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ORIGINAL RESEARCH PAPER

MATRIMANAS digital app for maternal mental healthcare: A research proposal

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Abstract

Motherhood brings significant physical and emotional changes for women, often accompanied by various mental health challenges like stress, anxiety, and depression. A mother's mental health is essential for her own well-being and significantly influences her child's long-term psychological and physical development. Achieving SDG 3- Good Health and Well-Being is not possible if maternal mental healthcare, especially during the antenatal and perinatal phases, is neglected. Overlooking this important aspect of healthcare can hamper progress towards SDG 5 (Gender Equality) and SDG 10 (Bridging Inequalities).

Unfortunately, women in India face numerous barriers to accessing mental healthcare, primarily a lack of awareness and support regarding the range and severity of their mental health concerns, stigma associated with these conditions, lack of availability and accessibility of professional help, etc. The current paper is based on the crucial topics of antenatal and perinatal mental health, a decisive factor for the overall well-being of women, children, and families.

To address the barriers to maternal mental health, a digital app is proposed as a way of bridging the masses' access to comprehensive healthcare and dealing with the existing lack of trusted mental healthcare. The proposed solution, integrating mental health sciences and computer sciences, can provide India with the means of achieving SDGs 2030.

The App MATRIMANAS, currently a work-in-progress, shall combine standardized assessment and screening tools, personalized support, and help from trained, qualified mental health professionals in the mode chosen by users, breaking the barriers of time and distance. It is proposed as a solution to enhance women's access to professional services, reduce the stigma around mental healthcare and empower them to shape a healthy future for themselves and their babies.

Keywords: Antenatal, Perinatal, Mental health issues, Mobile application, Mental health screening, Psychometric assessments, Personalized counseling

Introduction

Pregnancy is a much-awaited and joyous phase for women and families, yet it often poses several challenges to the health of the expectant mother. The period after childbirth again proves to be a period of significant emotional and psychological stress for women. According to the World Health Organization, approximately 10% of pregnant women and 13% of new mothers globally experience mental health conditions, most often depression. In developing countries, this is even higher, i.e., 15.6% during pregnancy and 19.8% after childbirth. A systematic review of Indian studies revealed a wide range in depression prevalence among pregnant women, ranging from approximately 10 to 55% in the first trimester, 8 to 48% in the second trimester, and 11 to 30% in the third trimester (Arora & Aeri, 2019).

The various mental health concerns encountered during the antenatal and perinatal phases negatively impact women's well-being and that of their children. These issues are aggravated further by the lack of understanding and emotional support and the associated stigma. Moreover, the healthcare system in India also has limitations in the accessibility and affordability of professional mental healthcare and the stigma associated with seeking help.

The current study aims to explore the various mental health challenges faced by expectant and new mothers. It discusses our digital app as a platform that can provide them with comprehensive mental healthcare during the antenatal and perinatal stages.

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Background of the Research Problem

The primary research problem is the lack of accessible and affordable mental healthcare for expectant and new mothers in India, leading to significant gaps in their mental well-being and impacting the health of both mothers and their babies.

Pregnancy is a transformative journey that brings profound physical and emotional changes in a woman's body. Physically, the most obvious change is the growing fetus within the uterus, leading to increased weight, altered body shape, and hormonal fluctuations. These hormonal shifts can lead to several physical symptoms like morning sickness, fatigue, mood swings, and changes in appetite and sleep patterns. The body also undergoes physiological adaptations to support the growing baby, such as increased blood volume, changes in heart function, and adjustments to the respiratory system. The hormone levels also drop tremendously in the postpartum stage, along with many other anatomical and physiological changes following childbirth.

Emotionally, pregnancy can evoke a spectrum of feelings, from excitement and joy to anxiety and apprehension. The anticipation of motherhood, coupled with the physical and hormonal changes, can contribute to emotional volatility. After delivery, the emotional stressors increase with concerns and worry about the safety of their baby, self-doubts over proper care and handling of an infant, increased responsibilities, changing relationship dynamics of the parents, societal and familial pressures, as well as body-image issues caused by the changed body. Particularly, the primiparous women suffer more from the psychological stressors. Many women experience heightened sensitivity, fluctuating moods, and concerns about the well-being of their babies. These emotional experiences are unique to each individual and can be influenced by various factors, including personal history, relationship dynamics, and social support systems.

