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THE IMPACT OF MOBILE HEALTH APPLICATIONS ON THE NUTRITIONAL STATUS OF BREAST CANCER PATIENTS: A LITERATURE REVIEW

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ABSTRACT
Breast cancer is the leading cause of cancer-related deaths in women worldwide. Patients undergoing chemotherapy frequently experience nutritional deterioration, which negatively impacts treatment outcomes and quality of life. Mobile health (mHealth) applications offer an innovative approach to supporting nutritional management in this population. To synthesize scientific evidence on the effect of mHealth applications on the nutritional status of breast cancer patients and survivors. A literature review was conducted following the PRISMA 2020 guidelines. Searches were performed in PubMed, ScienceDirect, and Google Scholar for articles published between 2020 and 2026. Inclusion criteria included RCTs, quasi-experimental, or experimental studies examining mHealth interventions on the nutritional status of breast cancer patients. From 270 articles identified, 6 met the inclusion criteria after systematic screening. All six studies demonstrated that mHealth interventions showed promising positive effects on nutritional outcomes. Key findings included weight reduction, improved BMI, enhanced diet quality, increased consumption of fruits, vegetables, and protein, and improved self-efficacy in dietary management. mHealth applications demonstrated high feasibility and acceptability among participants. These findings should be interpreted cautiously, as most studies were pilot or feasibility studies with small sample sizes. mHealth applications show promising potential in improving nutritional status and eating behaviors in breast cancer patients and survivors. Further large-scale RCTs with standardized nutritional outcome measures and longer follow-up periods are warranted to establish robust evidence.

Keywords: breast cancer; diet quality; mHealth application; mobile health; nutritional status; self-efficacy

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INTRODUCTION

Breast cancer is the leading cause of cancer-related mortality among women worldwide, accounting for approximately 670,000 deaths in 2022 (World Health Organization, 2025). In Asia, an estimated 985.4 thousand new cases and 315.1 thousand deaths were reported during the same period (Fu et al., 2025). Within the ASEAN region, breast cancer is the most frequently diagnosed cancer among women, with Indonesia ranking fifth in prevalence and contributing 14.4% of all breast cancer cases in the region (Christopher et al., 2025).

In Indonesia, breast cancer ranks as the most common type of cancer. According to the National Cancer Plan 2024–2034, the incidence of breast cancer is 41.18 per 100,000 population, with a mortality rate of 14.4% (Ministry of Health of the Republic of Indonesia, 2024). Breast cancer treatment includes local therapies, such as surgery and radiotherapy, as well as systemic therapies, including chemotherapy, hormone therapy, and immunotherapy (Kashif et al., 2024). Among these treatment modalities, chemotherapy remains one of the primary therapeutic approaches aimed at eliminating cancer cells (Palmer et al., 2020). However, chemotherapy is frequently associated with severe gastrointestinal side effects. Olfa et al. (2024) reported that among breast cancer patients undergoing chemotherapy, constipation occurred in 80% of cases, diarrhea in 73%, nausea in 70%, and vomiting in 63.4%. These adverse effects directly contribute to significant nutritional intake disturbances. Data reported by Silalahi et al. (2025) indicated that 58.5% of patients experienced

severe energy deficits, 65.9% had inadequate carbohydrate intake, 56.1% had insufficient protein intake, and 36.6% had inadequate fat intake. Malnutrition resulting from these nutritional deficiencies has been associated with impaired immune function, reduced treatment tolerance, poorer quality of life, and unfavorable clinical outcomes (Lazar et al., 2023; Rizqiyah et al., 2021).

Advances in digital technology have created new opportunities for improving nutritional management among cancer patients. Mobile health (mHealth) is defined as medical and public health practice supported by mobile devices, such as smartphones and tablets, enabling real-time and remote health monitoring, education, and intervention delivery (WHO, 2011). Relevant mHealth features for nutritional management include daily food intake recording (food diaries), artificial intelligence-based personalized feedback, meal and hydration reminders, nutrition education content, and monitoring of body weight and body composition. The behavioral mechanisms underlying the effectiveness of mHealth interventions include enhanced self-monitoring, increased self-efficacy, and sustained motivation through personalized and continuous feedback.

