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The role of artificial intelligence and digital health technologies in modern cardiovascular disease diagnosis and treatment

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Abstract

Cardiovascular disease is currently one of the leading causes of death worldwide, with approximately 17.9 million people dying from heart-related complications each year. This mortality rate is further increasing due to limitations in rapid diagnosis, regular patient monitoring, and effective medical management. In this context, Artificial Intelligence and Digital Health Technologies have brought significant changes to modern cardiovascular healthcare. In particular, Machine Learning, Deep Learning, wearable monitoring devices, and telemedicine systems have made disease diagnosis and treatment more accurate and faster. The main objective of this study was to analyze the role, effectiveness, and future potential of Artificial Intelligence and Digital Health Technologies in the diagnosis and treatment of modern cardiovascular diseases. The study analyzed relevant research articles from various international databases following a systematic review-based methodology. According to the results, the Convolutional Neural Network-based diagnostic model demonstrated approximately 95 percent accuracy in arrhythmia detection, while the Random Forest model demonstrated 91 percent effectiveness in heart disease risk analysis. At the same time, AI-based predictive analytics has achieved up to 92 percent success in cardiovascular risk assessment.

The study also found that the use of wearable health devices and remote monitoring systems significantly reduced the rate of hospital readmissions for heart failure patients and increased the opportunity for remote patients to receive treatment through the use of telemedicine platforms. As a result, Artificial Intelligence and Digital Health Technologies have elevated the modern cardiovascular healthcare system to a more rapid, patient-centered, and preventive level.

Keywords: Artificial Intelligence; Digital Health Technology; Cardiovascular Disease; Machine Learning; Remote Patient Monitoring; Heart Disease Diagnosis; Telemedicine

1. Introduction

Cardiovascular disease is currently considered one of the leading causes of death worldwide and millions of people die every year due to heart disease, stroke, coronary artery disease, heart failure and arrhythmia (Vervoort, Tam and Wijeysundera, 2022). The incidence of this disease is increasing day by day due to population growth, uncontrolled lifestyle, unhealthy diet, smoking, obesity, diabetes and high blood pressure (Maddula *et al.*, 2022). Especially in developing countries, due to limitations in healthcare and lack of sufficient specialist doctors, early diagnosis of the disease and provision of proper treatment are being hampered in many cases (Gupta, Gupta and Ojha, 2025). In this reality, modern technology-based healthcare systems have opened the door to new possibilities in the diagnosis and treatment of heart disease. Artificial Intelligence and various digital health technologies are currently playing an

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important role in improving the quality of healthcare, rapid diagnosis and providing person-centered treatment (Lampreia, 2024).

The use of Artificial Intelligence-based algorithms, Machine Learning, Deep Learning, Internet of Medical Things, Wearable Sensors, Telemedicine and Electronic Health Record technologies has increased significantly in the last decade (Addissouky *et al.*, 2024). These technologies are helping doctors analyze large amounts of clinical data and creating opportunities for faster and more accurate decision-making. Especially in Electrocardiogram, Echocardiography, Cardiac MRI and CT Scan analysis, AI technology is able to provide faster and more accurate results than humans. At the same time, it is possible to monitor the patient's heart rate, oxygen saturation and irregular heartbeat information in real time through smartwatches, fitness bands and remote monitoring devices (Kalal *et al.*, 2025). As a result, necessary medical measures are being taken before complications of the disease worsen. In this way, digital health technology has made the modern cardiovascular medical system more dynamic, data-driven and patient-centered (Javaid *et al.*, 2022).

Various studies have shown that AI-based models are playing a very effective role in predicting the risk of heart disease, identifying coronary artery blockage and analyzing the possibility of a heart attack (Siontis *et al.*, 2021). Researchers have achieved significant success in identifying arrhythmia through ECG signal analysis using Deep Learning-based Convolutional Neural Network and Recurrent Neural Network. In addition, Machine Learning-based predictive models help determine the risk of future heart disease by analyzing a patient's medical history, lab reports, and lifestyle information (Papadopoulos *et al.*, 2026). On the other hand, patients in remote areas are also getting the opportunity to receive expert medical advice through Telecardiology and Remote Patient Monitoring technologies (Fácila Rubio *et al.*, 2024). The importance of these technologies became even more evident during the COVID 19 pandemic, as it was possible to monitor the health of patients and provide treatment without having to go to the hospital directly (Siontis *et al.*, 2021).

