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| RESEARCH ARTICLE

Telepsychiatry for the Treatment of Postpartum Depression in Women in Urban and Rural Areas of Bangladesh

Tasneem Binte Alam
M.Sc. in Computer Science and Engineering, United International University, Dhaka, Bangladesh
Corresponding Author: Tasneem Binte Alam, **E-mail**: tasneem.binte29@gmail.com

| ABSTRACT

This report examines the implementation of a telepsychiatry intervention using synchronous and asynchronous modules in a mobile app for the treatment of postpartum depression (PPD) in both urban and rural areas of Bangladesh. Postpartum depression is a significant mental health concern affecting women in Bangladesh, with limited access to mental health services. The telepsychiatry mobile app aims to overcome barriers to care by providing convenient and personalized support. The synchronous module allows for real-time video consultations and audio calls with mental health professionals, while the asynchronous module provides self-help resources and interactive modules for women to engage with at their own pace. This report discusses the benefits, considerations, and potential impact of the telepsychiatry intervention in addressing PPD in Bangladesh, promoting accessibility, and improving maternal mental health outcomes.

| KEYWORDS

Telepsychiatry, mobile app, information technology, postpartum depression, mental health, Bangladesh

| ARTICLE INFORMATION

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1. Introduction

Postpartum depression (PPD) is a significant mental health concern affecting women worldwide, including Bangladesh. It is characterized by depressive symptoms that occur after childbirth and can have long-lasting effects on both the mother and the child. However, accessing mental health services, particularly in resource-limited settings, remains a challenge. Telepsychiatry, utilizing mobile applications, presents a promising solution to bridge this gap by providing convenient and accessible mental health support. This introduction explores the use of synchronous and asynchronous modules in a telepsychiatry mobile app to address postpartum depression in both urban and rural areas of Bangladesh.

In Bangladesh, postpartum depression is a pressing issue with significant maternal and child health implications. The cultural context, socio-economic factors, and limited mental health infrastructure contribute to the underdiagnosis and undertreatment of PPD. Women in both urban and rural areas face barriers to accessing mental health services, such as stigma, lack of awareness, and geographical constraints. Therefore, innovative approaches are needed to overcome these challenges and provide effective support to postpartum women across the country.

Telepsychiatry, the delivery of mental health services through technology, offers a promising solution for improving access to care and reducing barriers associated with seeking help for PPD. With the widespread availability of

mobile devices, a telepsychiatry mobile app can provide a convenient and confidential platform for women to access mental health support anytime and anywhere.

The synchronous module of the telepsychiatry mobile app enables real-time communication between postpartum women and mental health professionals. Through video consultations or audio calls, women can receive immediate support, counselling, and evidence-based interventions tailored to their specific needs. This module can be particularly beneficial in urban areas where access to mental health providers may be relatively easier. It allows for interactive discussions, visual cues, and a personalized therapeutic relationship, mirroring traditional face-to-face consultations.

The asynchronous module of the telepsychiatry mobile app provides flexibility and convenience for both urban and rural areas of Bangladesh. With this module, postpartum women can access psychoeducation materials, self-help resources, and interactive modules at their own pace. They can engage in guided self-reflection exercises, journaling, and educational videos that promote coping strategies, stress management, and self-care. Asynchronous communication channels, such as secure messaging or discussion boards, can also be utilized to address non-urgent queries and provide ongoing support.

The utilization of both synchronous and asynchronous communication architecture in the telepsychiatry mobile app offers several advantages. It provides real-time support for acute concerns while allowing women to engage in self-directed interventions at their convenience. Additionally, it overcomes geographical barriers, reduces the stigma associated with seeking help, and optimizes Bangladesh's limited mental health resources. However, ensuring data privacy, security, and confidentiality are essential considerations. Adapting the app to the cultural context, ensuring user-friendliness, and addressing technical limitations in rural areas will be crucial for successful implementation.