Maternal health is an umbrella term that encompasses the holistic health of women during the period of expectancy, childbirth, and the postnatal period (WHO). It includes the physical as well as the psychological health of women. The Sustainable Development Goals (SDGs) offer a cooperative global structure aimed at improving maternal health internationally. To achieve universal health coverage by 2030, the World Health Organization (WHO) has set a target to reduce the global maternal mortality ratio to less than 70 deaths per 100,000 live births. These objectives necessitate comprehensive reproductive, maternal, newborn, and child health services accessible to all. And this strategy cannot be complete without including maternal mental health.

The substantial physical and emotional transformations experienced during pregnancy often lead to numerous mental health challenges. The hormonal shifts lead to significant impairment to the mood regulation system in the brain, the physical demands of the growing body, and resulting fatigue extends to emotional fatigue and the changing relationship dynamics, financial concerns also aggravate this emotional distress for the expectant women. The fears related to labor, delivery, and raising a baby add to the anxiety and stress of an expecting mother, which can be further affected by incomplete information or confusion caused by discrepancies in medical advice and cultural norms. Many mothers, especially in the postpartum phase, face severe mental health issues, some of which are postpartum psychosis/ depression and OCD related to childcare practices. Poor mental health conditions can also stem from various other factors such as miscarriages and abortions, family and relationship conflicts, unequal distribution of labor, unhealthy work-life balance, birth complications, etc. (Chauhan & Potdar, 2022). Especially women with existing mental health issues become helpless as they have to discontinue medications during and immediately after pregnancy.

Studies have clearly shown a strong link between a mother's emotional well-being during pregnancy and after birth and her child's overall health. These effects can range from developmental delays in newborns and neurodevelopmental disorders in adolescence to mental health and social difficulties that may persist into adulthood. Complete antenatal and perinatal healthcare is hence a crucial element for achieving SDG 3, which is Good Health and Well-being. Maternal mental healthcare has been identified as one essential element of the same by the World Health Organization (WHO). WHO has expressed that the need for the hour is "evidence-based, cost-effective, and human rights oriented mental health and social care services in community-based settings for early identification and management of maternal mental disorders." Poor perinatal mental healthcare affects the women's overall well-being and the fetus' physical health as it impacts the mother's adherence to proper diet plans, medicinal plans, self-care routines, physical exercise plans, as well as sleep patterns. Research has shown that it also significantly affects the emotional make-up of the unborn child. Poor psychological health concerns that emerge during pregnancy usually last for the postpartum phase as well and significantly affect the connection between the mother and her baby. It impairs her ability to manage her new responsibilities, provide a healthy environment for the baby and raise an emotionally secure and physically healthy child.

Postpartum mental healthcare is a focus of interest worldwide, especially when it comes to postpartum psychosis and depression. In January 2016, the UK Prime Minister revealed a major funding initiative of more than £290 million to create specialized mental health support

services for pregnant women and new mothers in their child's first year. Similarly, in Australia as well as in France, psychiatric MBUs (mother-baby units) have been set up.

Yet, there hasn't been sufficient focus on antenatal or perinatal mental healthcare, globally as well as in India. Patton *et al.* have also noted in their 2015 study that perinatal depression has been neglected globally, while it should be a key health priority, given its impact on 10-15% of women in affluent nations and an even greater proportion in less-developed countries. They express further that in recent years, maternal mental health has begun to gain attention. Another extensive review study (Hadfield *et al*., 2022) on pregnancy-related anxiety, which included 295 studies, found that though such research has been conducted in 33 countries, there are almost no culturally valid tools developed for the target populations in the low-income countries.

Regrettably, numerous expectant women encounter various obstacles in accessing mental health care. Often, their anxiety, stress, or sadness are overlooked as minor and temporary emotional fluctuations, and the issues are neglected without counseling for the same. There is no attempt at help-seeking, which worsens these issues. The stigma surrounding mental health often acts as a barrier, preventing pregnant women from accessing the support and treatment they need. They are unable to disclose and discuss their emotional turmoil with family, friends, or even healthcare providers due to embarrassment or discomfort.

Another barrier posed to women is when they face a lack of understanding from partners and families regarding their mood changes, struggles with added duties, daunting fear for the safety of the baby, self-doubt over their abilities as mothers, and their struggles with the various physiological changes. Moreover, in the absence of counseling and mental health support, the postpartum phase is often one of huge stress for the romantic relationship between partners, particularly in the nuclear families of the modern world. Research has shown that the postpartum period commonly leads to long-term conflicts and misunderstandings. Such issues cannot be neglected as parental conflicts have direct consequences on the emotional health of children.

Access to qualified mental health professionals, such as therapists or psychiatrists, can be limited, especially in rural areas or underserved communities. The long waiting lists, limited availability of appointments, and financial constraints can further hinder access to care.

