International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 20s, 2025
https://theaspd.com/index.php

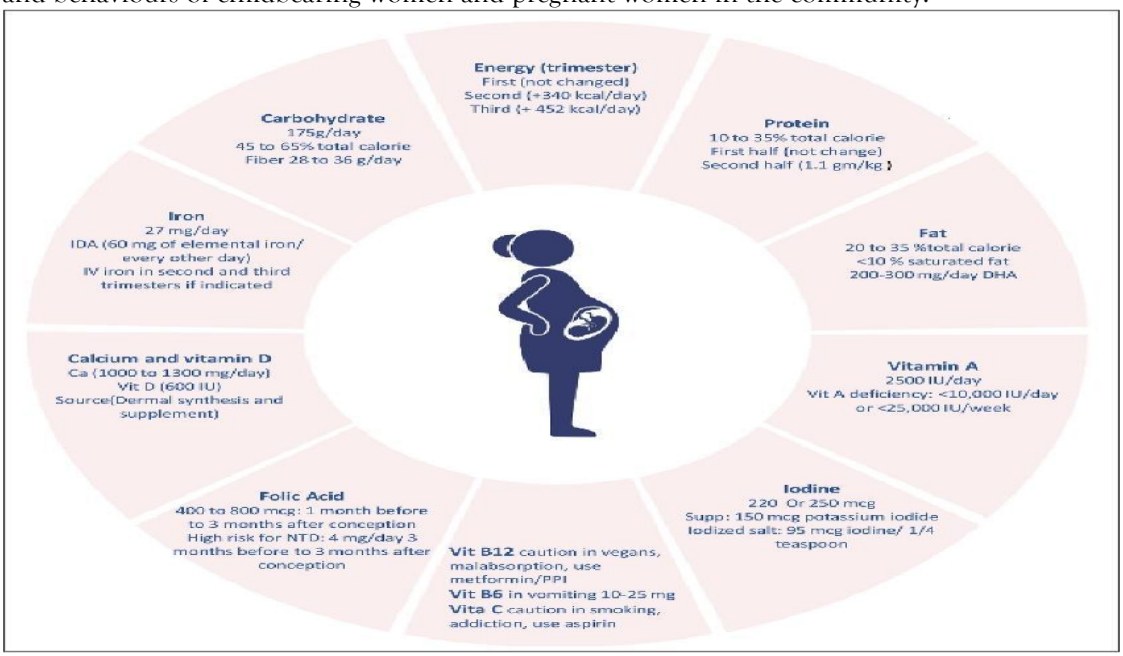
The Effectiveness Of The Nutrition Education Application For Women Of Childbearing Age And Pregnant Women In The Community

XIAO LIAN[1], Prof. Thamer Kadum Yousif AL HILFI[2], Ram Paudel[3]
[1]Faculty of Education, Shinawatra University, 2557753465@qq.com, 0009-0003-9313-1682
[2]Madenat Alelem University College, Baghdad/Iraq, alhilfit@mauc.edu.iq
[3]American Management University, Utah, USA, rpaudel@amu.edu.eu

Abstract
The nutritional needs of women of childbearing age and pregnant women are crucial for ensuring both maternal and fetal health. Despite increasing awareness, many women still face nutritional deficiencies due to limited access to accurate information and resources. This study evaluates the effectiveness of a mobile-based nutrition education application tailored for women of reproductive age and pregnant women within a community setting. By offering customized content on dietary guidelines, prenatal nutrition, and health tips, the application aims to bridge the gap between knowledge and practice. A mixed-methods approach was employed, involving pre- and post-intervention surveys, focus group discussions, and health record analysis. The results indicate a marked improvement in nutritional awareness, dietary behavior, and compliance with recommended guidelines. The study concludes that technology-driven nutritional education can be a powerful tool to empower women and improve community health outcomes.
Keywords: *Maternal Nutrition, Nutrition Education, Mobile Health (mHealth), Reproductive Health, Pregnant Women, Dietary Behavior, Health Promotion, Community Health, Women of Childbearing Age*