In conclusion, the use of synchronous and asynchronous modules in a telepsychiatry mobile app holds great potential for addressing postpartum depression in both urban and rural areas of Bangladesh. By leveraging technology, this innovative approach can provide accessible, personalized, and effective mental health support to postpartum women, promoting their well-being and enhancing the country's overall maternal and child health outcomes.

1.1 Motivation

The motivation behind this report is driven by the urgent need to address the high prevalence of postpartum depression (PPD) among women in Bangladesh, particularly in both urban and rural areas. Telepsychiatry has emerged as a critical intervention for managing postpartum depression (PPD) in Bangladesh, particularly in urban and rural settings where access to mental health services can be limited. A study conducted in Matlab reported a 22% prevalence of PPD among women in rural areas at 6-8 weeks postpartum, with significant risk factors including past mental illness and poor relationships with in-laws. Research focusing on urban populations revealed a higher prevalence of 39.4%, emphasizing factors such as job loss due to pregnancy and intimate partner violence as significant contributors to PPD. These statistics highlight the urgent need for effective mental health interventions, including telepsychiatry, which can bridge the gap in healthcare access. By introducing a mobile app as a platform for telepsychiatry, we can leverage technology to reach and support a larger population of women in need. This approach holds the potential to overcome geographical barriers, reduce the stigma associated with seeking help, and improve the availability of mental health support in both urban and rural areas.

The motivation behind this report lies in exploring the feasibility and effectiveness of utilizing a mobile app for telepsychiatry interventions in the treatment of postpartum depression in Bangladesh. By leveraging the widespread use of mobile devices, we can increase access to mental health services, provide evidence-based interventions, and promote self-care practices among postpartum women.

Given the scarcity of mental health professionals in Bangladesh, the introduction of a mobile app for telepsychiatry offers a scalable solution that can reach a larger number of women in need of support. The app can provide a

variety of features, including synchronous video consultations, asynchronous messaging for ongoing support, educational resources, and self-help tools. By offering these services through a mobile app, we can empower women to take an active role in managing their mental health and seek professional guidance when needed.

The motivation behind this report is to contribute to the enhancement of mental healthcare services in Bangladesh by exploring the potential of telepsychiatry interventions using a mobile app. By assessing the acceptability, feasibility, and potential impact of this approach, we aim to provide insights and recommendations to policymakers, healthcare providers, and stakeholders to improve the availability and accessibility of mental health support for postpartum women in both urban and rural areas of Bangladesh. Ultimately, our goal is to alleviate the burden of postpartum depression, improve the overall well-being of women, and foster a supportive environment that promotes maternal mental health in the country.

2. Literature Review

Postpartum depression (PPD) is a significant public health issue that affects women worldwide, including those living in low-resource settings such as urban slums in Dhaka, Bangladesh. Several research studies have been conducted to explore the prevalence, risk factors, and impact of PPD in Bangladesh. However, these studies have certain limitations that should be taken into consideration. This review aims to identify and discuss the limitations of the research papers on PPD in Bangladesh.

A comprehensive review of research on postpartum depression (PPD) by various authors reveals insights and limitations in understanding this critical issue. Azad et al. [1] examined PPD prevalence and risk factors in urban Dhaka slums, but their cross-sectional design and reliance on self-report measures hindered causal inference and introduced potential response biases. Valdes et al. [2] delved into PPD's socioeconomic and psychological correlates in Dhaka, using a cross-sectional approach and self-report measures, raising concerns about measurement bias and limited generalizability due to clinic-based sampling. Other authors explored the impact of COVID-19 on PPD in Bangladesh, utilizing teleconsultation data and highlighting a restricted sample, potentially overlooking those without access to such services. Another literature assessed cultural attitudes toward PPD in Dhaka, and their qualitative approach offered insights, yet its narrow focus and small sample size compromised extrapolation to diverse contexts. Some studies examined PPD prevalence and health-seeking behavior in rural Bangladesh, their cross-sectional design and sample restrictions pointing to potential biases and limited representativeness. This collective body of work underscores the importance of refining study designs, incorporating diverse samples, and employing comprehensive methodologies to further illuminate the complexities of PPD and its effects in various settings.

