application during delivery?			

Are you satisfied with the services you expected from the application during the postpartum period?			
Did the application affect your choice of birth type?			

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Am I able to get all the required information using the app?					
Found using the app fun?					
I think that my use of the application helps to access more information about the health of the mother?					
I recommend others who are interested in maternal health to use this app					
I intend to continue using the app for my maternity information needs					
Using the app has greatly increased my knowledge of mother's health					
I am able to use the app easily					
I find the app design and layout easy to understand and use					
I am able to browse the application with ease					
The information from the app is accurate and reliable to me					
Sections of the application can be accessed whenever you request it					

Annex II: Questionnaire and Tool (in Arabic)

ARAB AMERICAN UNIVERSITY

كلية الدراسات العليا –ماجستير المعلومات الصحية

السيدة المحترمة...

تحية طيبة وبعد،

تقوم الباحثة بإعداد دراسة حول موضوع " المعرفة والممارسة المتعلقة بفترة الحمل والمقارنة بين النساء اللواتي يستخدمن تطبيقات الهاتف المحمول وبين اللواتي لا يستخدمن التطبيقات المتعلقة بالحمل" لقد تم اختيارِك لتكوني جزءا من عينة الدراسة بطريقة عشوائية، لذا نضع بين يديكِ هذه الاستبانة راجين تقديم المساعدة، وذلك بالإجابة عن فقرات الاستبانة بدقة وموضوعية لما له اثر كبير في الحصول على نتائج ايجابية، علماً بان كل ما يرد في إجابتكِ سيكون موضع احترام وسوف يعامل بسرية تامة ولن يستخدم إلا لأغراض البحث العلمي فقط ، وعليه لا داعي لكتابة الاسم أو أيه معلومات تدل على شخصكِ الكريم.

وللاستفسار يمكنكم الاتصال على تلفون رقم:

فريق البحث:

القابلة مريم عدنان مناصرة

إشراف: الدكتورة هلا اللبدي والدكتور فيصل عورتاني

شاكرين لكم حسن تعاونكم

الجزء الاول:

معلومات عامة عن الأم:

مستشفى الولادة:☐ المقاصد   ☐ الفرنساوي /القدس   ☐ الهلال الأحمر / القدس

العمر: ....

مكان السكن :   ☐ مدينة   ☐ بلدة   مخيم ☐   قرية

المحافظة : 1- القدس 2- بيت لحم 3- الخليل 4- رام الله والبيرة 5- نابلس 6- سلفيت 7- قلقيلة 8- طولكرم 9- طوباس 10-جنين 11-أريحا والأغوار 12- غزة

المستوى التعليمي :   ☐ غير متعلم   ☐ ابتدائي☐   اعدادي ☐   ثانوي ☐   جامعي ☐ .

الدخل الشهري للاسرة : ☐ اقل من 2500   ☐2500-3999   ☐ 4000- 5500   ☐ اكثر من 5500

هل لديكِ تامين صحي: ☐ نعم   ☐   لا

عدد الذين يعيشون معكِ في نفس المنزل ....

الوظيفة :   ☐ ربة منزل   ☐ موظفة   ☐ عمل خاص ....

الوزن قبل الحمل: .... **الوزن عند الولادة:** .... **الطول:** ....

أسئلة متعلقة بالحمل

- **عدد مرات الحمل :** ---------
- **عدد مرات الولادة :** ---------
- **عدد مرات الإجهاض:** ---------
- **عدد الأطفال :** ---------
- **نوع الولادة في الحمل الحالي :**☐ ولادة طبيعية ☐ قيصرية ☐ ولادة بالشفط أو الملقط

خلال الحمل الحالي كانت المراجعة لدى

1- عيادة خاصة   2- عيادة حكومية   3- عيادة وكالة

عدد الزيارات للعيادة خلال الحمل الحالي

1- زيارة واحدة   2- من 2-5 زيارات   3- من 6-9 زيارات   4- أكثر من 9 زيارات.