1. INTRODUCTION

Women of reproductive age and pregnant women are often affected by the malnutrition problem, and it is a critical issue these days, particularly in low- and middle-income states. Proper nutrition at these levels does not only imply improved health to the mother, but also benefits to the child in terms of development and health. Among this group of people, poor nutrition, inadequate knowledge regarding nutrition, and cultural misunderstanding are usually the causes of iron-deficiency anemia, folate deficit, and other nutrition-related issues (Black et al. 2013). In his turn, mobile health (mHealth) interventions have become popular due to the ease of access, low costs, and the ability to scale. There is promise in the use of nutrition education applications as a means of providing on demand, individualized support. The paper focuses on investigating the extent to which such application might promote nutritional awareness and behaviours of childbearing women and pregnant women in the community.



Nutrition plays a pivotal role in the health of women during their reproductive years and throughout pregnancy. These life stages demand increased nutritional attention due to physiological changes, hormonal fluctuations, and the demands of fetal development. Proper nutrition not only supports maternal health but also determines long-term outcomes for children, such as physical growth, cognitive development, and resistance to disease. Yet, global statistics show alarming trends in maternal malnutrition, particularly in regions with socioeconomic disparities (Lassi et al. 2017). Iron-deficiency anemia, calcium and vitamin D deficiencies, and inadequate caloric intake are still prevalent, leading to a higher incidence of complications during and after pregnancy. As the provision of smartphones and mobile internet connection, especially in rural and peri-urban settings, is becoming more widespread, the opportunities of technology-based interventions as a complement to already existing healthcare services are becoming larger. Nutrition education is an innovative scalable solution that was created to spread evidence-based information and facilitate healthy behavioral change. Compared to conventional counseling or face-to-face care where logistics should be organized, mobile apps allow ensuring the 24/7 viability of information and reminders by the user (Savarino et al. 2021). In this paper, the researcher explores the feasibility and efficacy of a nutrition education app that would give women the skills and knowledge to enable them have improved health outcomes at their reproductive and prenatal ages.

2. Rationale of the study

The reason this study is worth doing is that it is the way to find a solution to the challenging issue of a poor maternal diet in a creative way. Conventional learning activities are mainly costly and do not have wide coverage. Nevertheless, the penetration of mobile technology even in the rural and underserved regions is also an opportunity to share important health information. Reproductive and prenatal women are in the crossroad where nutrition-related knowledge can produce a drastic change in the maternal and neonatal health status. However, not all people know diet recommendations, and they do not understand how to apply them (Feroz et al. 2017). In this study, the researcher endeavors discovering whether nutrition education application with user-friendly interface, culturally relevant information, and professionally-endorsed advice can make significant health behavior change happen. The study will be valuable to inform practical measures that health practitioners, policymakers, and health-tech solution developers will take to improve knowledge and adherence to diet among individuals.

There is a compelling need to address the nutritional knowledge gaps and poor dietary practices among women of reproductive age and pregnant women. Despite government programs and healthcare services targeting maternal nutrition, compliance and awareness remain limited due to cultural beliefs, poor literacy, lack of personalized information, and time constraints. Traditional education methods—such as pamphlets, workshops, and antenatal visits—often fail to engage women consistently or to deliver personalized guidance that aligns with their daily routines and preferences. This study was conceptualized to explore how mobile-based solutions can help overcome these challenges. The rationale stems from the growing body of evidence suggesting that mobile applications can serve as practical tools to deliver real-time, user-friendly, and contextually relevant health information. The core objective is to evaluate whether the use of a mobile nutrition education app can improve knowledge retention, dietary behavior, and supplement intake among the target demographic. Moreover, integrating technology into maternal health education aligns with global Sustainable Development Goals (SDG 2: Zero Hunger and SDG 3: Good Health and Well-being) and can serve as a model for scalable interventions in other low-resource settings. The findings of this study will help determine the feasibility of broader implementation and may inform policy decisions and public health strategies aimed at maternal nutrition.