In conclusion, while the research papers on PPD in Bangladesh contribute valuable insights into the prevalence, risk factors, and impact of PPD, they have certain limitations that should be acknowledged. These limitations include cross-sectional designs, reliance on self-report measures, small sample sizes, selection biases, and potential recall or response biases. Future research in this area should consider longitudinal designs, more diverse samples, and a combination of quantitative and qualitative methods to enhance the validity and generalizability of findings.

3. Methodology

The methodology section of this research report outlines the approach and procedures used to study the implementation of telepsychiatry for the treatment of postpartum depression (PPD) in women residing in both urban and rural areas of Bangladesh. The research focuses on the development of a mobile app using synchronous and asynchronous system structure architecture.

The following sections describe the key components of the methodology.

3.1 Study Design

A mixed-methods approach will be employed to gather comprehensive data and insights. This will involve both quantitative and qualitative methods to provide a holistic understanding of the telepsychiatry intervention. The

study will be conducted in collaboration with healthcare institutions, mental health professionals, and relevant stakeholders in both urban and rural areas of Bangladesh.

3.2 Ethical Considerations

Ethical approval will be sought from the appropriate institutional review board to ensure the protection of participants' rights and well-being. Informed consent will be obtained from all participants prior to their involvement in the study. Confidentiality and privacy measures will be implemented to ensure the security of participant data.

3.3 Participant Recruitment

A purposive sampling technique will be employed to recruit women experiencing postpartum depression in both urban and rural areas. Recruitment strategies will involve collaborating with healthcare facilities, community organizations, and local authorities to identify eligible participants. Efforts will be made to ensure representation from diverse socio-economic backgrounds and cultural contexts.

3.4 Development of the Telepsychiatry PPD Mobile App

The mobile app will be designed and developed with a focus on both synchronous and asynchronous system structure architecture, as illustrated in Fig.1

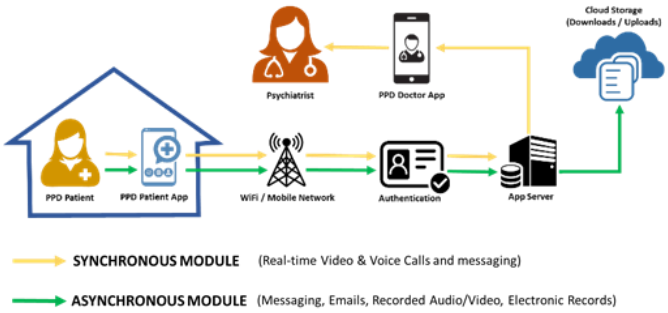

Fig. 1 Synchronous & Asynchronous system structure architecture

Synchronous features will include real-time video consultations between postpartum women and mental health professionals.

Asynchronous components will enable secure messaging, self-help resources, educational materials, and appointment scheduling.

The app will be built using appropriate technologies and programming languages, ensuring user-friendly interfaces and seamless communication capabilities.

3.5 Implementation and Data Collection

The telepsychiatry intervention will be implemented, allowing postpartum women to access the mobile app for mental health support and treatment. Quantitative data will be collected through validated questionnaires and rating scales to assess the effectiveness of the intervention in reducing PPD symptoms and improving overall well-being. Qualitative data will be gathered through interviews and focus group discussions with participants to explore their experiences, satisfaction, and perceptions of the telepsychiatry intervention. Data collection will be conducted at multiple time points to capture changes and trends over the course of the intervention.

3.6 Data Analysis

Quantitative data will be analysed using appropriate statistical techniques, such as descriptive statistics, correlation analysis, and regression analysis, to examine the impact of the telepsychiatry intervention.

