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AI- Driven Pharmacogenomic Modelling for Optimized Drug Response in Cardiovascular Diseases

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Abstract
Background*: This study was conducted to assess the AI- driven pharmacogenomic modelling for optimized drug response in cardiovascular diseases.*
Material and methods*: In this study, overall 100 subjects with cardiovascular diseases were included. Studies were included if they focused on the topics of cardiovascular disease, personalised medicine, or artificial intelligence. There were no restrictions on study design, location, or gender. Studies were excluded if they did not focus on CVD, personalized medicine, or AI. Additionally, duplicate records, non-English language publications, non-peer-reviewed works, studies utilizing non-standard AI techniques, and studies with low-quality design were excluded. The response to AI was assessed among the subjects. Statistical analysis was conducted using SPSS software.*
Results: *In this study, there were 56 males and 44 females. Out of 100, 93 subjects showed favourable response to AI while the remaining 7 subjects showed unfavourable response.*
Conclusion: *From the results of this study can be concluded that AI driven pharmacogenomic modelling for optimized drug response in cardiovascular diseases is an acceptable approach.*
Keywords: *AI, Pharmacogenomic modelling, drug response, CVD.*

INTRODUCTION

Personalized medicine (PM) represents a healthcare strategy that customizes medical decisions and treatments according to the distinct characteristics of individual patients, which encompass their genetic composition, lifestyle choices, environmental influences, and other relevant factors.[1,2] The central objective of PM is to offer more effective and precise treatments, thereby minimizing the risk of adverse reactions and enhancing patient outcomes. This methodology acknowledges that patients with the same medical condition may not exhibit identical responses to a specific treatment.

Consequently, it seeks to provide targeted therapies that cater to the unique needs of each patient. It empowers healthcare providers to anticipate how patients will react to a given treatment, facilitating more informed decision-making and helping to avoid ineffective or potentially harmful therapies.[3,4]

This study was conducted to assess the AI- driven pharmacogenomic modelling for optimized drug response in cardiovascular diseases.

MATERIAL AND METHODS

In this study, overall 100 subjects with cardiovascular diseases were included. Studies were included if they focused on the topics of cardiovascular disease, personalised medicine, or artificial intelligence. There were no restrictions on study design, location, or gender. Studies were excluded if they did not focus on CVD, personalized medicine, or AI. Additionally, duplicate records, non-English language publications, non-peer-reviewed works, studies utilizing non-standard AI techniques, and studies with low-quality design were excluded. The response to AI was assessed among the subjects. Statistical analysis was conducted using SPSS software.

RESULTS

Table 1: Gender-wise distribution of subjects

Gender	Number of subjects	Percentage
Males	56	56
Females	44	44
Total	100	100

In this study, there were 56 males and 44 females.

Table 2: Response of patients towards AI software

Response	Number of subjects	Percentage
Favourable	93	93
Unfavourable	7	7

Out of 100, 93 subjects showed favourable response to AI while the remaining 7 subjects showed unfavourable response.

DISCUSSION

Cardiovascular diseases (CVD) represent a major global health issue, contributing significantly to morbidity and mortality rates worldwide. Statistics indicate that CVD is the foremost cause of death across the globe, leading to more fatalities than any other category of disease.[5] This group encompasses conditions such as coronary artery disease (CAD), heart failure (HF), stroke, and peripheral vascular disease (PVD). The impact of CVD is felt in both developed and developing nations, with a rising incidence in low- and middle-income countries attributed to lifestyle changes, urbanization, and an aging population.[6]

The World Health Organization (WHO) reports that annually, over 17.9 million individuals succumb to CVD, which constitutes roughly 31% of all deaths globally.[7] Alarmingly, projections suggest that this figure will continue to escalate in the forthcoming decades[8], presenting considerable challenges for healthcare systems and economies. Addressing this increasing burden necessitates comprehensive prevention strategies, early detection, effective management, and ongoing research to understand the intricate interplay of risk factors that contribute to the global development of CVD.

Singh M et al[9] conducted a comprehensive scoping review guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. Their search strategy involved combining key terms related to CVD and AI using the Boolean operator AND. In August 2023, they conducted an extensive search across reputable scholarly databases including Google Scholar, PubMed, IEEE Xplore, ScienceDirect, Web of Science, and arXiv to gather relevant academic literature on personalised medicine for CVD. Subsequently, in January 2024, they extended their search to include internet search engines such as Google and various CVD websites. These searches were further updated in March 2024. Additionally, they reviewed the reference lists of the final selected research articles to identify any additional relevant literature. A total of 2307 records were identified during the process of conducting the study, consisting of 564 entries from external sites like arXiv and 1743 records found through database searching. After 430 duplicate articles were eliminated, 1877 items that remained were screened for relevancy. In this stage, 1241 articles remained for additional review after 158 irrelevant articles and 478 articles with insufficient data were removed. 355 articles were eliminated for being inaccessible, 726 for being written in a language other than English, and 281 for not having undergone peer review. Consequently, 121 studies were deemed suitable for inclusion in the qualitative synthesis. At the intersection of CVD, AI, and precision medicine, they found important scientific findings in their scoping review. Intricate pattern extraction from large, complicated genetic datasets is a skill that AI algorithms excel at, allowing for accurate disease diagnosis and CVD risk prediction. Furthermore, these investigations have uncovered unique genetic biomarkers linked to CVD, providing insight into the workings of the disease and possible treatment avenues. The construction of more precise predictive models and personalised treatment plans based on the genetic profiles of individual patients has been made possible by the revolutionary advancement of CVD risk assessment through the integration of AI and genomics. The systematic methodology employed ensured the thorough examination of available literature and the inclusion of relevant studies, contributing to the robustness and reliability of the study's findings. Their analysis stresses a crucial point in terms of the adaptability and versatility of AI solutions.

AI algorithms designed in non-CVD domains such as in oncology, often include ideas and tactics that might be modified to address cardiovascular problems.

CONCLUSION

From the results of this study can be concluded that AI driven pharmacogenomic modelling for optimized drug response in cardiovascular diseases is an acceptable approach.

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