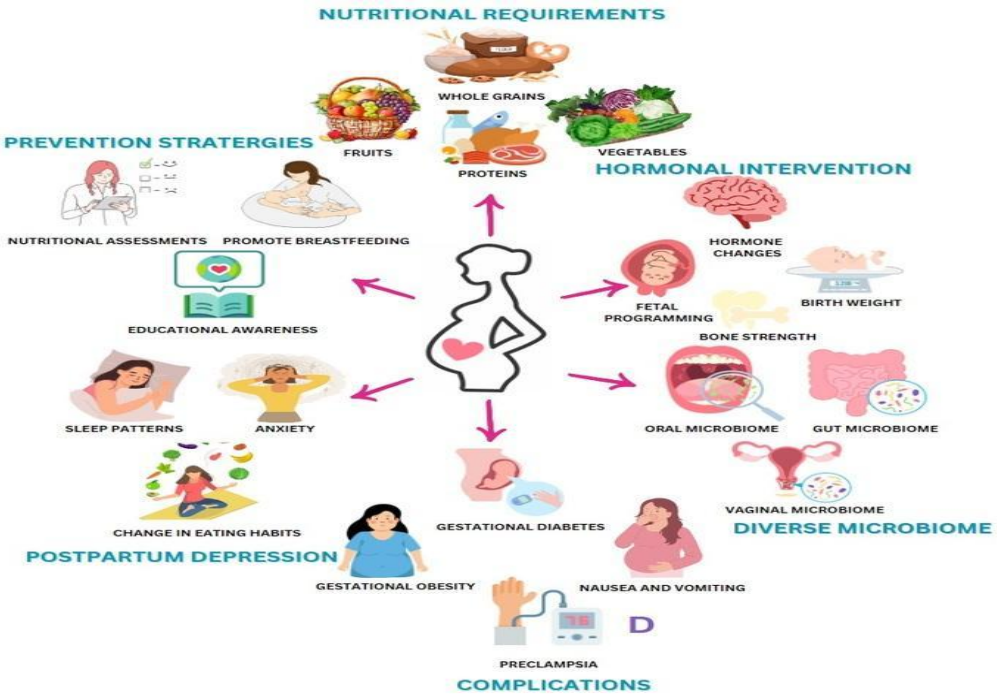
3. LITERATURE REVIEW

3.1 Importance of Nutrition for Reproductive and Maternal Health

Diet is very critical on the wellbeing of women within their reproductive age and during pregnancy. The correct diet will not only help to preserve the health of the mother but also will provide an ideal formation of the fetus and healthy childbirth. The world health organization (WHO) claims that maternal underweight leads to a death rate of almost 20 per cent, iron, folate, calcium, and iodine deficiencies are the highest (Cetin and Laoreti, 2015). The body during the pregnancy period needs increased energy and other nutrients which are essential to the growth of the fetus, as well as the tissue of the mother and the placenta. Researchers have established that malnutrition in pregnancy is associated with poor outcomes that include low birth weight, pre-mature birth, birth defects and poor cognitive development among

children. Nutrition is also vital before conceiving, as it determines fertility, hormonal balance, and quality of eggs (Maqbool et al. 2019). One of the most well-recognized disorders of women in the reproductive age cohort is iron-deficiency anemia, which frequently causes fatigue, suppressed immune system, and childbirth complications. Hence the need to ensure before and during pregnancy nutritional adequacy in breaking the cycle of malnutrition among generations.

