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Mini Review

The Future of Artificial Intelligence-driven Personalized Nutrition in Gastroenterology and Hepatology: Emerging Trends and Perspectives

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Abstract

Nutrition plays a pivotal role in the prevention and management of gastrointestinal and hepatic diseases, yet dietary guidance remains generic, limiting its effectiveness. Conditions such as inflammatory bowel disease, irritable bowel syndrome, metabolic dysfunction-associated steatotic liver disease, celiac disease, and gastroesophageal reflux disease are significantly influenced by dietary factors. Personalized nutrition has emerged as a promising strategy to tailor interventions, but conventional approaches fail to account for individual metabolic, genetic, and microbiome variability, limiting their clinical impact. The rapid rise of artificial intelligence (AI) has transformed precision nutrition by integrating genomics, microbiome profiles, metabolic markers, and real-time dietary tracking to generate individualized recommendations. AI-driven systems are advancing dietary assessment, condition-specific nutrition optimization, and continuous monitoring through tools such as wearable devices and natural language processing-based diet analysis. These innovations hold transformative potential in gastroenterology and hepatology, offering dynamic, patient-specific strategies that may enhance clinical outcomes. However, challenges remain, including the lack of standardized AI-driven protocols, ethical concerns such as bias and data privacy, limited clinical validation, and the underrepresentation of nutrition in many current AI applications. Opportunities for progress include developing federated learning models, expanding real-world validation studies, and designing regulatory and ethical frameworks for safe implementation. This narrative review synthesizes literature published between 2015 and 2025 across five databases, highlighting key applications, limitations, and future directions of AI-driven personalized nutrition in gastroenterology and hepatology. It provides insights into how AI could reshape patient-centered care through more individualized, effective, and scalable dietary strategies.

Introduction

Artificial intelligence (AI) has rapidly evolved into a pivotal innovation within the healthcare landscape, offering the ability to process complex clinical data, recognize subtle patterns, and support clinical decision-making processes with remarkable accuracy. Its integration into medicine has transformed diagnostic accuracy, optimized therapeutic planning, and enhanced healthcare delivery across multiple specialties.[1] AI encompasses a wide range of technologies designed to mimic cognitive functions such as learning, reasoning, and problem-solving.[2] Within this framework, machine learning (ML) and deep learning (DL) represent two of the most influential and widely adopted subfields. ML involves algorithms that learn from data inputs to make predictions or decisions without being explicitly programmed. By developing mathematical models based on training datasets, ML systems are capable of improving their performance over time.[3,4] As neural network architectures advanced, DL emerged as a powerful extension of ML. DL utilizes multi-layered neural networks that can hierarchically extract features from complex data, mimicking the processing mechanisms of the human brain.[5] This enables the automated detection, classi-

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fication, and segmentation of biomedical images with exceptional accuracy, making DL particularly suitable for image-intensive specialties such as endoscopy, radiology, and pathology.[2]

AI consists of diverse branches, each with potential applications in both clinical and academic settings within digestive health.[6] In the domains of gastroenterology and hepatology, the application of AI has progressed significantly, driven by the availability of extensive clinical data, endoscopic imaging, and histopathological inputs. Recent advances have facilitated AI-assisted evaluation of colorectal polyps, Barrett's esophagus, gastrointestinal malignancies, and obscure gastrointestinal bleeding through capsule endoscopy.[7] In hepatology, AI is increasingly employed to detect and stage liver fibrosis, diagnose metabolic dysfunction-associated steatotic liver disease (MASLD), differentiate hepatic lesions, and predict outcomes related to hepatocellular carcinoma and liver transplantation.[8] These developments are supported by the growing use of electronic health records (EHRs), advanced imaging modalities, and computational tools that allow real-time interpretation of clinical and laboratory data.[9]

Despite the acceleration of AI-based tools in diagnosis and monitoring, nutrition, which is a fundamental component in the prevention and management of gastrointestinal and liver diseases, has not been fully integrated into these AI-driven approaches. A wide range of disorders, including inflammatory bowel disease (IBD), irritable bowel syndrome (IBS), MASLD, celiac disease, and gastroesophageal reflux disease (GERD), are significantly influenced by dietary factors.[10–15] Conventional dietary recommendations often rely on generalized guidelines that fail to address individual variation in metabolism, genetic makeup, microbiota composition, and lifestyle behaviors.[5]