Qualitative data will be thematically analysed to identify patterns, themes, and insights related to participants' experiences and perceptions.

3.7 Ethical Considerations

The principles of confidentiality, anonymity, and data protection will be upheld during the analysis and reporting of the data. All personal identifiers will be removed or anonymized to ensure the privacy of participants.

3.8 Findings and Recommendations

The research findings will be presented and discussed, providing a comprehensive understanding of the feasibility, effectiveness, and acceptability of the telepsychiatry intervention for the treatment of PPD in urban and rural areas of Bangladesh.

Recommendations will be provided for the improvement and scalability of the telepsychiatry app, taking into account the specific needs and cultural considerations of the target population.

By following this methodology, the research aims to contribute to the advancement of telepsychiatry services for postpartum depression in both urban and rural areas of Bangladesh, with a focus on developing an effective PPD mobile app using synchronous and asynchronous system structure architecture.

4. Results

This system's layout provides a general picture of how patients and doctors are related. The proposed Telepsychiatry system will be connected to a main cloud database where all the data, including patient information, doctors' information, and symptom data, will be stored. Patients' personal information, medical history, prescription information, appointment information, and a list of specialist doctors will be uploaded to the central database's patient records. Patients and doctors can retain their profiles, and administrators can keep the network connected and track of their users and doctors. Users in Bangladesh can easily communicate with the dentist thanks to the availability of 4G and WIFI.

4.1 Network Model Structure

This system's layout provides an idea of how patients and doctors are related. The proposed Telepsychiatry system will be connected to a central cloud database where all the necessary data, including that of the patient, the dentist, and any symptoms, will be stored.

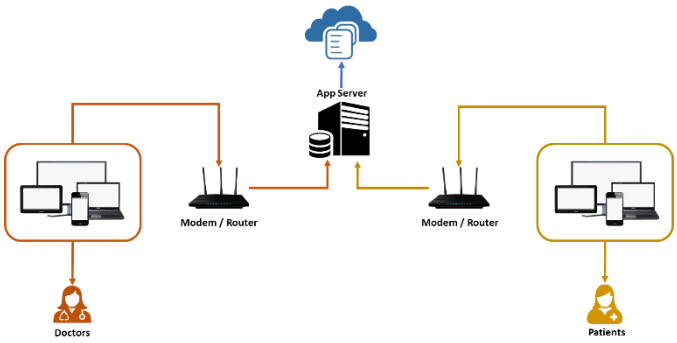

Fig. 2 Proposed Model Architecture

4.2 Platforms

This method is mostly based on an application for Android phones. We will leverage cross-platform technology like PhoneGap for android-based services. The Android SDK tools and web APIs will be used to develop the android-based application. This system will utilize Microsoft Azure, one of the greatest cloud servers currently available, which supports multiline platforms.

4.3 Services Analysis

There are several different health service systems in use today as a part of telehealth systems. This Telepsychiatry system service architecture has been created by integrating all of those services into it as well as by including some additional specialised health services.

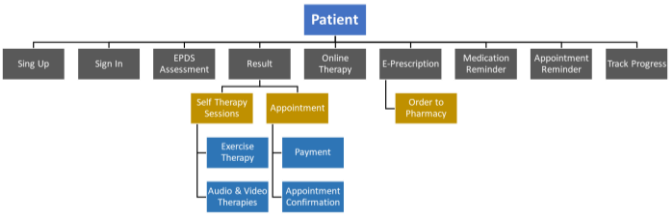

Fig. 3 Patient Case Diagram

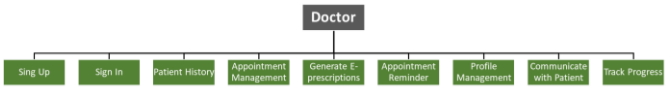

Fig. 4 Doctor Case Diagram

4.4 Dynamic EPDS Analysis

A dynamic EPDS (Edinburgh Postnatal Depression Scale) in the telepsychiatry app is a crucial tool for assessing and monitoring maternal mental health. Unlike a static paper questionnaire, a dynamic EPDS within the app adapts to the user's responses, tailoring the questions and follow-ups based on their previous answers. This intelligent approach allows for a more personalized and accurate evaluation of postnatal depression risk. As the user progresses through the assessment, the app's algorithms can detect subtle changes in symptoms and severity, providing timely alerts to the patient. According to the results obtained, the patients will be advised to learn the in-app resources or advised to make an appointment with a suitable doctor of their choice available on the app platform.