The widespread adoption of digital technology in Indonesia supports the potential implementation of mHealth interventions on a large scale. Data from the Indonesian Central Statistics Agency (BPS, 2023) indicated that 67.29% of the population uses mobile phones, with Riau Province ranking fourth highest in mobile phone usage at 72.40%. Furthermore, the Indonesian Internet Service Providers Association (APJII, 2022) reported that 77.02% of Indonesians are active internet users. Akingbade et al. (2024) found that mobile application-based interventions significantly improved patients' understanding of chemotherapy, nutrition, and physical activity recommendations. Although the potential of mHealth to support nutritional management among breast cancer patients has been widely explored, there remains a lack of comprehensive evidence synthesis specifically examining the effectiveness of mobile health applications on nutritional status, including body weight, body mass index (BMI), and diet quality, within this population. Therefore, this literature review aims to identify, evaluate, and synthesize current scientific evidence regarding the impact of mobile health applications on the nutritional status of patients and survivors of breast cancer.

METHOD

This study employed a literature review approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency and quality in reporting (Page et al., 2021).

Literature Search Strategy

A systematic literature search was conducted using three reputable electronic databases: PubMed, ScienceDirect, and Google Scholar. The search strategy utilized combinations of English and Indonesian keywords linked by the Boolean operators AND and OR as follows: *"mobile health" OR "mHealth" OR "smartphone application" OR "health application" AND "breast cancer" OR "breast cancer" AND "nutritional status" OR "diet quality" OR "nutritional status" OR "weight" OR "BMI"* (Chung et al., 2025; Wong et al., 2023). The search period was limited to publications from 2020 to 2026, considering the substantial advances in mHealth technologies and the widespread adoption of smartphones in oncology care during this period.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) articles published between 2020 and 2026; (2) articles written in English or Indonesian; (3) studies examining mobile health interventions targeting the nutritional status of breast cancer patients; (4) randomized controlled trials (RCTs), quasi-experimental studies, or experimental studies; (5) full-text articles available for access (open access or indexed in at least SINTA 3 or Scopus); and (6) studies reporting outcomes related to nutritional status, body mass index (BMI), body weight, or diet quality.

The exclusion criteria included: (1) studies not addressing mobile health interventions for nutritional status among breast cancer patients; (2) editorials, opinion papers, letters to the editor, single case reports, or conference abstracts; (3) unavailable full-text articles; (4) duplicate records; and (5) qualitative studies or purely descriptive studies without clinical outcome data.

Article Selection

A total of 270 articles were initially identified through database searches. After removing 20 duplicate records, 250 articles remain for title and abstract screening. During this stage, 46 articles were excluded due to irrelevance to the review topic, leaving 204 articles for full-text assessment. In the eligibility stage, 109 articles were excluded because they did not employ RCTs or quasi-experimental designs, did not quantitatively assess nutritional status, involved populations other than breast cancer patients or survivors, or lacked full-text availability. Ultimately, six articles met all inclusion criteria and were included in the final analysis. A summary of the article selection process is presented in Table 1.

Table 1.
Article Selection Flow Based on PRISMA 2020

Stage	Information	Number of Articles
Identification	Total articles identified from PubMed, ScienceDirect, Google Scholar	270
Deduplication	Article excluded due to duplication	20
After deduplication		250
Screening (title & abstract)	Article excluded due to irrelevance	46
After screening		204
Eligibility (full text)	Articles were excluded because they did not meet the inclusion criteria: - Not an RCT/quasi-experimental - Did not measure nutritional status quantitatively - Did not discuss mHealth interventions in breast cancer - No full-text available	109
Final article analyzed	Meets all inclusion criteria	6

Quality Appraisal

Methodological quality assessment was conducted independently by two reviewers using appraisal tools appropriate to the study design. The Cochrane Risk of Bias Tool 2 (RoB 2) was applied to randomized controlled trials (RCTs) and pilot RCTs, while the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Quasi-Experimental Studies was used to evaluate feasibility studies and pre–post intervention designs. The assessment covered key methodological domains, including randomization procedures, blinding, completeness of follow-up, standardization of outcome measurements, and sample size adequacy. Any disagreements between reviewers were resolved through discussion and consensus (Chung et al., 2025; Gong et al., 2023).

