DIGITAL HEALTH APPLICATIONS IN MIDWIFERY: THE ROLE AND EFFECTS OF MOBILE TECHNOLOGIES IN PREGNANCY AND BIRTH

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SUMMARY

The integration of technology in healthcare, especially digital health applications in midwifery practice, has undoubtedly created a new paradigm. This narrative review comprehensively evaluates the role of mobile health (mHealth) applications in supporting midwifery services during pregnancy and childbirth. This study definitively examines the contributions of mobile applications to pregnancy monitoring, patient education, psychosocial support, and health communication. It draws on studies selected from PubMed, Scopus, and Web of Science databases between 2015 and 2025. It is clear that challenges related to data privacy, user adaptation, access inequality and clinical effectiveness must be discussed in detail. It is clear that recommendations for the sustainable and effective use of digital health solutions in midwifery must be made, and the potential for the future integration of innovative technologies such as artificial intelligence and personalised healthcare services must be highlighted.

Keywords: Midwifery, digital health, mobile health (mHealth), pregnancy monitoring, childbirth and health technologies.

INTRODUCTION

In the 21st century, the digital transformation in healthcare has accelerated with the integration of technological advancements into healthcare practices, leading to radical changes in how healthcare professionals improve patient care.[1] Mobile health (mHealth) technologies have had a transformative effect on midwifery practice in the management of pregnancy and birth, creating new opportunities in critical areas such as patient monitoring, health education, and psychosocial support.[2-4]

Digital health applications are vital in midwifery. They facilitate communication between patients and healthcare professionals. They also increase the accessibility of healthcare services and raise quality standards. [5] These applications are vital for improving health outcomes by

providing access to health information for pregnant and new mothers, especially in regions where geographic and socioeconomic barriers limit access to healthcare. [1,5-7]

However, the widespread use of digital health technologies has also presented significant ethical, technical and social challenges. Data privacy and security, the digital divide and technological access inequalities, the scientific validity of applications, and users' digital literacy levels are the primary factors limiting their effective use. [8,9] There is ongoing scientific debate regarding the clinical effectiveness of digital health applications and the capacity of healthcare professionals to integrate these technologies. [10]

Källander et al. (2020) conducted a thorough examination of the potential of mobile health (mHealth) applications to enhance access to maternal and child health services, with a particular focus on low- and middle-income countries. The study emphasised that digital applications have the capacity to enhance communication between healthcare professionals and pregnant women, thereby facilitating early diagnosis and intervention. However, barriers to technology adoption, infrastructure deficiencies, and user training needs were identified as significant obstacles to the sustainability of these apps.[10] These findings underscore the necessity to formulate multifaceted strategies for the effective integration of digital health technologies in midwifery practice.

In this context, the current status, advantages, obstacles, and future potential of digital health applications used in midwifery practice during pregnancy and birth should be comprehensively examined. This contributes to the shaping of health policies, improved application design, and clinical integration processes.

The present narrative review aims to provide an in-depth analysis of the role of mobile health applications in midwifery services during pregnancy and childbirth, drawing on scientific literature published between 2015 and 2025. The article assesses the multifaceted challenges faced in integrating digital health technologies into healthcare and innovative developments in this field, aiming to provide a comprehensive perspective to guide the digitalization of midwifery practice.

METHODOLOGY

For the present narrative review, a comprehensive search was conducted across the PubMed, Scopus, and Web of Science databases, encompassing the period from 2015 to 2025. The search terms employed included "midwifery," "digital health," "mobile health," "mHealth,"

"pregnancy monitoring," "birth," and "maternal health," along with their Turkish equivalents. The search process incorporated original research articles, systematic reviews, and narrative reviews that evaluated the utilisation of digital health technologies in midwifery practices during pregnancy and birth. Studies deemed irrelevant or off-topic were excluded from the analysis.

During the data collection process, the impact of mobile applications on health monitoring, patient education, psychosocial support, and communication, as well as challenges related to data security, accessibility, and clinical effectiveness, were carefully analysed. The findings were interpreted within the context of midwifery practice and linked to current scientific perspectives.