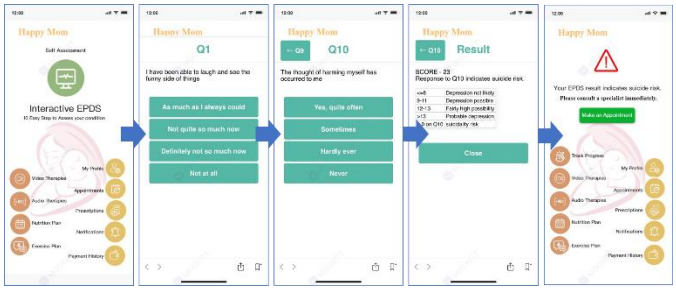

Fig. 5 Patient Assessment Process Flow

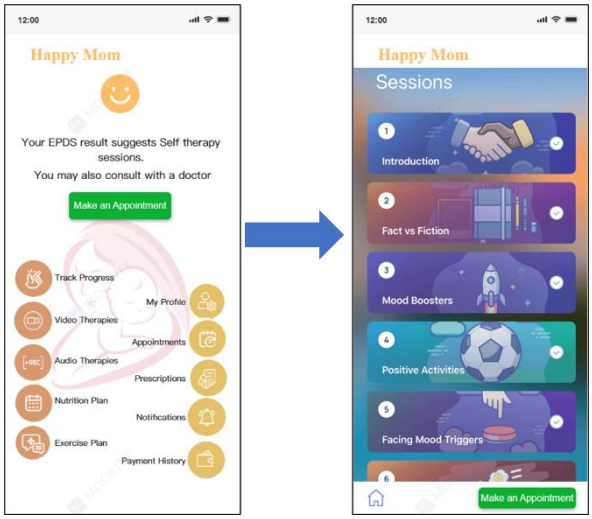

Fig. 6 Patient Assessment Process Flow 2

4.5 Scheduling Appointment

Manually scheduling an appointment with a doctor is both time-consuming and expensive. However, the user can easily and conveniently schedule an appointment with a doctor by utilizing this method. A payment gateway is also integrated within the app to make payments for the doctor's appointment. The system is set up so that it will automatically create an appointment reminder from the available appointment list and notify the user of the appointment's timing.

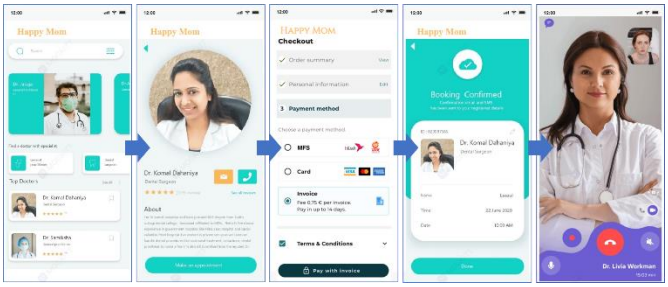

Fig. 7 Appointment Process Flow

4.6 Communication Media

Communication media in a telepsychiatry app serve as the bridge between patients and mental health professionals, enabling remote consultations and support. These media encompass various channels, including secure video calls, messaging, and even voice calls, allowing patients to connect with therapists or psychiatrists conveniently. In addition to facilitating face-to-face interactions, text-based messaging and multimedia sharing offer avenues for ongoing communication and sharing of relevant information like mood logs or journal entries. The versatility of communication media in a telepsychiatry app ensures that individuals can receive the care they need, fostering a supportive and accessible environment for mental health services regardless of physical location.