<u>مصدر المعلومات المتعلقة برعاية صحة الأم اثناء الحمل *** يمكن اختيار اكثر من اجابة</u>

◯ **الاهل و الأصدقاء**

◯ **العاملون في العيادة الصحية (طبيب/ة، ممرضة، قابلة ... الخ)**

◯ **الانترنت**

◯ **تطبيقات الهاتف المحمول**

◯ **كتب ومجلات**

◯ **أخرى حدد** _____

<u>هل كانت المعلومات التي حصلتِ عليها واضحة بالنسبة لكِ</u>

☐ نعم ، ....   ☐ لا

هل تمتلكين هاتف ذكي :

نعم ، .... ☐   لا ☐

هل لديك تطبيق هاتف محمول خاص بالحمل والولادة

نعم، عدد التطبيقات .... ☐   لا ☐

منذ متى تستخدمين الهواتف الذكية؟

1- أقل من سنتين

2- من سنتين الى ثلاثة سنوات

3- أكثر من ثلاث سنوات

المعرفة 1:

	لا اعلم	لا	نعم		
				من المهم لكل امرأة حامل أن تذهب إلى عيادات الرعاية الصحية للولادة في المرفق الصحي.	**1.**
				يجب على المرأة الحامل القيام بأول زيارة لعيادات رعاية الحوامل بعد أن فاتتها الدورة الشهرية لشهرين متتاليين.	**2.**
				يمكن للمرأة الحامل الحصول على خدمات الرعاية الصحية للولادة في المنشأة الصحية من الأطباء والقابلات والممرضات وأي مقدم رعاية صحية آخر.	**3.**
				لا يوجد عدد محدود من الزيارات لعيادات ما قبل الولادة خلال فترة الحمل بأكملها ويمكن للحامل الذهاب إلى العيادة في أي وقت ترغب فيه.	**4.**
				يجب عمل التصوير التلفزيوني للمرأة الحامل في كل مرة تزور فيها العيادة	**5.**
				يجب تقديم التثقيف الصحي للمرأة الحامل في كل مرة تقوم فيها بزيارة العيادة	**6.**
				عند زيارة المرأة الحامل لأول مرة يتم شرح علامات الخطر التالية للحمل بما في ذلك: تورم القدمين والوجه ، القيء المفرط ، زيادة الشهية للطعام	**7.**
				يعتبر وزن الأمهات وضغط الدم والطول من العوامل المهمة التي يجب قياسها بشكل روتيني خلال جميع الزيارات للعيادة .	**8.**
				أعلم لماذا يتحرك طفلي واشعر بحركته	**9.**

المعرفة 2:

	أعرف كثيرا	أعرف بشكل كافي	أعرف	أعرف قليلا	لا أعرف		**10.**
						لدي معرفة كافية بالتغذية خلال فترة الحمل .	**11.**
						لدي معرفة كافية حول وسائل الولادة ومميزات ومضعفات كل منها.	**12.**
						لدي معرفة كافية بالعناية بنفسي بعد الولادة .	**13.**
						لدي معرفة جيدة حول الفحوصات التي يجب علي القيام بها اثناء فترة الحمل.	**14.**
						لدي معرفة كافية حول الرضاعة وأهمية وفوائد الرضاعة الطبيعية	**15.**
						لدي معلومات كافية عن مراحل تطور الجنين داخل الرحم	**16.**
						كان لدي تخيل على ما يبدو عليه طفلي داخل الرحم في كل فترة زمنية	**17.**
						لدي معرفة كافية حول المضاعفات التي ممكن أن تصيب الام الحامل مثل سكري الحمل، الضغط، تسمم الحمل	**18.**
						لدي معرفة كافية حول كيفية التعامل مع الأعراض الطفيفة خلال فترة الحمل	**19.**
						لدي قدرة على التفريق بين علامات الحمل الخطر والعلامات الطفيفة لمضاعفات الحمل	**20.**

الممارسة :

1 اعارض بشدة   2- لا أوافق   3- محايد   4- أوافق   5 أوافق بشدة

1	2	3	4	5	
					1. لقد هيأت نفسي للولادة بشكل جيد من حيث المعلومات والممارسات والتجهيزات اللازمة.
					2. أخذت الحديد والفيتناميات خلال فترة الحمل.
					3. أخذت حبوب حمض الفوليك قبل الحمل ب 3 اشهر.
					4. أخذت حبوب حمض الفوليك خلال الأشهر الأولى من الحمل.
					5. لقد هيأت نفسي لأكون أم جيدة لطفلي.
					6. التزم بشكل كامل بالتغذية الصحية .
					7. امارس التمارين الرياضية الأمنة لمدة ساعة يوميا خلال فترة الحمل.
					8. اتناول الأدوية دون وصفة طبية خلال الحمل.
					9. كنت أذهب للمراجعة حسب المواعيد المحددة من قبل الطبيب المعالج .