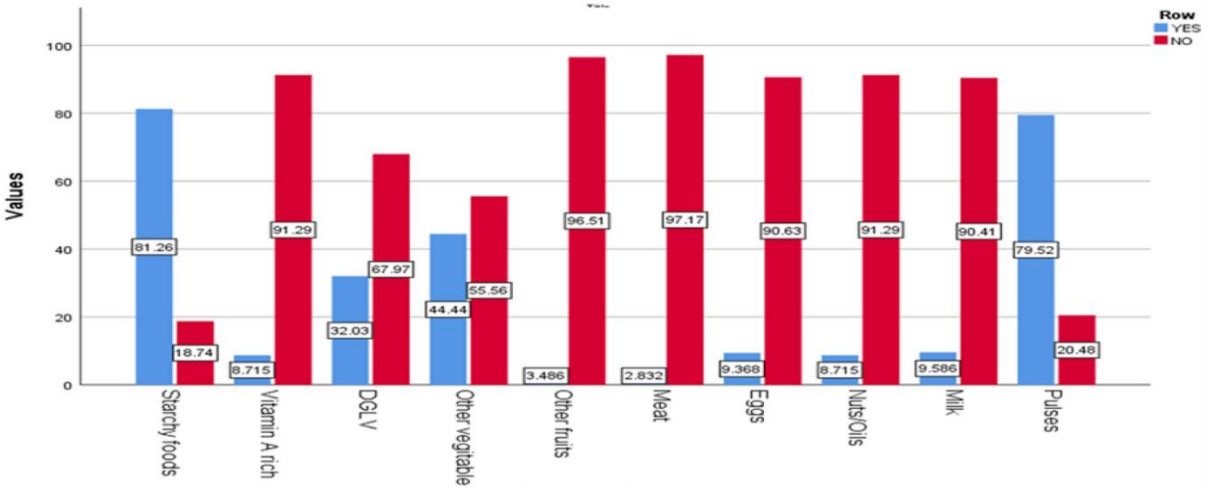
Maternal and reproductive nutrition serves as the cornerstone for public health strategies worldwide. It is widely accepted that the nutritional status of women before, during, and after pregnancy significantly affects both maternal and neonatal health outcomes. Proper nutrition reduces the risks of complications such as gestational diabetes, hypertension, neural tube defects, and preeclampsia (Maqbool et al. 2019). Micronutrients such as iron, folic acid, calcium, iodine, and zinc play vital roles during gestation. For example, folic acid deficiency during early pregnancy is linked to severe congenital malformations like spina bifida. Iron-deficiency anemia remains a leading cause of maternal morbidity, affecting nearly 41.8% of pregnant women worldwide according to WHO (2021). Nutrition during the periconceptional period also influences placental development, fetal programming, and long-term noncommunicable disease risks in the offspring—a concept known as the "Developmental Origins of Health and Disease" (DOHaD).



3.2 Challenges in Nutritional Awareness and Practice

Despite the proven benefits of adequate maternal nutrition, many women lack access to reliable information and resources. Cultural beliefs, low literacy rates, economic constraints, and gender inequalities significantly influence dietary practices among women, particularly in low- and middle-income settings. In several cultures, pregnant women are advised to reduce food intake due to myths about difficult labor or large babies. Such misinformation contributes to nutritional deficiencies at a time when the body's demands are highest (Salama and Esmail, 2018). Moreover, limited access to antenatal care services, poor dissemination of nutrition-related policies, and minimal counseling by healthcare providers further hinder nutritional awareness. Even when knowledge is available, practical implementation is often lacking due to unavailability or affordability of nutritious food. These challenges call for innovative strategies that make nutrition education more accessible, relevant, and actionable for women across different backgrounds.

Despite numerous global campaigns and public health efforts, significant challenges remain in enhancing nutritional awareness and translating knowledge into practice. A wide range of barriers—structural, economic, educational, and cultural—continue to limit the effectiveness of maternal nutrition programs. Cultural taboos such as avoiding eggs or bananas during pregnancy due to fears of "big babies" are still prevalent in South Asia and parts of Africa. In some communities, pregnant women intentionally eat less to ease labor pain. Poor literacy levels further reduce the ability to interpret nutrition labels or understand the importance of balanced meals.



Healthcare systems in low-resource settings are often overstretched and underfunded, leading to minimal personalized dietary counseling during antenatal visits. Moreover, even when information is provided, it may be generic and fail to consider socio-cultural dietary patterns or financial constraints. Additionally, time poverty among women—due to work, household duties, and caregiving responsibilities—often makes it difficult to prioritize meal planning or visit healthcare facilities regularly (Pepino, 2014). Hence, there is a strong need for interventions that are flexible, context-aware, and available at the convenience of the user.