LITERATURE REVIEW

1. Digital Health Applications:

Digital health applications are defined as digital platforms that facilitate the monitoring of health, the access of health information, and interaction with healthcare services through mobile health (mHealth) technologies. [1,11] The efficacy of healthcare services is enhanced by these applications, which facilitate effective communication between healthcare professionals and patients during pregnancy and childbirth. [12] In particular, within the context of low- and middle-income countries, the integration of digital health technologies has been demonstrated to enhance access to healthcare by transcending geographical and economic boundaries. [13,14]

2. Mobile Health Apps Used During Pregnancy and Childbirth:

Mobile health applications (apps) utilised during pregnancy facilitate the monitoring of maternal health, the provision of prenatal education, and the identification of psychosocial support. [15,16] For instance, applications such as "Pregnancy+" and "What to Expect" furnish developmental information based on gestational age and facilitate the recording of health data by users. The utilisation of these applications has been demonstrated to enhance health literacy by facilitating enhanced access to health-related information for expectant mothers. [17,18]

3. Benefits of Digital Health Applications for Midwifery Practice

Digital health applications have become a pivotal instrument in enhancing the quality and efficacy of healthcare services during pregnancy. It is particularly noteworthy that they offer significant benefits during pregnancy monitoring, antenatal education, psychosocial support and early intervention. Digital platforms have been demonstrated to enable the routine

monitoring of expectant mothers' health status, the early identification of potential complications, and the timely administration of necessary interventions. [5,10]

For instance, in the study conducted by Källander and colleagues (2023) in Uganda, mHealth-based interventions were found to be effective. It has been demonstrated that the employment of healthcare professionals plays a pivotal role in the early identification of pregnancy complications, thereby significantly reducing intervention times. Notwithstanding, favourable outcomes have been achieved in the domain of maternal and neonatal health. In a similar manner, digital educational materials and psychosocial support programs have been shown to enhance the experience of childbirth for expectant mothers by reducing their anxiety. [19,20]

Furthermore, the integration of digital health applications within healthcare systems has been demonstrated to contribute to the sustainability of healthcare services, functioning as a decision support system for healthcare professionals. [11] In the context of the pandemic, the extant literature emphasises the pivotal role of digital platforms in ensuring the continuity of e-health services, particularly in circumstances of increasing social isolation (World Health Organization, 2021). [1]

4. Challenges and Risks

Notwithstanding the advantages inherent in digital health applications, there are considerable challenges and risks associated with their use. Data security and privacy concerns represent pivotal issues with regard to users' trust in these technologies. [8] Moreover, a paucity of digital literacy, most notably in low-educated and rural areas, curtails the effective utilisation of applications. [21] As posited by Pimmer et al. (2016) and the WHO (2021), inequalities in technological infrastructure and access also impede access to digital health services, particularly in low-income areas, resulting in inequalities in healthcare. [1,22] As Marcolino et al. (2018) demonstrate, cultural differences and language barriers represent further factors hindering the adoption of applications. It is therefore essential that these barriers are overcome in order to ensure the sustainable success of digital health applications. [23]

5. Innovative Technologies and Applications for the Future

In the future, the convergence of artificial intelligence (AI), big data analytics, and personalised health applications is poised to catalyse revolutionary changes in the domain of digital health. The utilisation of advanced technologies, such as machine learning algorithms and 3D body scans, facilitates earlier and more precise detection of conditions that pose a risk of complications during pregnancy. [24] These advancements have been demonstrated to improve maternal and neonatal health outcomes by enabling early intervention.

Moreover, research has demonstrated that mobile-based prenatal education programmes have a favourable impact on pregnancy outcomes and mitigate the risk of complications. [25] Digital education has been demonstrated to enhance expectant mothers' health literacy and fortify their psychological readiness for the birthing process.

However, there is a necessity for increased multidisciplinary research on the ethical, legal, and social aspects of these innovative technologies. This approach is expected to ensure the equitable and safe utilisation of these technologies.

RESULTS AND DISCUSSION

The present review of the literature reveals an increasing importance of digital health applications in the domains of pregnancy and childbirth. Mobile health (mHealth) technologies are being used effectively in critical areas such as regular health monitoring of expectant mothers, prenatal education, psychosocial support, and early complication detection. [24,10] In particular, within low- and middle-income countries, these technologies have been shown to make a significant contribution to the sustainability of health systems by overcoming geographic and economic barriers to accessing healthcare. [13,26]

However, the proliferation of digital health applications faces significant challenges, including data security and privacy concerns, digital literacy deficiencies, technological infrastructure deficiencies, and cultural barriers. [8,23] These barriers, particularly in rural and disadvantaged areas, limit their effective use and hinder the equitable distribution of healthcare services. [1]

In recent years, the integration of advanced technologies such as artificial intelligence, machine learning, and big data analytics into digital health has led to significant advances in the early detection and management of pregnancy complications. [24,27] These innovative technologies have the potential to enhance maternal and neonatal health outcomes, as well as to facilitate the delivery of personalised healthcare services. [25]