These barriers can significantly impact a pregnant woman's ability to access the mental health care she needs, potentially leading to untreated mental health conditions with harmful consequences for the mother and baby.

The current paper is an attempt to highlight the importance of maternal mental healthcare and propose our digital app MATRIMANAS, which shall provide comprehensive maternal mental healthcare.

Research questions

Under the Sustainable Developmental Goals 2030, SDG 3 is aimed at Good Health and Well-Being. This goal cannot be achieved if the mental healthcare of expectant mothers is neglected, as it directly impacts women's and children's health.

The current study not only explores the often overlooked yet hugely important area of antenatal and postnatal mental healthcare but also answers the following research questions:

- The most important research question that the current study answers is how digital health technologies can address healthcare access gaps in rural India. (Research Questions Part 3. 24) The proposed App MATRIMANAS will not only have standardized screening tools and psychometric tests but will also give users easy access to professional mental health services in their own preferred mode.
- This study is an integration of Computer Sciences and Mental Health Sciences and answers the research question of how such interdisciplinary research can help India achieve SDGs by the 2030s. (Research Question Part 1. 1.)
- Innovative technologies like digital apps and AI-powered communication systems integrated into the Digital App can bridge the gap between current progress and the SDGs (Research Question Part 1. 4. What role does innovation play in bridging the gaps between current progress and the SDGs, and how can it be fostered across disciplines?)
- Through such studies and through the optimum use of technologies that break the barriers of time and distance and help users access healthcare services from qualified trained professionals, India can strengthen its mental healthcare system, in order to achieve SDG 3 which is Good Health and Well-Being. (Research Question 3. 22. How can India strengthen mental health services as part of its efforts to promote holistic well-being by 2047?)

Importance of the Research

This research study holds significant importance in addressing a critical public health issue: inadequate maternal mental healthcare in India. The results of the study has several key implications:

Highlighting the prevalence and impact of maternal mental health challenges

the paper aims to shed light on the gravity and impact of various mental health problems such as anxiety, depression, OCD, and stress encountered during the antenatal and perinatal stages.

Examining obstacles to mental healthcare access

The study explores the specific barriers that prevent pregnant women from accessing necessary mental health

support, such as stigma, lack of awareness, limited access to professionals, and financial constraints. This information will be vital for developing targeted interventions to address these barriers.

Exploring the role of social support and cultural norms

By taking into account the link between social support, familial pressures, cultural norms and maternal mental health, this research will provide valuable insights into the socio-cultural factors that influence women's mental well-being during pregnancy.

Developing a data-driven solution- MATRIMANAS app

A key objective of this research is to highlight the importance of a user-friendly digital app – MATRIMANAS – that can effectively address the identified challenges. This app can prove to be an effective tool to revolutionize maternal mental healthcare in India by:

- *Enhancing accessibility*

Breaking down geographical barriers and providing access to mental health professionals remotely.

- *Reducing stigma*

Offering a confidential and convenient platform for seeking help, reducing the fear of social judgment.

- *Personalizing support*

Tailoring interventions to individual needs and preferences through personalized counseling and support resources.

- *Empowering women*

Providing women with the tools and information to manage their mental health and make informed decisions about their well-being.

Contributing to SDG 3 (Good Health and Well-being)

This study contributes directly to the achievement of the Sustainable Development Goals, specifically SDG 3, focused on ensuring healthy lives and promoting well-being for everyone, regardless of age. By improving access to maternal mental healthcare, this study highlights the existing gaps in the existing healthcare system. Moreover, it outlines strategies for improving the holistic well-being of mothers and their children, contributing to a healthier and more equitable society.

The research further supports the goals of SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities), as the gap in access to comprehensive maternal healthcare directly impacts the efforts towards achieving these other sustainable developmental goals.

Hence, this research study attempts to stress the vital connection between maternal mental health and the overall well-being of mothers and babies. The MATRIMANAS app, as a data-driven solution, holds the potential to transform healthcare services in India, improving access, reducing stigma, and empowering women to prioritize their mental well-being during this critical period.

Research Gaps

Despite its global impact, antenatal and perinatal mental healthcare remains significantly under-resourced. Studies like Patton *et al*. (2015) emphasize the neglect of perinatal depression, a condition that has an impact on 10 to 15% of women in high-income countries and an even larger population in low-income settings. Chauhan and Potdar (2022) further highlight a critical gap in research, noting the lack of comprehensive studies exploring the link between prenatal mental disorders and the availability of support. While maternal mental health is gaining some attention, it's primarily limited to urban areas and lacks widespread support from the medical community and society.