3.3 Mobile Health Interventions for Nutrition Education

Mobile health (mHealth) has emerged as a transformative tool for delivering healthcare information in recent years. With the proliferation of smartphones and increasing mobile internet penetration, even in remote areas, mHealth offers a scalable and cost-effective solution to bridge the nutrition knowledge gap. Nutrition education apps can deliver personalized dietary advice, daily tips, supplement reminders, and culturally appropriate recipes directly to users' phones. Evidence supports the positive impact of mHealth interventions on maternal and child health outcomes. For example, a randomized controlled trial in Bangladesh using mobile-based nutrition messages reported a 28% increase in iron-folic acid supplement adherence (Brown et al. 2020). Applications designed with input from public health professionals and aligned with national dietary guidelines have shown promising results in improving nutritional behavior among women of childbearing age. Furthermore, mobile apps allow users to access information on demand, track their progress, and receive continuous motivation—advantages that traditional paper-based education materials or occasional health visits cannot offer. By promoting self-efficacy and supporting informed decision-making, mHealth solutions hold great promise for tackling maternal malnutrition.

Mobile Health (mHealth) has liberated the health education sector due to closing the last mill gap in healthcare provision. As smartphone penetration has exceeded 70% in all regions of the world, digital interventions are finding more and more use to spread health information and enable self-care. mHealth platforms allow providing custom diet instructions, multimedia educational content, supplement prompting, and real-time feedback, all of which is critical to ensure long-running engagement (French et al. 2024). The effectiveness of mobile applications in enhancing the maternal health outcomes has been tested in various researches. Most of these interventions are cheap, modifiable, and flexible to regional languages and cultural experiences. As compared to the one-off counseling sessions, mobile platforms would allow enabling long-lasting support during the pregnancy and postpartum experience. In addition, it is possible to combine mHealth technologies with telemedicine services, referral systems, and the platforms of community health workers to provide continuity of care. The main benefit of those apps is interaction. These include individual self-assessment quizzes, video tutorials, grocery list planners and progress dashboards, which ensure that the individual learns at their own pace and has better chances of remembering and utilizing the information (French et al. 2024).

3.4 Behavioral Change and Technology Use

Any tool that is used in health education should be informative as well as in a position to motivate a long-term change in behavior. A more effective nutrition app will be one that has been designed to take into consideration the science of behavior like Health Belief Model, Transtheoretical Model, and Theory of Planned Behavior, and will induce long-term change. Such functionality as individual feedback, push

notifications, gamification, and progress monitoring can add motivation and engagement of users (Spring et al. 2012). The process of behavior change usually develops gradually through internal motivation, support by peers and relevance. Programs which support goal-setting (e.g. to drink 2 liter of water per day or to eat iron-containing food three times a week), remind and reward good habits with digital badges or advice are likely to increase the adherence. Greater community-building can also be achieved through peer forums and the sharing of messages which helps in further affirming the positive change.

A study conducted by Sawesi et al. (2016) showed that interventions based on multiple behavior change techniques (BCTs) such as self-monitoring and educational support along with prompts proved to be much more effective than purely information-delivering interventions. Thus, incorporation of behavior change concepts in nutrition education apps would turn them into a lifestyle change tool rather than a source of information. The knowledge of nutrition and nutrition practices alone does not magically result into a healthier behaviour. To be able to carry the impact over time, the interventions should contain the psychological, social, and environmental pressures causing the health choices. That is what digital platforms can competently do by adding behavioral change models and user centric design principles.