اذا كنتِ تستخدمي تطبيقات خلال فترة الحمل الرجاء اكمال هذا الجزء

عدد تطبيقات الرعاية بالحمل التي تستخدميها : ---------------

اسم التطبيق 1: ----------   2: -------------   3 :-----------

منذ متى تستخدمين هذه التطبيقات:

1- الأشهر الأولى (1-3)   2- الأشهر المتوسطة (4-6)   3- الأشهر الأخيرة (7-9)

كم الفترة التي تقضينها في استخدام التطبيق يوميا :

1- اقل من 15دقائق 2- من 15دقيقة الى 30 دقيقة   3- من 30 الى 60 دقيقة   4-اكثر من 60 دقيقة

الهدف الرئيسي للتطبيقات؟

1- علامات الخطر والأمراض أثناء الحمل والتغيرات الجسدية المتعلقة بالحمل الطبيعي

2- معرفة عمر الحمل

3- حجم الجنين ومراحل نموه

4- إرشادات لنظام غذائي

5- تمارين رياضية خلال الحمل

6- التثقيف قبل الولادة

7- -الرضاعة الطبيعية

8- رعاية المولود

9- التطعيمات

10- أخرى ----------

	ابدا	نادرا	احيانا	غالبا	دائما	
						هل هذا التطبيق كان ملبيا لاحتياجاتكِ ؟
						هل كان استخدام التطبيق سهلا وبسيطا بالنسبة لك؟
						هل انتِ راضية عن الخدمات التي توقعتها من التطبيق خلال فترة الحمل؟
						هل انتِ راضية عن الخدمات التي توقعتها من التطبيق خلال الولادة ؟
						هل انتِ راضية عن الخدمات التي توقعتها من التطبيق خلال فترة ما بعد الولادة؟
						هل التطبيق أثر على اختيارِك لنوع الولادة؟

أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة	
					أنا قادرة على الحصول على جميع المعلومات المطلوبة باستخدام التطبيق؟
					وجدت استخدام التطبيق ممتعا؟
					أعتقد أن استخدامي للتطبيق يساعد على الوصول لمعلومات أكثر عن صحة الام؟
					أوصي الاخرين المهتمين بصحة الأم باستخدام هذا التطبيق
					أعتزم الاستمرار في استخدام التطبيق لاحتياجات معلومات الأمومة الخاصة بي
					أدى استخدام التطبيق إلى زيادة معرفتي بصحة الأم بشكل كبير
					سهولة الاستخدام
					أنا قادر على استخدام التطبيق بسهولة
					أجد تصميم التطبيق وتخطيطه سهل الفهم والاستخدام
					أنا قادر على تصفح التطبيق بكل سهولة
					الدقة
					المعلومات الواردة من التطبيق دقيقة وموثوقة بالنسبة لي
					يمكن الوصول إلى أقسام التطبيق متى طلبت ذلك

الرجاء وضع دائرة حول الرضى بشكل عام عن التطبيق الذي تستخدمه.

ممتاز   سيئة

10   9   8   7   6   5   4   3   2   1

ملاحظات تود اضافتها

....
....
....
....
....

