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Artificial Intelligence in Early Diagnosis of Inflammatory Bowel Disease: A Systematic Review

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ABSTRACT

Introduction: The prevalence of inflammatory bowel disease (IBD) is estimated to be around 0.3% to 0.5% of the world's population globally. IBD is a chronic inflammatory disorder of the digestive tract that includes two main conditions named Crohn's disease (CD) and ulcerative colitis (UC). Early diagnosis of IBD allows for the prompt initiation of appropriate treatment, which can help manage symptoms, reduce inflammation, and improve the quality of life for people with IBD. Artificial intelligence (AI) has been used in recent years, using various models and methods being selected to analyze clinical and paraclinical data to predict and diagnose IBD. This study aimed to systematically review practical AI algorithms for analyzing clinical and paraclinical data for the early diagnosis of IBD patients.

Search Strategy: The study was conducted using the PICO criteria, aligned with the research objective, and guided by the PRISMA checklist. This systematic review included a comprehensive search from 2019 to 2024 across the PubMed, Scopus, Web of Science, and Magiran databases and the Google Scholar search engine. The search utilized MESH keywords, including "Artificial intelligence," "Inflammatory Bowel Disease," and "Diagnosis." Subsequently, two independent researchers screened the retrieved articles based on inclusion criteria.

Results: A total of 358 articles were identified through the initial search. After reviewing the inclusion and exclusion criteria and critically evaluating the quality of the articles, eight articles were finally included in the study. Most studies showed that AI, utilizing specific techniques such as Convolutional Neural Networks (CNN) and Random Forest (RF), can analyze clinical and paraclinical data to aid in predicting and early diagnosing IBD, particularly UC and CD. The CNN is a deep learning (DL) algorithm that effectively differentiates between UC and CD using endoscopic data. CNN works by learning patterns from data, which can be used to classify images accurately. In studies of IBD differentiation, CNN has achieved an accuracy of 99% for diagnosing UC and 87% for diagnosing CD. The RF machine learning (ML) algorithm has also effectively differentiated between UC and CD by utilizing clinical and paraclinical data. RF operates by constructing numerous decision trees and combining their outcomes. In studies of IBD differentiation, RFs have achieved an accuracy of 97% for diagnosing UC and 65% for diagnosing CD.

Conclusion and Discussion: AI-based IBD diagnosis using clinical and paraclinical data holds promise for improving the prediction and timely diagnosis of patients with IBD. Integrating AI technologies into diagnostic measures can make the diagnostic process faster and easier, ultimately leading to better management of IBD patients.

Keywords: Artificial intelligence, Diagnosis, Inflammatory bowel disease

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