The field of personalized nutrition has emerged in response to these limitations, aiming to tailor dietary advice based on individual biological characteristics. AI provides the computational foundation necessary to operationalize this approach at scale. By integrating data from genomics, transcriptomics, metabolomics, wearable sensors, and microbiome sequencing, AI-based systems can generate personalized dietary strategies with the potential to improve disease outcomes and patient adherence.[5,16,17] In IBS, for instance, ML models have been developed to identify dietary triggers and correlate them with symptom patterns, supporting more targeted nutritional interventions.[1] Similarly, in MASLD, AI technologies are being evaluated for their ability to predict treatment response to specific nutritional regimens, including calorie-restricted and macronutrient-modified diets.[18,19]

Further advancements in generative AI and natural language processing have expanded the accessibility of tailored dietary guidance. Large language models (LLMs) such as ChatGPT and structured systems like ChatDiet are being developed to offer real-time, multilingual, and culturally adaptive nutrition counseling.[18] These tools have demonstrated utility in addressing barriers related to healthcare accessibility and can assist in behavior change and continuous monitoring, particularly in underserved or resource-limited settings. Additionally, mobile applications that incorporate AI algorithms, such as Cara Care and Gali Health, enable real-time symptom tracking and offer decision-support features that enhance patient engagement in IBD and IBS management.[20]

Despite this growing interest, significant challenges continue to limit the widespread implementation of AI-driven personalized nutrition. Notably, existing literature often focuses on diagnostic applications, with limited exploration of nutrition-specific predictive modeling or intervention design, particularly in gastroenterology and hepatology. Additional issues include the lack of standardized clinical validation frameworks, limited integration into clinical workflows, algorithmic opacity, and ethical concerns regarding data privacy and equity.[21,22] These gaps highlight the urgent need for interdisciplinary collaboration to translate computational insights into actionable dietary strategies.

This review aims to synthesize recent developments in AI-driven personalized nutrition within gastroenterology and hepatology, offering a critical overview of current clinical applications, emerging technologies, and methodological challenges. It highlights the growing integration of ML, LLMs, and mobile health tools into nutrition care. By outlining future opportunities and addressing key limitations such as clinical validation, data standardization, and ethical concerns, this review seeks to inform the development of more individualized, precise, and sustainable dietary interventions for digestive and liver diseases.

Data source

This review was conducted using a narrative, non-systematic approach aimed at synthesizing emerging trends, challenges, and opportunities related to AI-driven personalized nutrition in gastroenterology and hepatology. To identify relevant studies, a bibliographic search was performed across major scientific databases, including PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar, between January 2015 and June 2025. The search utilized combinations of keywords such as "artificial intelligence," "machine learning," "deep learning," "large language models," "personalized nutrition," "precision nutrition," "gastroenterology," "hepatology," "IBD," "IBS," "MASLD," "GERD," and "celiac disease." Additional references were identified through citation tracking and expert knowledge. Duplicate entries were removed, and studies were selected based on relevance to the integration of AI with nutritional applications in gastrointestinal and liver health. This review does not follow the systematic review methodology, and findings are synthesized to provide a broad yet critical overview of current developments in the field.

Applications of AI-driven personalized nutrition in gastroenterology and hepatology

AI, including ML, DL, and LLMs, is rapidly transforming clinical nutrition by enabling personalized, data-driven dietary interventions tailored to individual physiological, metabolic, and behavioral profiles in gastroenterology and hepatology.[20,23] These advanced technologies offer the potential to move beyond generalized dietary guidelines and toward precision nutrition by integrating multidimensional data, including microbiome composition, genomics, metabolomics, dietary intake records, symptom tracking, EHRs, and wearable sensor outputs.[18,24,25]

AI applications in digestive health span three primary domains: (1) screening and triage of patients for specialist evaluation, (2) automation of repetitive and time-intensive clinical tasks such as food diary analysis and symptom monitoring, and (3) real-time clinical decision support to enhance diagnostic accuracy and therapeutic planning.[26] These AI functions span both diagnostic and nutritional domains, enhancing workflow efficiency while contributing to improved patient outcomes.[26–28]