Moreover, digital mental health (DTH) Platforms are also areas that have not been researched sufficiently. They are the platforms that can use modern technologies to bridge the gap between the masses and professional healthcare, transcending the barriers of means, mode, time, and distance. They can increase public and societal awareness about maternal mental healthcare and reduce the stigma around mental health conditions.

Existing interventions lack accessibility, affordability, and cultural sensitivity, especially in rural and remote settings.

While digital health interventions are emerging, there is a dearth of evidence-based and culturally adapted mobile applications specifically designed for maternal mental healthcare.

Overview of the Paper's Structure

The research study has been presented in the following format-

Introduction

1. Background of the Research Problem
2. Research Question
3. Importance of the Research
4. Research Gaps
5. Overview of the Paper's Structure

Review of Literature

- Details about the Proposed App

1. Target Audience
2. Key Features
3. Expected Impact
4. Pilot Study

Discussion

- Implications of the Study
- Limitations of the Study

- *Conclusion*

- *Acknowledgment*

Conflict of Interest

References

Review of Literature

Maternal mental health conditions represent a substantial public health concern, exhibiting substantial prevalence within the antenatal and postnatal period. These disorders have been identified as contributing factors to maternal mortality rates and are associated with adverse outcomes for neonates, infants, and children (Howard & Khalifeh, 2020). The research was carried out after an extensive literature review, a few of which are as follows:

Balcombe & Leo did a review study in 2022 to assess the effectiveness of digital mental health (DMH) platforms and digital mental health interventions (DMHI). The study found that scalable DMH platforms applying ICBT can be highly effective in dealing with issues such as anxiety and depression for the adult population.

A review study by Chauhan and Potdar in 2022 highlighted the potential negative consequences of maternal mental health issues on the developing fetus, such as low birth weight, neonatal challenges, adolescent neurodevelopmental disorders, etc. Societal factors like poverty and overcrowding can exacerbate these challenges. The research highlighted the need for various treatment options, including medication, therapy, exercise, social support, and couple counseling.

Morales *et al*. 2021 published the findings of their study and found that pregnancy could aggravate the negative effects of other health conditions like the COVID-19 pandemic. Pregnant women participants showed a significant increase in psychopathological issues such as depression and anxiety. Thus, their research also highlights the need for more focus on perinatal health care so that healthcare initiatives are optimized.

The review study by Howard & Khalifeh in 2020 on perinatal mental disorders and psychiatric facilities reveals that the various interventions with psychological and psychosocial approaches are quite beneficial for perinatal mental health issues. They express the need for more research on the full extent of such conditions and on ways to improve the masses' access to such treatments. They also express the need for research to test the effectiveness of various types of treatment models. The implications put forth in this research encourage focus on preconception care and more research and investment into perinatal mental health services as a means to reduce maternal and child morbidity and mortality.

Baumel, Tinkelman, Mathur, and Kane published their study in 2018, where they examined the efficacy of a digital peer-support platform (7 Cups) as an adjunct treatment for women with postpartum depression. Their study found favorable outcomes in the app where peer support was created for mothers with PPD who chatted with trained volunteers (who had previously experienced perinatal mood disorders).

A 20-year cohort study published by Patton *et al*. in 2015 explored the prediction of perinatal depression based on mental health history during adolescence and before conception. Their findings revealed a significant link between prior mental health struggles and perinatal depression. Specifically, 34% of women experiencing perinatal depressive symptoms had a history of mental health problems in adolescence or adulthood, compared to only 8% of women without such a history. Furthermore, in the 109 pregnancies where perinatal depressive symptoms were observed at least once, a striking 93 involved a preconception history of mental health issues. These results clearly identify women with a history of common mental health conditions, like anxiety and depression, as a high-risk group requiring clinical support.

In a 2013 study, Wisner *et al***.** investigated postpartum depression screening with a focus on self-harm tendencies. Their research aimed to determine the timing of depressive episodes, the rate and nature of self-harm ideation, and the prevalence of primary and secondary DSM-IV disorders. This information was intended to inform both treatment strategies and policy development. Following their screening process, the most frequent diagnosis observed among the women studied was major depressive disorder accompanied by generalized anxiety disorder.

Russell, Fawcett and Mazmanian, in 2013, conducted a meta-analysis to assess the prevalence of OCD in pregnant and postpartum women. Their research revealed that the prevalence of OCD is maximum in postpartum women (M = 2.43%) and a bit lesser in pregnant women (M = 2.07%), both of which are more than the prevalence rate in the general population (M = 1.08%). Their exploratory analysis also leads to the conclusion that pregnant and postpartum women are more likely to portray OCD symptoms as compared to the women in the general population.