Data Analysis

The data were analyzed using a descriptive and narrative synthesis approach. The included studies were compared according to the type of mHealth intervention, intervention duration, sample size, population characteristics, and measured outcomes (Upoyo et al., 2024). Due to the heterogeneity of study designs, intervention characteristics, and participant populations, a quantitative meta-analysis was not performed. The synthesis focused on evaluating the effectiveness of mHealth interventions on nutritional status indicators, including body weight, body mass index (BMI), diet quality, and specific nutritional intake parameters, compared with baseline measurements or control group outcomes .

RESULT

Based on the PRISMA 2020 selection process, six articles met the inclusion criteria and were analyzed narratively. Study characteristics are presented in Table 2, and methodological quality assessments are presented in Table 3.

Table 2.
Synthesis of Characteristics and Study Results

No	Author & Year	Study Title	Type of Study	Population & Sample	Intervention	Main Output
1	Baek et al. (2022)	Effects of Mobile Healthcare Applications on the Lifestyle of Patients With Breast Cancer: A Protocol for a Randomized Clinical Trial	RCT Protocol	Stage I–III breast cancer patients undergoing/completed adjuvant therapy; n=90 (45 intervention, 45 control)	12-week mobile app: personal diet guide, activity reminders, self-monitoring	The protocol was designed to test improvements in nutritional intake, physical activity, and quality of life. Actual results await the implementation of a randomized controlled trial (RCT).
2	Chen et al. (2023)	Smartphone-Based Cancer and Obesity Prevention Education Program for Chinese Women (SCOPE): A Pilot RCT	RCT Pilot	Chinese women at risk of breast cancer with overweight/obesity (BMI ≥ 24); n=60 (30 intervention, 30 control)	12-week smartphone-based educational program: nutrition modules, physical activity, cancer prevention	Significant decrease in BMI ($p<0.05$); increased nutritional knowledge; decreased fat intake; increased consumption of vegetables and fruit
3	Shen et al. (2024)	Evaluation of a Mobile Behavior Change Program for Weight Loss in Breast Cancer Survivors	Pilot Study (Pre-post)	Breast cancer survivors with overweight/obesity (BMI ≥ 25); n=40	6-month mobile program: nutrition coaching, physical activity, weight monitoring	Average weight loss 4.2 kg (5.3%); increase in HEI score; improvement in body composition; app engagement >70% of active days
4	Park et al. (2026)	Impact of a Mobile Nutrition App on Dietary Outcomes in Cancer Survivors: Pilot Feasibility Study	Pilot Feasibility Study	Cancer survivors (including breast cancer) after active therapy; n=30	8-week mobile nutrition app: food diary, nutrition education, personal feedback	85% program completion rate; increased consumption of vegetables, fruit, and protein; more controlled calorie intake; high satisfaction
5	Seo et al. (2021)	The Development of a Lifestyle Modification Mobile Application "Health for You" for Overweight and Obese Breast Cancer Survivors in Korea	Development & Feasibility Study	Korean breast cancer survivors with overweight/obesity (BMI ≥ 23); n=20	8-week mobile app: diet, physical activity, stress management modules	Average weight loss of 1.8 kg; increased fiber and protein intake; increased physical activity; 90% user satisfaction
6	Allicock et al. (2021)	A Pilot and Feasibility of Mobile Health Intervention to Support Healthy Behaviors in African American Breast Cancer Survivors	Pilot & Feasibility Study	African American breast cancer survivors after active therapy; n=25	12-week mobile health intervention: SMS, smartphone app, peer support	Increased fruit and vegetable intake; decreased high-fat consumption; increased self-efficacy; increased physical activity