Generative AI, particularly LLMs such as GPT-4 and LLaMA-3, is emerging as a disruptive force in clinical nutrition, capable of delivering real-time, multilingual, and culturally tailored dietary guidance. Tools like the ChatDiet system exemplify this potential by integrating individual and population-level data to produce explainable, evidence-based recommendations for disease prevention and management.[18,29] These systems enhance dietary adherence by embedding behavior change techniques and simplifying complex nutritional information into patient-friendly formats. Nevertheless, generative AI presents specific limitations. LLMs are prone to hallucinations, which may result in the generation of incorrect or unsafe advice, particularly for patients with complex nutritional needs, such as those with renal or liver disease. Additionally, their accuracy in low-resource languages and nuanced medical contexts remains limited. Ongoing solutions, such as supervised fine-tuning and retrieval-augmented generation, are being tested to align outputs with evidence-based clinical nutrition guidelines.[18,20]

Beyond generative AI, wearable devices, mobile health platforms, and EHR-integrated AI systems are being deployed for real-time continuous monitoring and dynamic, adaptive adjustments to dietary strategies.[30] Devices such as smartwatches, glucose monitors, and mobile food trackers provide real-time data on physical activity, gastrointestinal symptoms, sleep patterns, and nutritional intake, facilitating a dynamic feedback loop between patients and providers.[21,31] This data ecosystem supports disease surveillance, malnutrition risk stratification, and treatment adherence.

AI-powered mobile tools like the Heali app have demonstrated improvements in quality of life and dietary adherence in IBS patients through low-FODMAP diet support, showcasing the potential of app-based AI to augment therapeutic compliance.[32]

In resource-limited settings, AI-driven conversational agents and natural language processing-based mobile applications are particularly valuable. They provide 24/7 dietary counseling and educational support, especially where access to registered dietitians is scarce. These systems also facilitate remote clinical decision-making by offering providers real-time access to patient-generated dietary and symptom data over extended periods.[18,20]

AI's strength lies in its ability to extract actionable insights from big data encompassing omics profiles, lifestyle patterns, and clinical records. In gastrointestinal health, ML algorithms integrate heterogeneous inputs to model disease trajectories and intervention responses. This is particularly evident in disorders such as IBS, IBD, GERD, and colorectal cancer.[4,33–36]

Studies like that by Huo *et al*.[35] have shown that customized LLMs (e.g., GERD Tool for Surgery) outperform general GPT-4 in aligning with clinical guidelines for surgical decision-making. Similarly, Rammohan *et al*.[37] demonstrated that ChatGPT-4 provided more reliable and accurate gastroenterology-related responses than other generative tools, underlining the importance of model customization in clinical contexts.

In summary, the integration of AI technologies, from traditional ML models to advanced generative systems, marks a paradigm shift in clinical nutrition for digestive and liver disorders. These innovations pave the way toward precision nutrition, replacing "one-size-fits-all" strategies with adaptive, individualized care that leverages microbiome science, behavioral data, and digital monitoring for improved patient outcomes.

AI-powered microbiome-based personalization in gastrointestinal disorders and precision nutrition

IBS exemplifies the potential of AI-driven microbiome-informed dietary personalization, owing to its heterogeneous pathophysiology, which encompasses alterations in gut motility, visceral hypersensitivity, immune activation, and microbiome dysbiosis. Traditional dietary strategies, particularly the low-FODMAP diet, have demonstrated short-term symptom relief in many IBS patients. However, these generalized, "one-size-fits-all" interventions fail to account for the interindividual variability in gut microbiota composition and metabolic responses, often resulting in inconsistent outcomes and suboptimal adherence.[36] This limitation underscores the need for data-driven, individualized approaches that integrate gut microbial features into nutrition care models.