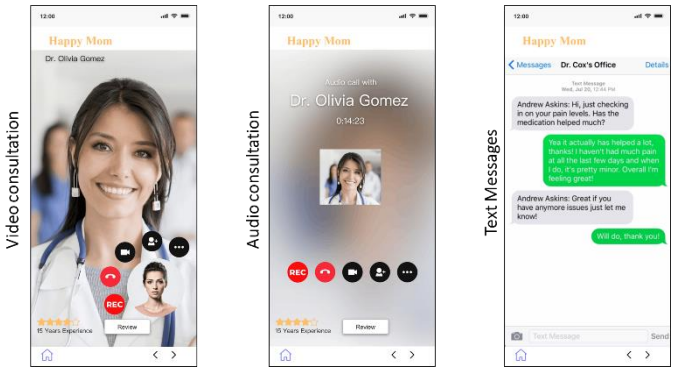

Fig. 8 Communication media

4.7 E-Prescription Creation

In the proposed app, doctors can seamlessly create prescriptions for their patients, ensuring a comprehensive approach to mental health care. Through the app's secure platform, healthcare providers can electronically prescribe medications and treatment plans tailored to individual patient needs. Additionally, patients can conveniently order prescribed medications directly from the app, streamlining the entire process and enhancing medication adherence. This integrated feature not only simplifies prescription management but also promotes continuity of care, making it easier for patients to access the necessary medications and maintain their mental well-being.

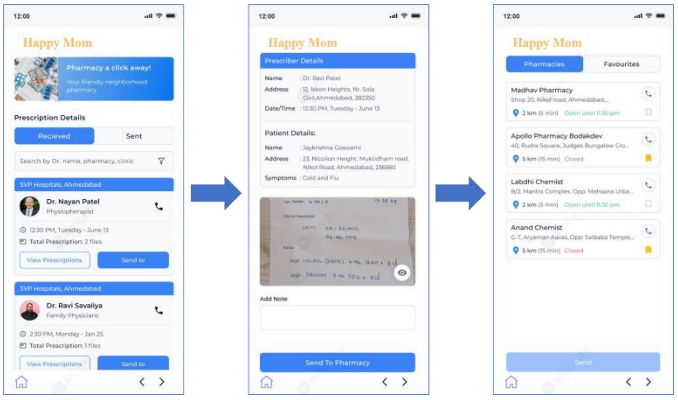

Fig. 9 e-Prescription creation

5. Future Works

The successful implementation of the telepsychiatry intervention for postpartum depression (PPD) in Bangladesh represents a crucial milestone in the pursuit of improved maternal mental health outcomes. To continue advancing the effectiveness and reach of this intervention, a multitude of avenues for future work and development are ripe for exploration:

Machine Learning and AI Integration: One promising avenue is the integration of machine learning and artificial intelligence (AI) into the telepsychiatry app. By harnessing machine learning algorithms, we can identify early signs of PPD, personalize treatment plans, and provide AI-driven insights to both users and mental health professionals. These insights can significantly enhance the effectiveness of interventions.

Partner and Family Inclusion: Recognizing the pivotal role of partners and family members in the PPD support process, it is imperative to develop features within the app that facilitate their inclusion. This holistic approach creates a comprehensive support system for postpartum women, addressing their mental health from multiple angles.

Integration with Wearable Devices: Exploring the integration of wearable devices, such as fitness trackers and smartwatches, offers the potential to provide valuable biometric data and activity insights. These insights can enable mental health professionals to better assess and monitor a user's mental well-being, leading to more targeted interventions.

Multilingual Support: To maximize accessibility, expanding the app's reach through multilingual support is paramount. Ensuring that content, including educational materials and interactive modules, is available in multiple languages will empower diverse linguistic backgrounds in Bangladesh to access mental health support.

