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DIGITAL HEALTH TECHNOLOGIES IN NUTRITIONAL CARE: A SYSTEMATIC REVIEW OF CLINICAL APPLICATIONS, EFFECTIVENESS, AND FUTURE DIRECTIONS

Nutrition

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ABSTRACT

Background Digital health technologies have emerged as transformative tools in healthcare delivery, particularly in nutrition and dietetics. Mobile health applications, wearable devices, tele-nutrition, artificial intelligence (AI), electronic health records (EHRs), and personalized nutrition platforms have enhanced dietary assessment, patient monitoring, and chronic disease management. The rapid adoption of digital healthcare following the COVID-19 pandemic has accelerated the integration of these technologies into nutritional practice. **Objective** To systematically review the current evidence regarding the effectiveness, clinical applications, benefits, limitations, and future prospects of digital health technologies in nutritional care.**Methods** A systematic literature search was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Electronic databases including PubMed, Scopus, Web of Science, Embase, Google Scholar, and Cochrane Library were searched. Keywords included "digital health," "tele-nutrition," "mobile health," "wearable devices," "artificial intelligence," "electronic health records," and "personalized nutrition." Studies published in English evaluating digital interventions in nutritional care were included. Editorials, conference abstracts, and non-relevant studies were excluded. **Results** Evidence demonstrates that digital technologies improve dietary adherence, patient engagement, weight management, glycemic control, and healthcare accessibility . Mobile health applications and wearable devices support self-monitoring and behavioral modification . Tele-nutrition improves continuity of care and access to specialist services . AI-based systems facilitate personalized dietary recommendations and clinical decision support . However, concerns regarding privacy, cybersecurity, digital literacy, and healthcare disparities remain significant barriers . **Conclusions** Digital health technologies have substantially improved nutritional care delivery and chronic disease management. Future research should focus on long-term clinical outcomes, equitable access, and integration of emerging technologies into routine healthcare practice.

KEYWORDS

Digital Health, Nutrition Care, Tele-nutrition, Mobile Health, Wearable Devices, Artificial Intelligence, Personalized Nutrition.

INTRODUCTION

Nutrition is a fundamental determinant of health and plays a crucial role in disease prevention and management. Poor dietary habits are major contributors to obesity, diabetes mellitus, cardiovascular diseases, and other chronic disorders that account for substantial global morbidity and mortality [13,16,17]. Traditional nutritional care has relied on face-to-face consultations and manual dietary assessments; however, technological advances have transformed healthcare delivery and expanded opportunities for personalized nutrition management [1,2].

Digital health encompasses the use of information and communication technologies to improve healthcare services, patient engagement, and disease management [8]. Mobile applications, wearable technologies, telehealth services, artificial intelligence, and electronic health records are increasingly used to support nutritional assessment and intervention [3,10].

The COVID-19 pandemic accelerated digital healthcare adoption worldwide, highlighting the importance of telemedicine and remote healthcare delivery [9]. Consequently, digital nutritional care has gained significant attention among healthcare providers and policymakers. This systematic review aims to evaluate the evidence regarding digital health technologies in nutritional care and assess their clinical effectiveness, benefits, limitations, and future applications.

Methods:

Search Strategy

A systematic literature search was conducted using PubMed, Scopus, Web of Science, Embase, Google Scholar, and Cochrane Library. The search included studies published between 2014 and 2025.

Inclusion Criteria

1. English-language publications.
2. Studies evaluating digital technologies in nutritional care.
3. Randomized controlled trials, observational studies, systematic reviews, and meta-analyses.
4. Studies reporting clinical or behavioral outcomes.

Exclusion Criteria

1. Editorials and opinion articles.
2. Conference abstracts.
3. Non-English publications.
4. Studies without nutritional outcomes.

Data Extraction and Analysis

Information regarding study design, intervention type, participant characteristics, outcomes, and key findings was extracted. Due to heterogeneity among studies, findings were synthesized narratively.

Results and Review of Literature

Mobile Health Applications

Mobile health applications are among the most extensively studied digital interventions in nutritional care. These applications facilitate dietary tracking, calorie monitoring, physical activity assessment, and personalized nutritional recommendations [3-7].