Recent clinical trials have illustrated the potential of AI-based personalization to outperform standard dietary recommendations in IBS. In a randomized controlled study, an AI-generated, microbiota-guided diet produced via the ENBIOSIS platform led to significantly greater reductions in IBS symptom severity scores compared to the standard low-FODMAP diet.[38] The ENBIOSIS system utilized an ML algorithm trained on publicly available gut microbiota and nutrient interaction databases to generate individualized diet plans, which also promoted favorable shifts in microbial diversity and composition [38]. Additional evidence from a clinical trial conducted in patients with mixed-type IBS demonstrated that AI-based dietary modulation achieved a classification accuracy of 91% (area under the curve = 0.964) in distinguishing microbiome-based IBS phenotypes and significantly improved gastrointestinal symptoms and patient-reported outcomes compared to conventional dietary management.[38] In a larger multicenter randomized controlled trial, Tunali *et al*.[39] found that AI-assisted personalized diets outperformed the FODMAP diet in reducing IBS symptoms, improving quality of life, and shifting microbiome diversity across all IBS subtypes. The personalized diet group showed significantly greater reductions in symptom severity and anxiety levels, with microbial shifts suggestive of healthier gut composition.

Beyond personalized intervention, AI technologies are increasingly employed for the stratification and diagnosis of IBS subtypes. ML models, including XGBoost, logistic regression, and support vector machines, have been developed to classify IBS variants using multidimensional input from gut microbiome profiles, fecal metabolomics, and breath-based volatile organic compound signatures.[33] A systematic review identified 25 studies utilizing ML algorithms for IBS detection and management, many of which reported classification accuracies exceeding 90%.[1] These findings demonstrate that AI can deconstruct microbiota-mediated heterogeneity to support individualized dietary and therapeutic strategies in functional gastrointestinal disorders.

In IBD, AI applications extend beyond classification to encompass dynamic monitoring and dietary management. Mobile health technologies, integrated with AI algorithms, collect real-time data on symptoms, medication adherence, and dietary habits. These systems synthesize patient-reported outcomes into personalized dashboards that facilitate early identification of disease flare-ups, support tailored nutritional guidance, and empower both patients and clinicians to adopt proactive care strategies.[20]

Collectively, these developments reflect a shift from population-based nutritional advice to microbiome-informed, AI-personalized dietary strategies in gastroenterology. By capturing the dynamic interplay between microbial ecosystems, dietary exposures, and host physiology, AI holds substantial promise for enabling precision nutrition in both functional and inflammatory gastrointestinal diseases.

AI-enabled personalization in MASLD and hepatology

MASLD remains the most prevalent chronic liver condition worldwide.[40,41] Although pharmacological progress has recently emerged, such as the 2024 U.S. Food and Drug Administration approval of resmetirom for noncirrhotic MASLD with fibrosis, personalized lifestyle and dietary interventions continue to be central to MASLD management.[42] However, the marked metabolic heterogeneity among individuals poses significant challenges to standardized dietary strategies.[43–45] In this context, AI technologies are increasingly being utilized to capture individual variability, integrate multi-dimensional data, and facilitate precision nutrition therapies tailored to metabolic profiles.

One of the most notable advancements in this area involves the use of ML to predict individual postprandial glycemic responses.[2] In a pivotal study involving over 800 individuals and 46,898 meals, continuous glucose monitoring data were combined with clinical, behavioral, and gut microbiota variables to train a gradient-boosted regression model. This model was able to accurately predict an individual's glycemic response to specific foods and meals, enabling the formulation of personalized dietary recommendations tailored to optimize metabolic outcomes. Compared to conventional dietetic guidance, the AI-generated diet plans led to significantly improved glycemic control and favorable shifts in gut microbial composition and diversity.[46]

Subsequent interventions have confirmed the utility of this approach in broader populations. The implementation of digital phenotyping, via smartphones and wearable technologies such as smart scales, sleep monitors, and physical activity trackers, further enhances AI's capabilities. These devices generate continuous, real-time data (e.g., circadian rhythm patterns, step counts, meal timing) that can be fed into adaptive ML systems. Such integration allows for dynamic adjustments to dietary plans based on real-world behaviors, supporting sustained adherence and improved long-term outcomes in MASLD management.[43,46–48]