Virtual Support Groups: Facilitating virtual support groups within the app presents an opportunity for postpartum women to connect with peers facing similar challenges. These support groups foster a sense of community, peer support, and shared experiences, contributing significantly to improved mental health outcomes.

Research and Data Analysis: Continued investment in research initiatives and data analysis will be critical to assess the long-term impact of the telepsychiatry intervention. Collaboration with academic institutions to conduct rigorous studies, gather user feedback, and refine the intervention based on evidence-based findings will be integral to its evolution.

Expanded Mental Health Coverage: Advocacy for expanded mental health coverage and support from healthcare institutions and insurance providers is vital. Ensuring the recognition and integration of the telepsychiatry intervention into the broader mental healthcare system will extend its reach and benefit a wider audience.

AI-Driven Insights: Leveraging AI-driven insights to provide personalized recommendations and resources based on app usage patterns, symptom severity, and treatment progress empowers users to actively engage in their mental health journey. AI-driven insights are a powerful tool for improving mental health outcomes.

5.1.1 Additional Considerations for Future Work and Development:

Telepsychiatry for Other Mental Health Conditions: Considering the expansion of the telepsychiatry app to address a broader spectrum of mental health conditions beyond PPD is a forward-thinking step. Tailoring the intervention to provide support for conditions such as anxiety, depression, and stress will amplify its impact on mental healthcare in Bangladesh.

Enhanced Accessibility: Continuous improvement of app accessibility is essential. Addressing technical limitations, ensuring compatibility with a wide range of mobile devices, and optimizing for low-bandwidth internet connections, especially in rural areas, are crucial for equitable service delivery.

Collaboration with Local Communities: Collaborating with local community organizations, leaders, and influencers to raise awareness about the telepsychiatry intervention is instrumental. Engaging in community-driven initiatives aimed at reducing the stigma surrounding mental health is a collective responsibility.

Long-Term Follow-Up: Future studies should encompass long-term follow-up assessments to gauge the sustained impact of the telepsychiatry intervention on PPD symptoms and overall well-being. This insight is invaluable for continually refining the app's design and content.

Cultural Adaptation: Ongoing efforts are necessary to culturally adapt the telepsychiatry mobile app to align with the diverse cultural contexts within Bangladesh. This includes accommodating language preferences, traditional practices, and cultural beliefs related to mental health.

Technical Infrastructure: Investing in the improvement of technical infrastructure in rural areas is a prerequisite to ensure uninterrupted access to the telepsychiatry app. Tackling issues related to internet connectivity and smartphone accessibility in remote regions is vital for equitable service delivery.

Training and Capacity Building: Establishing training programs for mental health professionals and healthcare providers on the effective use of telepsychiatry tools is essential. This ensures that the app's potential is maximized in delivering high-quality mental health care.

Expanded Access: Proactive measures should be taken to expand access to the telepsychiatry app to a broader audience, encompassing both pregnant women and those in the postpartum period. This approach enables the proactive addressing of PPD risk factors.

6. Conclusion

In conclusion, the implementation of a telepsychiatry intervention using synchronous and asynchronous modules in a mobile app for the treatment of postpartum depression (PPD) in Bangladesh holds significant promise. This innovative approach leverages technology to address the pressing issue of PPD in both urban and rural areas, where access to mental health services is limited. By offering real-time video consultations, asynchronous self-help resources, and personalized support, this telepsychiatry mobile app can bridge geographical and cultural barriers, reduce stigma, and optimize the use of mental health resources in Bangladesh. However, it is crucial to consider ethical, technical, and cultural factors in its implementation. Looking ahead, the integration of machine learning, multilingual support, wearable devices, virtual support groups, and expanded mental health coverage can further enhance the app's impact and accessibility, contributing to improved maternal mental health outcomes and a brighter future for mental healthcare in Bangladesh.

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