When technology platforms contain behavior changes communication (BCC) strategies, its pathway of impact can lead the users through phases of awareness, interest, action, and maintenance. As an example, the behavior, according to the COM-B Model, is seen as the consequence of the interaction between the capability, opportunity, and motivation of the reaction, which could be manipulated via digital content. Personalized goal setting, frequent feedback, motivating quotes and community forums have been incorporated in health apps which have demonstrated to increase compliance to health practices. The implementation of gamification (the enumeration of reward systems, tasks, and their procedural significance) has shown itself useful in enhancing the use of the app and the adherence to its rules (Sawesi et al. 2016). In addition, an application with social support tools (e.g., discussion board, peer challenges, chatbots) promotes an experience of participation in communities, which is reported to enhance commitment and adherence. The idea of smarter interventions that are adaptive can be achieved by further personalizing the recommendations through answers, feedback, and behaviour in the course of using technology. These are done using AI and machine learning technologies.

4. METHODOLOGY

This paper used the mixed-method research design which mainly entailed quantitative and qualitative data collection methods. The target population was on women (18-45 years) of a semi-urban community; and the sample consisted of two hundred participants including 80 pregnant women. The purposive sampling approach was used to identify participants working together with the local health centers. By a consultation on nutrition experts, obstetricians, dieticians, and public health professionals developed a mobile nutrition education application with modules on balanced diets, micronutrients need, locally based food recipes, and weekly nutrition tidbits. A baseline test of nutritional knowledge was conducted and then data on individuals were collected over 3 months of using the app on a daily basis to graduate. Post-graduation assessments were done to check the difference between their nutritional knowledge, diet and health indicators like hemoglobin levels. Further, to acquire knowledge on user experience, usability and perceived impact, focus group discussions and interviews were carried out. The SPSS was used to analyze the quantitative data and the qualitative data were coded in a thematic way.

5. RESULTS AND DISCUSSION

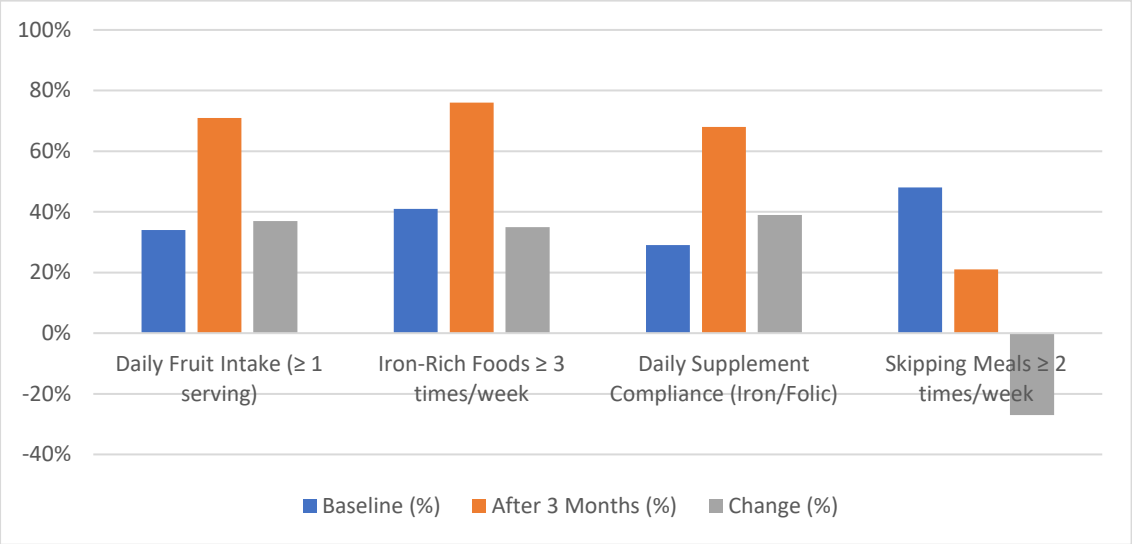
The utilization of the nutrition education application provided significant results both in the level of knowledge and change of behavior by the study participants. The average score of nutritional knowledge of pregnant women at baseline score was 10.2 in a scale of 0 to 20, whereas women of childbearing age were averagely 9.5. These scores went up tremendously after three months of using the mobile application at 16.8 and 15.1 respectively. This marked an improvement above 60 percent in both groups, and the statistical analysis proved beyond doubt that the increment was very considerable ($p < 0.01$). The results reveal how the digital platform contributes to a better grasp of the main fundamental knowledge in the realm of nutrition, i.e., the relevance of iron, folic acid, hydration, and balanced meal (Brown et al. 2020). There is also improvement in dietary behavior; beyond the knowledge gained. In the final part of the intervention, the percentage of those who reported intake of at least one fruit per day increased to 71 percent against 34 percent at the time of initiation. On the same note, iron rich food consumption of at