Table 3.
Assessment of Study Methodological Quality

Studies	Type of Study	Randomization	Blinding	Follow-up	Standardized Output	Sample Size	Risk of Bias Assessment
Baek et al. (2022)	RCT Protocol	✓	Not yet implemented	Not yet implemented	✓	n=90 (planned)	Medium – protocol only, no results data yet
Chen et al. (2023)	RCT Pilot	✓	No	12 weeks	✓	n=60	Low-Medium
Shen et al. (2024)	Pre-post Pilot	No	No	6 months	✓	n=40	Medium-High (no control)
Park et al. (2026)	Pilot Feasibility	No	No	8 weeks	✓	n=30	Medium-High (no control)
Seo et al. (2021)	Dev & Feasibility	No	No	8 weeks	Part	n=20	High (small sample, no control)
Allicock et al. (2021)	Pilot & Feasibility	No	No	12 weeks	Part	n=25	Medium-High

General Characteristics of the Studies

The six studies included in this review were published between 2021 and 2026 and were conducted in South Korea (Baek et al., 2022; Seo et al., 2021), the United States (Shen et al., 2024; Allicock et al., 2021; Park et al., 2026), and China (Chen et al., 2023). Sample sizes ranged from 20 to 90 participants (mean ≈ 43 participants). The duration of the interventions varies from 8 weeks to 6 months. The target populations included patients undergoing adjuvant therapy (Baek et al., 2022), breast cancer survivors with overweight or obesity (Shen et al., 2024; Seo et al., 2021; Allicock et al., 2021; Park et al., 2026), and women at increased risk of breast cancer (Chen et al., 2023).

Regarding study design, one study was a randomized controlled trial (RCT) protocol (Baek et al., 2022), one was a pilot RCT (Chen et al., 2023), one was a pre–post pilot study (Shen et al., 2024), one was a pilot feasibility study (Park et al., 2026), one was a development and feasibility study (Seo et al., 2021), and one was a pilot and feasibility study (Allicock et al., 2021). It is important to note that Baek et al. (2022) was a study protocol without actual outcome data; therefore, its contribution to the effectiveness of synthesis was limited.

Characteristics of mHealth Interventions

All mHealth interventions analyzed in this review incorporated a combination of the following features: (1) daily dietary intake recording through a food diary, (2) personalized feedback based on dietary intake data, (3) nutrition and physical activity educational content, and (4) reminders or notifications. Several studies also integrated additional components, such as peer support (Allicock et al., 2021), telephone-based coaching (Shen et al., 2024), and stress management modules (Seo et al., 2021).

Nutritional Status Outcomes

Five of the six studies reported changes in body weight or body mass index (BMI) as primary outcome. Shen et al. (2024) reported a mean weight loss of 4.2 kg (5.3%) after six months of intervention. Seo et al. (2021) observed a weight reduction of 1.8 kg over an eight-week period. Chen et al. (2023) demonstrated a statistically significant decrease in BMI ($p < 0.05$) in the intervention group compared with the control group. Meanwhile, Park et al. (2026) and Allicock et al. (2021) reported improvements in overall diet quality, although changes in body weight were not assessed as primary outcomes.

DISCUSSION

Effectiveness of mHealth on Anthropometric Parameters

The studies included in this literature review consistently demonstrate that mHealth application–based interventions have the potential to positively influence anthropometric outcomes among breast cancer patients and survivors, although the magnitude of the effects varies across studies. Shen et al. (2024) reported a mean weight reduction of 4.2 kg (5.3%), accompanied by

improvements in Healthy Eating Index (HEI) scores and body composition following a six-month intervention. Similarly, Chen et al. (2023) observed a statistically significant reduction in body mass index (BMI) ($p < 0.05$) in the intervention group compared with the control group in a 12-week pilot randomized controlled trial.

