

Diet-related Health Recommender Systems (HRS) for patients with chronic health conditions: A scoping review protocol

INPLASY202550081

doi: 10.37766/inplasy2025.5.0081

Received: 27 May 2025

Published: 27 May 2025

Dong, XL; Yun, B; Anni Pakarinen; Zheng, ZT; Niu, H; Jin, T; Yuan, CR; Wang, JT.

Corresponding author:

Jingting Wang

jtwang730@hotmail.com

Author Affiliation:

School of Nursing, The Naval Medical University.

ADMINISTRATIVE INFORMATION**Support** - 72374204.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202550081**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 May 2025 and was last updated on 27 May 2025.**INTRODUCTION**

Review question / Objective This study aims to conduct a scoping review of the current research on diet-related HRS for patients with chronic health conditions, identify existing gaps, and suggest future research directions to enhance their effectiveness in healthcare settings.

Background Dietary management is crucial to overall health, especially in the context of global trends where poor dietary habits have become a significant factor contributing to weight-related issues¹. Statistics from the latest Global Nutrition Report indicated alarming rates of overweight and obesity among adults, with 40.8% of adult (18 years or older) women and 40.4% of adult men affected. Conversely, 9.1% of adult women and 8.1% of adult men were underweight². Improper dietary management not only affects body weight but also contributes to the development of diabetes^{3,4}, hypertension⁵, cardiovascular diseases⁶, chronic kidney disease⁷, and inflammatory bowel disease⁸, among others.

The Scientific Research Report on Dietary Guidelines for Chinese Residents (2021) highlighted that the overweight and obesity rates among children under 6 years old and those aged 6-17 were 10.4% and 19.0%, respectively⁹. Among residents aged 18 and above, the overweight rate was 34.3% and the obesity rate was 16.4%, with 50.7% of adults being overweight or obese⁹. Overweight and obesity are significant risk factors for cardiovascular diseases, diabetes, cancer, and other chronic health conditions⁹. Poor dietary habits contribute to both the onset and progression of these chronic conditions. Therefore, scientific and effective diet management is essential for ensuring proper nutrient intake, which directly enhances individual immunity, halts disease progression, impacts health status, and supports recovery from chronic health conditions, thereby improving overall health outcomes^{10,11,7}. Moreover, good diet management regulates sleep and mood, reduces fatigue, and comprehensively enhances overall health^{12,13}. In February 2024, China's National Health Commission released the "Dietary Guidelines for Adults with Hyperuricemia and Gout (2024 Edition)", "Dietary Guidelines for

Adult Obesity (2024 Edition)", "Dietary Guidelines for Childhood and Adolescent Obesity (2024 Edition)", and "Dietary Guidelines for Adults with Chronic Kidney Disease (2024 Edition)"¹⁴. These guidelines aimed to prevent and control the occurrence and progression of chronic diseases among the Chinese population through dietary management.

Patients with such conditions often need to adjust their diets based on their specific health status to manage health conditions effectively and enhance the overall quality of life. When patients are required to follow dietary restrictions due to their chronic health condition, it is important for the patient to distinguish whether certain foods are permissible, ensure that the cooking methods meet the essential requirements, evaluate whether portion sizes are appropriate, and strive to maintain a balanced diet in order to reduce the risk of malnutrition and other issues caused by dietary limitations. Therefore, these patients require targeted and personalized guidance to help them implement scientific and feasible dietary management practices.

Recommender Systems (RS) are software tools that provide suggestions or recommendations of items to users, such as products, services, information, or content, based on their preferences, interests, and past behaviors which have been used in several domains such as e-commerce, e-learning, e-tourism, or e-health. Health Recommender Systems (HRS) are also one of RS's important application scenarios. HRS offer the potential to motivate and engage users to change their behavior by sharing better choices and practical knowledge based on observed user behavior¹⁷. HRS have been applied in healthcare in recent years, in areas such as mental health, hearing aid usage, health education, physical activity, and diet-related health.

Diet-related HRS are software tools that utilize personalized data to provide tailored food recommendations from a wide range of options. Diet-related HRS present promising solutions to the issues of information overload and limited food choices, which contribute significantly to diet-related health problems. By utilizing personalized data, diet-related HRS offer tailored food recommendations that take into account users' taste preferences, dietary needs, and medical conditions.