least three times or more per week rose by 41% to 76 percent and adherence to intake of iron and folic acids supplement rose by 29 percent to 68 percent as well. There was also a positive change in the incidence of poor health behaviors like missing out meals, where it dropped to 21% as opposed to 48%. The obtained findings provide an indication that the educational material of the application coupled with dietary reminders and goal creation mechanisms helped to promote a healthier eating behavior (Lassi et al. 2017).

Table 2: Change in Key Nutritional Behaviors

Behavior	Baseline (%)	After 3 Months (%)	Change (%)
Daily Fruit Intake (≥ 1 serving)	34%	71%	+37%
Iron-Rich Foods ≥ 3 times/week	41%	76%	+35%
Daily Supplement Compliance (Iron/Folic)	29%	68%	+39%
Skipping Meals ≥ 2 times/week	48%	21%	-27%

Qualitative insights from focus group discussions supported the quantitative data. Participants shared their experience of the app as simple to navigate, appealing and applicable in their daily endeavors. Here are some features that were particularly popular among pregnant women: suggestions about what meals to make based on what is available locally, visual guides that showed how much is a serving, and frequent reminders notifying one to take supplements and to hydrate. Included among the above ways, some women mentioned the participation of family members, including their spouses and mothers-in-law, in the use of the app, which contributed to the establishment of a supportive setting in terms of behavior change (Salama and Esmail, 2018). But there are several obstacles that were noted. There was low digital literacy in the older women and sometimes problems with internet sources in distant places, which prevented the other users to participate fully. Also, despite having the regional language as the content, some of the participants proposed even reducing the complexity of the technical terms to enhance comprehension (Spring et al. 2012).



Compared to other similar mHealth interventions in other parts of the world, including the Kilkari program in India or mNutrition in Africa, the results of this study follow the worldwide pattern of mHealth-based tools beneficially affecting maternal health behaviors. The inclusion of such interactivity, which involves quizzes, weekly check-ins, and individual dashboards, in this app was probably one of the reasons as to why it became relatively more engaging and effective in terms of behavior outcomes compared to the traditional aspects such as passive data reporting seen in apps based on traditional principles. These findings imply that nutrition education can be a potential intervention to the community with respect to reproductive and maternal health using the mobile-based platform. The inclusion of health behavior theories, interactive design, and culturally adapted material resulted in the intervention that was practical and effective (Feroz et al. 2017). This correlates with the need to utilize technology as a means of breaking old guard inhibitors of health education: time restrictions, lack of access to professionals, and illiteracy in particular in resource constrained fields.

6. CONCLUSION

Based on the results of this study, it can be said that digital intervention in the form of nutrition education application can be effectively used to enhance dietary knowledge and practices of women of child bearing age and expectant women. The availability of both the technology and the personal material creates the compatibility of more engagement and the ability to cross the traditional obstacles of health education. The use of such tools in community health programs would be able to make a substantial contribution to the development of maternal and child health. Nevertheless, there is still a need to maintain sustainability, inclusiveness, and cultural responsiveness of app design and delivery.