In the context of the novel challenges posed by social distancing measures during the pandemic, digital health applications emerged as a pivotal element in ensuring the uninterrupted delivery of midwifery services. These applications facilitated seamless communication between healthcare professionals and patients, thereby underpinning the continuity of care during periods of physical distancing. [1] However, the effective and sustainable use of these

technologies requires integration with healthcare systems, increased digital literacy, and the development of ethical and legal frameworks. [21,27]

In conclusion, digital health applications have the potential to transform information access, monitoring, and support processes in midwifery practice. However, the realisation of this potential is predicated on the establishment of multidisciplinary collaborations, the development of comprehensive policy, and the implementation of culturally appropriate approaches.

CONCLUSION

Digital health applications have been shown to make a significant contribution to midwifery practice during pregnancy and childbirth. Mobile health technologies have been demonstrated to be effective in a number of areas, including the monitoring of expectant mothers, the delivery of prenatal education, and the facilitation of psychosocial support. Furthermore, these technologies have been shown to facilitate access to healthcare services, particularly in areas where access to such services is limited. Innovative technologies, including artificial intelligence and big data analytics, hold considerable potential for the early detection and management of complications.

However, data security, digital literacy, inadequate technological infrastructure, and cultural barriers act as significant impediments to the widespread adoption of these practices. Consequently, there is a necessity to augment security measures, expand training programmes, allocate resources to infrastructure, and cultivate practices that are culturally congruent. In addition, there is a necessity to establish ethical and legal frameworks with a view to ensuring the safe and fair use of technologies.

Consequently, there is a necessity for multidisciplinary and inclusive approaches in order to facilitate the effective utilisation of digital health technologies in midwifery.

REFERENCES

1. World Health Organization. (2021). WHO guideline: recommendations on digital interventions for health system strengthening.
2. Lupton D. (2016). Digital Health Technologies and Digital Data: New Ways of Monitoring, Measuring and Commodifying Human Embodiment, Health and Illness. 10.4337/9781784717766.00011.
3. Lupton D. (2021). Young People's Use of Digital Health Technologies in the Global North: Narrative Review. J Med Internet Res. 23(1):e18286. Published 2021 Jan 11. doi:10.2196/18286
4. O'Donovan J, Bersin A, O'Donovan C. (2015).The effectiveness of mobile health (mHealth) technologies to train healthcare professionals in developing countries: a review of the literature BMJ Innovations;1:33-36.
5. Choudhury A, Asan O, Choudhury MM. (2021). Mobile health technology to improve maternal health awareness in tribal populations: mobile for mothers. J Am Med Inform Assoc ; 28(11):2467-2474. doi:10.1093/jamia/ocab172
6. Dol J, Richardson B, Murphy GT, Aston M, McMillan D, Campbell-Yeo M. (2020). Impact of mobile health interventions during the perinatal period on maternal psychosocial outcomes: a systematic review. JBI Evid Synth;18(1):30-55. doi:10.11124/JBISRIR-D-19-00191
7. Dol J, Richardson B, Tomblin Murphy G, Aston M, McMillan D, Campbell-Yeo M. (2019).Impact of mobile health (mHealth) interventions during the perinatal period for mothers in low- and middle-income countries: a systematic review. JBI Database System Rev Implement Rep;17(8):1634-1667. doi:10.11124/JBISRIR-2017-004022
8. Okunola, A. (2024). Data Privacy Challenges in Health Informatics: A Comparative Study of Database Management Systems. 10.20944/preprints202410.1792.v1.
9. Grande D, Luna Marti X, Feuerstein-Simon R, et al. (2020). Health Policy and Privacy Challenges Associated With Digital Technology. JAMA Netw Open;3(7):e208285. Published 2020 Jul 1. doi:10.1001/jamanetworkopen.2020.828
10. Källander K, Soremekun S, Strachan DL, Hill Z, Kasteng F, Kertho E, et al. (2023) Improving community health worker treatment for malaria, diarrhoea, and pneumonia in Uganda through inSCALE community and mHealth innovations: A cluster randomised controlled trial. PLOS Digit Health 2(6): e0000217. https://doi.org/10.1371/journal.pdig.0000217

