Diagnosing Coronary Artery Disease Using Machine Learning Algorithms: A Systematic Review

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ABSTRACT

Introduction: Coronary artery disease (CAD) is one of the principal causes of mortality in the contemporary industrialized world. Early detection and timely intervention can prevent a significant proportion of the complications associated with CAD, consequently reducing mortality. Machine learning (ML) methods represent cutting-edge technology that can be a suitable solution for diagnosing this disease. This systematic review was therefore conducted to diagnose CAD through artificial intelligence (AI) algorithms.

Search Strategy: A systematic review was conducted to identify relevant studies on AI and CAD. The search was conducted in electronic databases, including Web of Science, Cochrane, Scopus, and PubMed, using the keywords "artificial intelligence", "coronary artery disease", and "machine learning" from 2019 to 2024. A total of 3,088 studies were identified through the search method. A total of 15 studies were included in the review after a title and abstract screening according to the PRISMA checklist. These studies were conducted within the specified time frame and met the inclusion criteria. Furthermore, feasibility studies were excluded. The studies were subjected to evaluation using the Critical Appraisal Skills Programme (CASP) tool.

Results: After a comprehensive literature review, 15 articles were selected for inclusion in the study. The support vector machine (SVM), artificial neural network (ANN), and random forest were employed to predict CAD. The three algorithms yielded comparable results. Nevertheless, the SVM exhibited the highest accuracy compared to the other techniques. The accuracy of the SVM was calculated to be 89.73%. The ANN algorithm also demonstrated a high area under the curve, sensitivity, and accuracy, indicating an acceptable level of performance.

Conclusion and Discussion: The findings of this study demonstrate that ML algorithms can effectively be employed to accurately detect CAD. Consequently, physicians can provide timely preventive treatment to patients with CAD.

Keywords: Artificial intelligence, Coronary artery disease, Diagnosis, Machine learning