Beyond glycemic control, AI technologies are being employed to decipher complex nutrient–gene–microbiota interactions using integrative omics approaches. Emerging personalized nutritional geometry models aim to optimize macronutrient distribution based on individual hepatic lipid metabolism profiles, insulin sensitivity, and microbiota composition. These models incorporate genomic variants (e.g., PNPLA3, TM6SF2), microbial taxa abundances, and dietary intake to generate targeted diet prescriptions that reduce hepatic steatosis and metabolic dysfunction. Sensor-derived data such as heart rate variability and sleep efficiency can also be utilized to refine these models further, producing adaptive, patient-specific nutritional protocols.[48]

In hepatology more broadly, AI applications are expanding into diagnostic and prognostic domains. AI systems assist with fibrosis staging, hepatotoxicity prediction, and post-transplant risk stratification by analyzing imaging, histology, and EHRs. ML algorithms have been trained to predict fibrosis progression, cirrhosis risk, and post-liver transplant outcomes by integrating imaging, histopathological, and EHR data. Tools like AI4FoodDB centralize multimodal datasets, including food images, biosensor data, biomarkers, and omics, to enable robust model training and hypothesis testing in hepatometabolic disorders.[31] These systems offer enhanced accuracy in staging liver disease and guiding clinical decision-making. Additionally, AI tools are being explored for monitoring dietary exposures and predicting hepatotoxicity during pharmacological treatment, especially in settings where polypharmacy and supplement use complicate clinical risk assessments.[5,7]

These developments highlight the transformative potential of AI in the nutritional management of MASLD and broader hepatological conditions. By leveraging high-throughput omics, continuous behavioral monitoring, and advanced learning algorithms, AI enables a transition from generalized dietary recommendations to precision nutrition models that are both dynamic and individualized. Such systems promise not only to optimize metabolic health but also to reduce disease progression and improve quality of life in patients with liver disorders.

Challenges, ethical concerns, and future perspectives for AI-driven personalized nutrition in gastroenterology and hepatology

Despite its transformative potential, the implementation of AI in personalized nutrition for gastroenterology and hepatology is fraught with complex challenges that must be addressed to ensure clinical efficacy, patient trust, and ethical integrity. These include data-related limitations, algorithmic bias, regulatory gaps, stakeholder skepticism, financial barriers, and practical considerations in diverse healthcare settings.

One of the most persistent ethical concerns is the lack of transparency in DL and generative models, which often function as "black boxes." These models can yield clinically significant outputs without providing interpretable justifications, thus complicating informed consent and eroding trust among both patients and healthcare professionals.[49] Furthermore, when AI is used to generate personalized dietary recommendations based on sensitive data, such as genomics, metabolomics, and gut microbiome profiles, issues of data privacy, ownership, and consent become even more pronounced. Discriminatory risks associated with the use of genetic or microbiome data in insurance or employment contexts highlight the urgent need for ethical frameworks and legislative oversight.[5,7]

Technical limitations further complicate AI deployment in clinical nutrition. Data collected from different sources, ranging from food diaries and wearable sensors to sequencing platforms, vary widely in structure and quality. Inconsistent methodologies in microbiome sequencing and dietary assessment introduce bias and limit the generalizability of AI models.[5] Standardization of data formats, preprocessing pipelines, and analytical frameworks is essential for creating reliable, reproducible, and transferable models.

Federated learning, which enables AI models to be trained on decentralized datasets while preserving patient privacy, has emerged as a potential solution but requires sophisticated infrastructure and expertise. The lack of uniformity in algorithm validation, across metrics such as sensitivity, specificity, area under the receiver operating characteristic curve, and real-world applicability, also raises questions about the clinical readiness of many AI tools.[7] Most studies to date have been retrospective, single-center, and observational in nature, further underlining the need for large, prospective, multicenter trials and real-world evaluations.

Bias in training data remains a significant hurdle, particularly when datasets fail to capture population heterogeneity. Underrepresented groups are at increased risk of receiving inaccurate or inequitable recommendations. This is especially concerning in nutrition, where sociocultural dietary patterns, language, and access to food resources vary widely. High-dimensional data, such as microbiome features, exacerbate these problems by increasing the likelihood of overfitting and reducing the external validity of models.