11. Free C, Phillips G, Galli L, et al. (2013). The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: a systematic review. PLoS Med ;10(1):e1001362. doi:10.1371/journal.pmed.1001362
12. Balakrishnan R, Gopichandran V, Chaturvedi S, Chatterjee R, Mahapatra T, Chaudhuri I. (2016). Continuum of Care Services for Maternal and Child Health using mobile technology - a health system strengthening strategy in low and middle income countries. BMC Med Inform Decis Mak ;16:84. Published 2016 Jul 7. doi:10.1186/s12911-016-0326-z
13. Agarwal S, Perry HB, Long LA, Labrique AB. (2015). Evidence on feasibility and effective use of mHealth strategies by frontline health workers in developing countries: systematic review. Trop Med Int Health. 20(8):1003-1014. doi:10.1111/tmi.12525
14. Ciapponi A, Lewin S, Herrera CA, et al. (2017). Delivery arrangements for health systems in low-income countries: an overview of systematic reviews. Cochrane Database Syst Rev. ;9(9):CD011083. Published 2017 Sep 13. doi:10.1002/14651858.CD011083.pub2
15. Lupton D. (2016). The use and value of digital media for information about pregnancy and early motherhood: a focus group study. BMC Pregnancy Childbirth 16, 171. https://doi.org/10.1186/s12884-016-0971-3
16. Nawabi F, Krebs F, Vennedey V, Shukri A, Lorenz L, Stock S. (2021). Health Literacy in Pregnant Women: A Systematic Review. International Journal of Environmental Research and Public Health; 18(7):3847. https://doi.org/10.3390/ijerph18073847
17. Till S, Mkhize M, Farao J, et al. (2023). Digital Health Technologies for Maternal and Child Health in Africa and Other Low- and Middle-Income Countries: Cross-disciplinary Scoping Review With Stakeholder Consultation. J Med Internet Res. 2023;25:e42161. Published 2023 Apr 7. doi:10.2196/42161
18. Kabongo, E.M., Mukumbang, F.C., Delobelle, P. et al. (2021). Explaining the impact of mHealth on maternal and child health care in low- and middle-income countries: a realist synthesis. BMC Pregnancy Childbirth 21, 196. https://doi.org/10.1186/s12884-021-03684-x
19. Chen C, Wang X, Xu H, Li Y. (2023).Effectiveness of digital psychological interventions in reducing perinatal depression: a systematic review of meta-analyses. Arch Womens Ment Health ;26(4):423-439. doi:10.1007/s00737-023-01327-y
20. Lazarevic N, Lecoq M, Boehm C, Caillaud C. (2023). Pregnancy Aps for Self-Monitoring: Scoping Review of the Most Popular Global Apps Available in Australia. International Journal of Environmental Research and Public Health. 20. 1012. 10.3390/ijerph20021012.

21. Chib A, van Velthoven MH, Car J. (2015). mHealth adoption in low-resource environments: a review of the use of mobile healthcare in developing countries. J Health Commun. 20(1):4-34. doi:10.1080/10810730.2013.864735
22. Pimmer C, Mateescu M, Gröhbiel U. (2016). Mobile and ubiquitous learning in higher education settings. A systematic review of empirical studies. Computers in Human Behavior.
23. Marcolino MS, Oliveira JAQ, D'Agostino M, Ribeiro AL, Alkmim MBM, Novillo-Ortiz D. (2018). The Impact of mHealth Interventions: Systematic Review of Systematic Reviews. JMIR Mhealth Uhealth.6(1):e23. Published 2018 Jan 17. doi:10.2196/mhealth.8873
24. Mennickent D, Rodríguez A, Opazo MC, Riedel CA, Castro E, Eriz-Salinas A, Appel-Rubio J, Aguayo C, Damiano AE, Guzmán-Gutiérrez E, Araya J. (2023). Machine learning applied in maternal and fetal health: a narrative review focused on pregnancy diseases and complications. Front. Endocrinol. 14:1130139. doi: 10.3389/fendo.2023.1130139
25. Hao J, Yang L, Wang Y, et al. (2023). Mobile Prenatal Education and Its Impact on Reducing Adverse Pregnancy Outcomes: Retrospective Real-World Study. JMIR Mhealth Uhealth. ;11:e46910. Published 2023 Dec 20. doi:10.2196/46910
26. Sondaal SF, Browne JL, Amoakoh-Coleman M, et al. (2016).Assessing the Effect of mHealth Interventions in Improving Maternal and Neonatal Care in Low- and Middle-Income Countries: A Systematic Review. PLoS One. ;11(5):e0154664. Published 2016 May 4. doi:10.1371/journal.pone.0154664
27. Topol EJ. (2019). High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 25(1):44-56. doi:10.1038/s41591-018-0300-7