شكرا لكم ☺

Annex III: Facilitating letter

Arab American University

Faculty of Graduate Studies

الجامعـــة العربيـــة الأمريكيـــة

كلية الدراسات العليا

<div dir="rtl">

تسهيل مهمة بحثية

تحية طيبة وبعد,

تهديكم كلية الدراسات العليا في الجامعة العربية الأمريكية أطيب التحيات, وبالإشارة الى الموضوع أعلاه, تشهد كلية الدراسات العليا في الجامعة أن الطالبة مريم عدنان حسين مناصرة والتي تحمل الرقم الجامعي 202012517 وهي طالبة ماجستير في الجامعة العربية الأمريكية في برنامج المعلوماتية الصحية, وتعمل على اعداد أطروحة الماجستير بعنوان:" المعرفة والممارسة المتعلقة بفترة الحمل والمقارنة بين النساء اللواتي يستخدمن تطبيقات الهاتف المحمول وبين اللواتي لا يستخدمن التطبيقات المتعلقة بالحمل " تحت اشراف كل من د. هلا اللبدي ود. فيصل العورتاني، حيث تستهدف الباحثة النساء الحوامل في مستشفى المقاصد علما بأن أداة التقييم التي سيتم استخدامها عبارة عن استبيان، نأمل من حضرتكم الايعاز لمن يلزم لمساعدتها للحصول على المعلومات اللازمة للدراسة، علما أن المعلومات ستستخدم لغاية البحث العلمي فقط وسيتم التعامل معها بسرية تامة, وقد أعطيت هذه الرسالة بناء على طلبها.

وتفضلوا بقبول فائق الاحترام ,,,

عميد كلية الدراسات العليا

د. نوار قطب

</div>

ملخص الدراسة

مقدمة: الهدف الأساسي من رعاية الحمل هو حماية صحة الأم والطفل من خلال تقديم الرعاية المناسبة قبل الولادة والوقاية من المضاعفات ، ويشمل تطبيقات الهاتف المحمول "استخدام الأجهزة الإلكترونية المحمولة مع تطبيقات البرامج لتوفير الخدمات الصحية وإدارة معلومات المريض ، "على الرغم من عدم وجود تعريف مقبول عالميًا ، فإن التطبيقات الصحية لديها القدرة على توفير معلومات مخصصة لفئات معينة من السكان ، وتقوم الأنظمة الصحية ومؤسسات رعاية الأمومة بفحص ما إذا كان سيتم دمج طرائق دعم المرضى الرقمية في الرعاية وكيفية دمجها والبحث عن البيانات لدعم قراراتهم. لقد تم اقتراح أن التطبيقات المحمولة قد تعزز نتائج الفترة المحيطة بالولادة من خلال تسهيل الوصول إلى المعلومات الصحية، وتغيير الطلب على الخدمات، وتمكين تقديم العلاج المركّز.

الهدف الرئيسي من هذه الدراسة هو تقييم استخدام تطبيقات الهاتف المحمول لرعاية ما قبل الولادة (ANC) وتأثيرها على المعرفة بصحة الأم، والتغيير في سلوكيات الأم في مرحلة ما قبل الولادة، والولادة في المستشفى بين عينة من النساء الفلسطينيات في الضفة الغربية والقدس مقارنة بالنساء اللواتي لا يستخدمن تطبيقات الصحة المحمولة.

الأساليب: تصميم وصفي مقارن مقطعي يستخدم لتحقيق هدف الدراسة. أجريت الدراسة في أقسام الولادة في مديرية القدس التي يحكمها القطاع الأهلي، بدأ جمع البيانات في يونيو 2022 واكتمل في يوليو 2022، أجريت التحليلات الإحصائية باستخدام SPSS 25.

النتائج:كان مصدر المعلومات حول الرعاية الصحية للأم أثناء الحمل في الغالب مقدمي الرعاية الصحية مع 96.1٪ و81٪ من العائلة والأصدقاء، و 96.6٪ من العينة يوافقون على أن المعلومات كانت واضحة، و 93٪ لديهم هواتف ذكية و 50.7٪ لديهم تطبيقات للهاتف المحمول. الحمل والولادة، وكانت النساء أيضًا مستوى عالٍ من المعرفة والممارسة تجاه رعاية ما قبل الولادة، مع ارتفاع بين مستخدمي تطبيقات ما قبل الولادة، كما كان لدى النساء أيضًا مستوى عالٍ من الرضا تجاه تطبيقات ما قبل الولادة التي استخدموها

الكلمات المفتاحية: الصحة المتنقلة، رعاية ما قبل الولادة، المعرفة، الممارسة، الرضا، التطبيقات