Financial constraints, infrastructural limitations, and digital inequality also pose formidable barriers. The high cost of implementing AI, through computational infrastructure, software licenses, and personnel training, may be prohibitive for under-resourced institutions and countries. Individuals in rural or underserved areas may lack access to digital tools and internet connectivity, excluding them from the benefits of AI-driven dietary care. Promoting digital equity and inclusive design is therefore a crucial part of making AI accessible and effective for all.

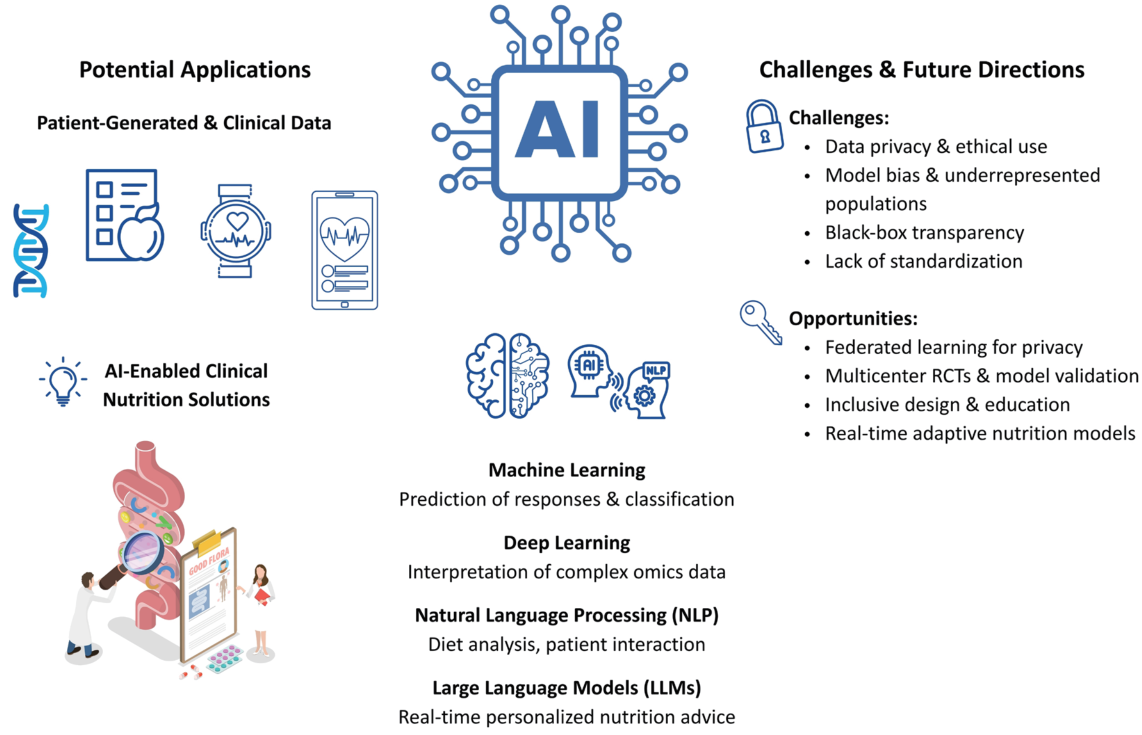

Fig. 1. AI-driven personalized nutrition in gastroenterology and hepatology: clinical applications and future impact. An overview of how AI systems integrate patient-generated and clinical data, including genomic, nutritional, biometric, and symptom-related inputs, to deliver AI-enabled clinical nutrition solutions in gastroenterology and hepatology. Key AI technologies such as machine learning, deep learning, natural language processing, and large language models are applied to predict dietary responses, interpret complex omics data, and deliver real-time personalized nutrition advice. The left side of the figure shows the flow from data sources to clinical application. The right side outlines current challenges and future directions, including opportunities. AI, artificial intelligence; RCT, randomized controlled trial.

The success of AI in this field also depends on widespread acceptance and engagement by stakeholders, including healthcare professionals and patients. Clinicians may be reluctant to adopt AI systems unless they are easy to integrate into workflows, demonstrate clear benefits, and preserve their role in decision-making. Patients, particularly older adults, may express concerns over the impersonality of AI systems and fear privacy violations. These concerns must be addressed through patient-centered design, educational initiatives, and transparent communication.