Seo et al. (2021) reported a weight loss of 1.8 kg over an eight-week period. Although relatively modest, this reduction may be considered clinically meaningful given that breast cancer survivors often experience greater difficulty achieving weight loss due to post-treatment metabolic alterations (Chung et al., 2025). It is important to note that the included studies differed in terms of population characteristics (active patients versus survivors), intervention duration, and outcome definitions; therefore, direct comparisons between studies should be interpreted with caution.

Effectiveness of mHealth on Diet Quality and Eating Behaviors

Beyond anthropometric outcomes, mHealth interventions were shown to effectively improve diet quality. Park et al. (2026) reported increased consumption of vegetables, fruits, and protein-rich foods after eight weeks of intervention, with an overall program completion rate of 85%. Features such as food diaries and personalized feedback appear to play a critical role in enhancing nutritional awareness and dietary adherence, consistent with the principles of self-regulation theory (Gong et al., 2023).

Allicock et al. (2021) evaluated an mHealth intervention among African American breast cancer survivors, a population known to experience significant health disparities. The study demonstrated increased fruit and vegetable intake, reduced consumption of high-fat foods, and, most notably, improved self-efficacy related to healthy eating behaviors. This finding is theoretically important because self-efficacy has been recognized as a stronger predictor of long-term health behavior change than short-term behavioral modification alone (Bandura, 1986, as cited in Allicock et al., 2021).

Feasibility and Acceptability of mHealth Interventions

All included studies reported high levels of feasibility and acceptability. Park et al. (2026) documented an 85% program completion rate without any reported adverse events. Seo et al. (2021) reported a user satisfaction rate of 90%, while Shen et al. (2024) found that participants actively engaged with the application on more than 70% of intervention days. These findings suggest that user-centered design, culturally relevant content, and motivational features are key determinants of successful mHealth implementation. This observation is consistent with the findings of the systematic review by Chung et al. (2025), which concluded that mHealth-based dietary interventions among cancer survivors generally demonstrate high feasibility and acceptability.

Implications for Nursing Practice

The findings of this review have important implications for nursing practice. Oncology nurses can serve as facilitators in introducing, educating, and monitoring patient adherence to mHealth applications as part of technology-assisted nursing care. Allicock et al. (2021) highlighted the importance of peer support within mHealth interventions, a role that parallels the therapeutic and supportive functions of nurses in patient care. Integrating mHealth applications into oncology nursing protocols may expand access to nutritional interventions, particularly for patients with limited access to dietetic services and specialized nutritional counseling.

Study Limitations and Implications for the Quality of Evidence

Several important limitations should be acknowledged. First, the majority of included studies were pilot or feasibility studies with relatively small sample sizes ($n = 20–60$), limiting statistical power and reducing the generalizability of the findings. Second, the study by Baek et al. (2022) was an RCT protocol without outcome data, limiting its contribution to the evidence base to intervention

design considerations only. Third, substantial heterogeneity exists among study populations, including active patients, cancer survivors, and women at increased risk of breast cancer, making direct comparisons challenging. Fourth, differences in application platforms, intervention features, and outcome measures limited cross-study comparability. Finally, the relatively short intervention durations (8–12 weeks in most studies) precluded assessment of long-term effects. Based on the methodological quality assessment (Table 3), most studies were judged to have moderate to high risk of bias. Therefore, conclusions regarding effectiveness should be considered preliminary and interpreted as promising evidence rather than definitive proof of efficacy.

CONCLUSION

Based on the six studies reviewed, there is consistent preliminary evidence suggesting that mobile health applications have the potential to improve the nutritional status of breast cancer patients and survivors. Reported benefits include reductions in body weight, improvements in diet quality, enhanced intake of essential nutrients, and increased self-efficacy in self-managing nutritional behaviors. Furthermore, mHealth interventions demonstrate high levels of feasibility and acceptability across diverse populations. However, given that the current evidence is largely derived from pilot studies with small sample sizes and limited controlled designs, conclusions regarding effectiveness should be interpreted cautiously as promising evidence rather than proven efficacy. Large-scale randomized controlled trials with longer follow-up periods and standardized nutritional outcome measures are needed to strengthen and confirm the existing evidence base.

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