Divney *et al*. conducted a study in 2012 to assess the link between couples' experiences of stressful life events and depression during pregnancy and also the buffering provided by the social support present for the couples. They concluded that support systems reduce the negative impact of stressors and enhance the emotional well-being of expectant couples.

Details about the Proposed App

The researchers have brainstormed and wish to work on a mobile application that is easily accessible and provides reliable and confidential mental health assessment and remote counseling services specifically designed for pregnant women. This app will include the following features:

Mental Health Assessment

standardized questionnaires and screening tools to assess users' mental health status.

Psychometric Tools

standardized psychometric tools for assessment of specific issues, like stress and anxiety levels.

Counseling Services

Provide real-time counseling services through chat, audio, and video calls with qualified mental health professionals.

Educational Resources

Offer evidence-based information and resources on pregnancy-related mental health, stress management, and coping strategies.

Community Support

Facilitate peer-to-peer support through online forums and chat groups.

Target Audience

- Pregnant women
- Partners of pregnant women
- Other family members
- Healthcare providers (obstetricians, gynecologists, family physicians)

Key Features

User-Friendly Interface

A simple and intuitive interface to ensure easy navigation and accessibility.

Secure and Confidential Platform

Robust security measures to protect user privacy and data confidentiality.

Real-Time Counseling

Earliest access to suitable mental health professionals for counseling sessions.

Personalized Treatment Plans

Tailored recommendations based on individual needs and assessment results.

Anonymous Support

Option to participate in peer-support groups anonymously.

Integration with Healthcare Providers

Seamless integration with healthcare providers to facilitate referrals and shared care plans.

Expected Impact

- Easily accessible support for women in the antenatal and perinatal stages
- Improved mental health outcomes for expectant and new mothers
- Reduced confusion and uncertainty regarding various physiological and psychological changes and mood fluctuations experienced during pregnancy
- Reduced rates of anxiety, depression, and other mental health disorders
- Enhanced maternal health with a direct effect on physical health and overall well-being
- Ease of communication between mental health care providers and other medical professionals to ensure the best healthcare facility for pregnant women.
- Holistically safe and optimum development of the fetus is ensured
- long-term benefits to the mental health of the mothers and babies
- Increased awareness regarding the importance of maternal mental health among partners and families
- Better relationships between partners and family members due to informed counseling
- Increased access to mental health services, especially for women in remote areas
- Reduced stigma associated with seeking mental health help

Pilot Study

A pilot study shall evaluate the feasibility, usability, and acceptability of the "MATRIMANAS" app with a small group of target users (approximately 50-60 women) in the antenatal and perinatal stages. The pilot study will not only aim to assess usability and user experience but also gather preliminary data on app usage and user engagement.

Discussion

This paper highlights the critical need for accessible and effective mental healthcare for pregnant and postpartum women in India. It discusses the prevalence of various maternal mental health challenges, with numerous contributing factors such as physiological changes, emotional changes and sociocultural factors.

It also discusses the detrimental impact of such mental health conditions on maternal and child well-being.

The identified barriers to accessing care, including stigma, limited access to professionals, and financial constraints, further emphasize the urgent need for innovative solutions.

The study proposes a means to enable India to achieve its SDG 3 (Good Health and Well-being) by 2030, along with enhancing its success towards SDG 5 (Gender Equality) and SDG 10 (Bridging Inequalities).

Implications of the study

The importance of the research lies in its potential to contribute significantly to

- Improving maternal and child health outcomes
- Reducing health disparities

- Advancing the field of digital health
- Informing policy and program development

Limitations of the study

- The current paper lacks empirical data due to time constraints and due to the lack of culturally adapted, scientifically validated tools.
- There is a lack of focus on maternal mental healthcare in India, due to which there is poor body of existing literature on the topic.
- The current paper focuses on the conceptual framework for the development of the MATRIMANAS App. Comprehensive empirical research and a pilot study will be conducted in the subsequent phases of the research.

Conclusion

Maternal mental healthcare is a crucial aspect of the overall health and well-being of women and babies. It requires extensive focus and research for India to achieve SDG 3. There is a need for accessible, affordable and culturally sensitive interventions for the same. MATRIMANAS App demonstrates the potential of digital health technologies to address these challenges by providing a comprehensive one-stop platform for maternal mental health support.

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Conflict of Interest

The authors declare no competing interests related to the paper "MATRIMANAS Digital App for Maternal Mental Healthcare."

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