Education and interdisciplinary collaboration will play a foundational role in overcoming these barriers. There is a growing need to train professionals who can operate at the intersection of nutrition science, computer science, statistics, and medicine. Academic institutions must incorporate AI, data science, and ethics into the curricula of dietitians and gastroenterologists. Workshops and training programs aimed at upskilling healthcare providers and fostering collaboration between technical and clinical experts are also essential.[5]

Opportunities for future development are substantial. AI models can be enhanced using synthetic datasets and generative approaches, which preserve patient privacy while expanding data availability. Emerging platforms such as AI4FoodDB and ENBIOSIS illustrate the potential of integrating behavioral, clinical, and omics data into robust personalized nutrition algorithms. Furthermore, AI holds promise in detecting causal relationships through longitudinal data analysis and experimental interventions, key elements for advancing precision nutrition beyond observational correlation.

From a regulatory perspective, AI tools in clinical nutrition must be treated as medical devices and subjected to rigorous evaluation by authorities such as the U.S. Food and Drug Administration. This includes ensuring transparency in algorithmic logic, establishing thresholds for performance validation, and clarifying liability in the case of AI-driven errors.[7]

As the use of AI expands, so too must safeguards to ensure ethical, inclusive, and equitable implementation. These include secure and privacy-respecting data infrastructures, clear informed consent protocols, measures to address bias and algorithmic fairness, and accessibility for underserved populations. Addressing the limitations and challenges outlined above will be key to harnessing AI's full potential in gastroenterology and hepatology.

In summary, while AI offers powerful tools to personalize nutrition and improve outcomes in gastrointestinal and hepatic health, its promise can only be fully realized through ethical vigilance, methodological rigor, and interdisciplinary collaboration. Successful integration of AI into clinical nutrition depends not only on technological innovation but also on transparent governance, equitable data representation, and robust validation in diverse populations. Moreover, empowering healthcare professionals and patients through education and inclusive digital solutions is critical to ensuring trust and sustainability.

To encapsulate these themes, Figure 1 presents a visual overview of the current applications, key technologies, and future directions of AI in personalized nutrition within the fields of gastroenterology and hepatology. It illustrates how diverse sources of data, such as microbiome analyses, wearable sensor outputs, and EHRs, can be processed using AI systems to develop tailored dietary strategies for conditions including IBS, IBD, MASLD, GERD, and celiac disease. This framework highlights the clinical potential of AI while also emphasizing the need to address challenges related to data quality, model fairness, ethical concerns, and equitable access to ensure successful integration into healthcare practice.

Conclusions

AI has the potential to transform personalized nutrition in gastroenterology and hepatology by integrating high-dimensional clinical, behavioral, and omics data into adaptive dietary strategies. Applications ranging from microbiome-guided diet personalization in IBS and IBD to predictive modeling of metabolic responses in MASLD demonstrate how AI can enhance individualization, adherence, and outcomes. However, this review also acknowledges inherent limitations, primarily regarding the choice to adopt a narrative design. While this approach allows for a broad synthesis of heterogeneous technologies and early-stage applications, it lacks the structured search strategy and quantitative rigor of a systematic review. Consequently, no quantitative meta-analysis was performed, and the selection of studies may be subject to inherent bias. Furthermore, many cited AI applications remain in preliminary validation stages, necessitating cautious interpretation of their immediate clinical utility. These constraints highlight the need for more rigorous, large-scale, and standardized clinical investigations.

Nevertheless, the review outlines clear strengths, including the integration of multidimensional data, exploration of cutting-edge technologies such as LLMs and wearable tools, and a forward-looking perspective on ethical and regulatory frameworks. Bridging current gaps will require interdisciplinary collaboration, robust evaluation strategies, and investment in data standardization and digital equity. As AI technologies evolve, their successful integration into clinical nutrition workflows can redefine the management of digestive and liver diseases, making care more precise, proactive, and patient-centered.

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Conflict of interest

The authors declare that they have no conflicts of interest relevant to the content of this manuscript.

Author contributions

Manuscript conceptualization, literature review, writing of the manuscript (MGC), clinical interpretation of artificial intelligence applications in hepatology, and critically revised the manuscript for important intellectual content (MB). Both authors reviewed and approved the final manuscript.

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