Rationale While diet-related HRS have been explored within the field of information and communication technology, research on their application in chronic disease dietary management is still limited, and there is a lack of comprehensive literature reviews in this area. To address these

gaps, this study adopted scoping review methodology to review the research status quo of diet-related HRS for individuals with chronic conditions, specifically the target populations, function structures, recommendation contents, implementation of recommendation features, and evaluation of these systems, in order to provide a reference for healthcare researchers aiming to design more effective and user-friendly diet-related HRS.

METHODS

Strategy of data synthesis The literature search was performed by three researchers in October 2024, covering six English databases (Web of Science Core Collection, IEEE Xplore, PubMed, Medline, CINAHL, and Embase) and four Chinese databases (SinoMed, CNKI, Wanfang, and VIPIC). Relevant studies were searched from January 2010 to October 2024 to answer the above research questions. An example of the search strategy performed in Web of Science Core Collection is presented here: (Recommender system* OR Hybrid recommendation* OR Collaborative filtering OR Content based recommendation* OR Recommendation* system* OR Knowledge based recommendation*) AND (Recipe* OR Diet* OR Food OR Eat* OR Nutrition*).

Eligibility criteria All studies searched were independently assessed by two authors based on the inclusion criteria listed below, and discrepancies were verified by a third author. Studies were eligible for inclusion in this review if all the following criteria were met (1) the recommended information was related to at least one of the following: food, meal plan, diet plan, and recipe, (2) the study applied personalized recommendation strategy, (3) the recommendations were generated using algorithmic and technological methods, (4) the study population comprised patients with chronic health conditions, and (5) the study was published in a peer-reviewed journal or conference proceeding. The exclusion criteria included: (1) the recommendation unrelated to human health (e.g., study focusing on animal health³⁰), (2) only the most recent publication remained if two or more studies regarding the same system were identified (e.g., the latest published study³¹ was included, while the older one³² was excluded), and (3) full-text articles not in English or Chinese language.

Source of evidence screening and selection In total, 4370 published studies were identified in the searching process (see Figure 1). EndNote X9 was used to exclude 350 duplicates, and 3812 studies

were excluded based on a review of their titles and abstracts. The remaining 208 studies were searched for full text. Ultimately, 193 were excluded based on the exclusion criteria, and 15 studies were included and analyzed in Table 1.

Author 6 - Tian Jin.
Author 7 - Changrong Yuan.
Author 8 - Jingting Wang.

Data management Decisions regarding the information to be recorded from the primary studies were made through discussions within the research group. Subsequently, a structured chart was developed to collate, summarise, and share the extracted data. A descriptive-analytical narrative approach was employed to extract and chart the data from the selected articles^{28,33}. Two reviewers independently charted the data, while a third reviewer verified the accuracy of the information. The following details were documented for each included study (see Table 1): (1) author, nationality, and publication year, (2) target user, (3) age (years), (4) function structure, (5) recommendation content, (6) recommendation method, (7) recommendation technology, (8) data of training set, (9) recommendation process, (10) evaluation method, (12) evaluation criteria, (13) test set or evaluation sample size.

The scoping review methodology aimed to summarise the breadth and depth of the existing literature. At this stage, an overview of the characteristics of all included articles was collated, summarised, and reported. Initially, a basic numerical summary of the studies, including the extent, nature and distribution of the articles, was presented. As this was a scoping review, the critical appraisal of the quality of the included studies was not conducted. However, efforts were made to map the diversity and variety of diet-related HRS based on factors such as the characteristics of target users, function structure, recommendation content, and other factors. (see Table 1). This process facilitated researchers in reaching conclusions about the key characteristics of research in this field and provided insights for future studies.

Language restriction No.

Country(ies) involved China.

Keywords Recommender System, Health Recommender System, Chronic Health Conditions, Diet, Scoping Review.

Contributions of each author

Author 1 - Xiao Dong.
Author 2 - Bei Yun.
Author 3 - Pakarinen Anni.
Author 4 - Zhuting Zheng.
Author 5 - Hao Niu.