Chen et al. demonstrated that smartphone-based weight-management applications improve dietary awareness and support weight reduction [5]. Rollo et al. reported that technology-assisted interventions improve adherence to dietary recommendations and obesity management programs [6]. Wang et al. further found significant improvements in obesity and diabetes self-management among users of mHealth interventions [7].

Compared with conventional counseling, mobile applications provide real-time feedback and continuous monitoring, which enhance patient engagement and self-efficacy [3,4].

Wearable Technologies

Wearable devices such as smartwatches and fitness trackers provide continuous monitoring of physiological parameters and lifestyle behaviors [11]. These technologies measure physical activity, sleep quality, energy expenditure, and metabolic indicators.

Continuous glucose monitoring systems have shown particular benefit in diabetes management by enabling real-time dietary modifications and improved glycemic control [19]. Integration of wearable devices with mobile applications further enhances individualized nutritional interventions [11].

Tele-Nutrition

Tele-nutrition involves the provision of nutritional counseling through digital communication technologies [2]. Tele-nutrition became particularly important during the COVID-19 pandemic due to restrictions on face-to-face consultations [9].

Evidence indicates that tele-nutrition improves healthcare accessibility, especially in rural and underserved populations [2,12]. Studies have demonstrated favorable outcomes in dietary adherence, weight management, and glycemic control [12].

Artificial Intelligence

Artificial intelligence is increasingly being incorporated into nutritional care through automated dietary assessment, food recognition systems, and personalized recommendation algorithms [15].

AI systems can analyze large volumes of health data and identify patterns that support individualized dietary planning. These technologies have the potential to improve treatment adherence and optimize nutritional outcomes [15].

Electronic Health Records

Electronic health records facilitate the storage and management of patient information, including nutritional assessments and intervention plans [10]. Integration of nutrition-related data into EHR systems improves interdisciplinary communication and continuity of care [1,10].

Personalized Nutrition

Personalized nutrition involves tailoring dietary recommendations according to individual genetic, metabolic, and lifestyle characteristics [15]. Digital technologies have made personalized nutrition increasingly feasible through continuous monitoring and data analysis.

Evidence suggests that personalized nutritional interventions may improve adherence and clinical outcomes compared with generalized dietary recommendations [15].

Comparative Analysis of Digital Technologies

Technology	Clinical Benefit	Major Strength	Limitation
Mobile Applications	Improved dietary adherence	Accessibility	Reduced long-term engagement
Wearable Devices	Continuous monitoring	Objective data collection	Cost
Tele-Nutrition	Better healthcare access	Convenience	Internet dependence
Artificial Intelligence	Personalized recommendations	Advanced analytics	Ethical concerns
EHRs	Improved care coordination	Data integration	Infrastructure cost
Personalized Nutrition	Individualized interventions	Precision care	Limited long-term evidence

Reference:Coughlin S, Whitehead M, Sheats JQ, et al. The age of artificial intelligence: use of digital technology in clinical nutrition. *Curr Surg Rep*. 2021;9(7):20. doi:10.1007/s40137-021-00297-3.

DISCUSSION

The findings of this review indicate that digital technologies have transformed nutritional care delivery. Mobile applications and wearable devices improve self-monitoring and behavioral modification [3-7,11]. Tele-nutrition enhances healthcare accessibility and continuity of care [2,12]. AI and personalized nutrition represent emerging areas with considerable potential for improving individualized healthcare [15].

Nevertheless, challenges related to data security, digital literacy, healthcare disparities, and regulatory oversight remain significant barriers to widespread implementation [8,15]. Future research should focus on long-term effectiveness, cost-effectiveness, and equitable access to digital healthcare services.

Limitations

This review included only English-language studies and was limited by heterogeneity among interventions and outcome measures. Additionally, rapid technological advances may influence the applicability of findings over time.

CONCLUSIONS

Digital health technologies have become integral components of modern nutritional care. Evidence indicates that these technologies improve dietary monitoring, patient engagement, chronic disease management, and healthcare accessibility [1-19]. Continued technological innovation and rigorous clinical evaluation are essential for maximizing their potential and ensuring equitable implementation across healthcare systems.

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