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Revolutionizing SLE Diagnosis: A Systemic Review on the Role of Omics data and Artificial Intelligence

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ABSTRACT

Introduction: Approximately 0.4 million people are diagnosed with systemic lupus erythematosus (SLE) yearly. SLE is a chronic autoimmune disease characterized by the immune system attacking healthy tissues and organs. Early SLE diagnosis is crucial as it allows for the prompt initiation of appropriate treatment, which can help prevent disease progression and minimize organ damage. Artificial intelligence (AI) approaches have emerged as promising tools for studying SLE. AI algorithms have analyzed SLE patients' omics data (massive biomolecule datasets) to improve early diagnosis. This review systematically examines practical AI algorithms for omics data analysis and the early diagnosis of SLE.

Search Study: The study was conducted based on the PICO criteria and aligned with the research objective, adhering to the PRISMA checklist. This systematic review included a comprehensive search from 2019 to March 2024 across the PubMed, SCOPUS, Web of Science, SID, and Magiran databases, as well as the Google Scholar search engine. The search utilized MESH keywords, including "Diagnosis", "Lupus Erythematosus", Systemic", "Artificial intelligence", "multiomics", "Genomics", "Proteomics", and "Metabolomics". Subsequently, two independent researchers screened the retrieved articles based on inclusion criteria.

Results: A total of 94 articles were identified through the initial search. After screening titles and abstracts, the number of articles was reduced to 15. Finally, considering the inclusion and exclusion criteria and after reviewing the complete text, four articles were included in this study. Studies have shown that machine learning technology, which is one of the AI technologies, has been able to analyze a vast amount of omics data by using special techniques such as Uniform Manifold Approximation and Projection (UMAP), Recursive Feature Elimination (RFE), Least Absolute Shrinkage and Selection Operator (LASSO), Extreme Gradient Boosting (XGBoost), and Support Vector Machine (SVM), which helps in the prediction and early diagnosis of SLE. The UMAP technique, with its mechanism of dimensionality reduction, has contributed to a more accurate diagnosis and treatment of SLE by identifying important patterns. Additionally, the RFE and LASSO techniques have provided more accurate predictions of the probability of individuals developing SLE by selecting the most important data from the omics datasets. Furthermore, the XGBoost and SVM techniques have played a significant role in SLE diagnosis by analyzing various data sources and identifying disease-related patterns.

Conclusion and Discussion: AI-powered SLE diagnosis using omics data holds promise for improving the accuracy and timeliness of SLE diagnosis. However, further research is needed to validate these approaches and establish their clinical utility due to the limitations of the studies conducted in this field.

Keywords: Artificial intelligence, Diagnosis, Multiomics, Systemic lupus erythematosus