In this study, the robust evidence was presented, which shows that mobile-based nutrition education tools may contribute to health literacy and dietary behavior of women during reproductive and prenatal stages significantly. The app has been effective as a practical health promotional tool since knowledge score and compliance with supplement and positive food preferences improve in users. Also, the application was safe and easy to use with the cultural suitability being scientifically and medically acceptable to even the low literate or technologically involved women. Even though the use of technology-based health intervention is not a substitute to the traditional healthcare, it is an excellent complement in addressing people who have limited access. Such tools should be incorporated in maternal health strategies by policymakers and community health programs. The next stage activity is assessment on long-term impact, expansion of features (e.g. teleconsultation) and capacity building in integration with the local health system to make it sustainable and scalable.

REFERENCES

1. **Tee, M. (2022).**Technology acceptance before and after covid pandemic,International conference on human-computer interaction,119-132
2. **Zhou, F. (2019)**.Electrochemical and tribological properties of TiSiCN coatings in coolant,Materials Science,159-165
3. **Walton Wider** (2024).Metaverse chronicles: a bibliometric analysis of its evolving landscape,International Journal of Human–Computer Interaction,4873-4886
4. **Vasudevan, A. (2024).** Harnessing ChatGPT for effective assessment and feedback in education,Journal of Computer Science and Informatics Engineering,74-82
5. **Somthawinpongsai, C. (2024)**. Digital Communication Strategies in Promoting Sustainable Agriculture: Organic Products in Central Thailand,Journal of Ecohumanism,2822-2838
6. Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., ... & Uauy, R. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. The lancet, 382(9890), 427-451.
7. Brown, J. M., Savaglio, R., Watson, G., Kaplansky, A., LeSage, A., Hughes, J., ... & Arcand, J. (2020). Optimizing child nutrition education with the foodbot factory mobile health app: formative evaluation and analysis. JMIR formative research, 4(4), e15534.
8. Cetin, I., & Laoreti, A. (2015). The importance of maternal nutrition for health. Journal of Pediatric and Neonatal Individualized Medicine, 4(2), 1-11.
9. Feroz, A., Perveen, S., & Aftab, W. (2017). Role of mHealth applications for improving antenatal and postnatal care in low-and middle-income countries: a systematic review. BMC health services research, 17(1), 704.
10. Free, C., Phillips, G., Galli, L., Watson, L., Felix, L., Edwards, P., ... & Haines, A. (2013). The effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers: a systematic review. PLoS medicine, 10(1), e1001362.
11. French, M. L., Christensen, J. T., Estabrooks, P. A., Hernandez, A. M., Metos, J. M., Marcus, R. L., ... & Jordan, K. C. (2024). Evaluation of the effectiveness of a bilingual nutrition education program in partnership with a mobile health unit. Nutrients, 16(5), 618.
12. Lassi, Z., Moin, A., & Bhutta, Z. (2017). Nutrition in middle childhood and adolescence. Child and Adolescent Health and Development. 3rd edition.
13. Maqbool, M., Dar, M. A., Gani, I., Mir, S. A., Khan, M., & Bhat, A. U. (2019). Maternal health and nutrition in pregnancy: an insight. World Journal of Pharmacy and Pharmaceutical Sciences, 8(3), 450-459.
14. Pepino, S. (2014). Nutrition, education and awareness raising for the right to adequate food.
15. Salama, A., & Esmail, N. (2018). Assessing nutritional awareness and dietary practices of college-aged students for developing an effective nutrition educational plan. Canadian Journal of clinical nutrition, 6(2), 22-42.
16. Savarino, G., Corsello, A., & Corsello, G. (2021). Macronutrient balance and micronutrient amounts through growth and development. Italian journal of pediatrics, 47(1), 109.
17. Sawesi, S., Rashrash, M., Phalakornkule, K., Carpenter, J. S., & Jones, J. F. (2016). The impact of information technology on patient engagement and health behavior change: a systematic review of the literature. JMIR medical informatics, 4(1), e4514.
18. Spring, B., Schneider, K., McFadden, H. G., Vaughn, J., Kozak, A. T., Smith, M., ... & Lloyd-Jones, D. M. (2012). Multiple behavior changes in diet and activity: a randomized controlled trial using mobile technology. Archives of internal medicine, 172(10), 789-796.
19.