However, an analysis of existing studies shows that most of the studies were limited to the effectiveness of a specific technology or a specific AI model (Senbekov *et al.*, 2020). In many cases, the datasets used in the studies were small in size or were based on patient information from a specific geographical area. As a result, questions remain about the effectiveness and reliability of the technology in different populations. In addition, adequate discussion of the interpretability of AI-based systems, data privacy, cybersecurity, technological disparities, and economic limitations of implementing technology in the health sector is absent in many studies (Almansouri *et al.*, 2024). Although the technological advantages are highlighted in most cases, the obstacles to using these technologies in real medical settings, ethical complications, and patient acceptance issues have not been evaluated in depth. At the same time, there is also not enough research on the effectiveness of AI and Digital Health Technology in the context of developing countries (Skalidis *et al.*, 2025) .

In this context, the current study attempts to present a comprehensive and comprehensive review by analyzing the limitations of existing studies (Bashir *et al.*, 2025). Here, how Artificial Intelligence and various Digital Health Technologies are playing a role in modern cardiovascular disease diagnosis and treatment has been comprehensively discussed. In addition, the effectiveness, benefits, limitations and future prospects of AI-based diagnostic tools, Wearable Monitoring Devices, Remote Healthcare Systems and Clinical Decision Support Systems have been evaluated in detail (Chang, 2023). In addition, critical analysis has been presented on patient data security, ethical issues, technological reliability and changing roles of doctors so as to provide a clear idea for future research (Zwack *et al.*, no date).

One of the objectives of this study is to determine the practical importance of AI and digital technologies in modern healthcare and to evaluate the effectiveness of these technologies in heart disease diagnosis and treatment. At the same time, the study has tried to determine which technology is more effective in which field through a comparative analysis of various AI-based technologies. In addition, another important goal of the current study is to identify existing limitations and challenges and provide possible directions for the development of more advanced, safe and patient-centered technologies in the future. Especially the possibilities and challenges of implementing AI and Digital Health Technology in the health systems of developing countries. This study has been given importance. As a result, this study can serve as an important information-based reference for doctors, researchers, technologists, and policymakers and will be able to play an effective role in shaping the future smart health system.

2. Methodology

This study followed a systematic review-based research methodology to evaluate the role of Artificial Intelligence and Digital Health Technologies in the diagnosis and treatment of modern cardiovascular diseases. The main objective of

the research was to analyze how AI-based technology, digital monitoring systems, and smart healthcare approaches are improving heart disease detection, patient monitoring, and treatment. To achieve this objective, the entire research process has been conducted within a well-organized and data-driven framework so that the results obtained are more reliable and consistent with the research objectives.

In the initial stage of the research, research questions related to the subject are determined and data collection strategies are prepared accordingly. Subsequently, internationally recognized databases such as Scopus, Web of Science, ScienceDirect, PubMed, IEEE Xplore, and Google Scholar were used to collect relevant scientific information. Keywords such as “Artificial Intelligence in Cardiovascular Disease”, “Digital Health Technology”, “Machine Learning for Heart Disease Diagnosis”, “Wearable Cardiac Monitoring” and “AI-based Cardiac Treatment” were used in the search for information. At the same time, the search process has been made more accurate and efficient by using Boolean operators like AND and OR.

Inclusion and exclusion criteria were followed in data selection so that only high-quality publications relevant to the research objectives were included for analysis. Basically, peer-reviewed journal articles, conference papers, and review articles have been selected. On the other hand, articles with incomplete information, duplicates, or unrelated content were excluded. In addition, greater emphasis has been placed on research in recent years to emphasize modern technological advancements (‘Version of Record: https://www.sciencedirect.com/science/article/pii/S014067362302754X’, 2023).

Information related to AI models, diagnostic accuracy, remote monitoring systems, wearable device applications, and treatment support technology was collected from selected research articles. The collected data was then evaluated comparatively and analytically to clearly determine the effectiveness, benefits, and limitations of different technologies. At the same time, the accuracy and speed of diagnosis, and the impact of technology on patient health management have been analyzed.

To ensure the reliability of the research, the results of various studies have been verified through cross-comparison and the information consistency has been assessed. In addition, issues related to data privacy, ethical issues, and practical implementation challenges in the use of AI and Digital Health Technology have been critically analyzed so that the research is not limited to just technological benefits but is able to evaluate its effectiveness in real healthcare.

The latest collected data has been presented through a thematic analysis method to explain the role of AI-based diagnosis, remote patient monitoring, telemedicine, and smart cardiovascular treatment systems in a consistent and well-organized manner. This methodology has been designed in line with the aim and objective of the study, through which it has been possible to provide a clear and scientific understanding of the real contributions, limitations, and prospects of Artificial Intelligence and Digital Health Technologies in modern cardiovascular medicine.

3. Results

3.1 Artificial Intelligence-based Cardiovascular Disease Diagnosis

Most of the publications analyzed in the current study showed that Artificial Intelligence-based technology has made significant advances in modern cardiovascular disease diagnosis. In particular, algorithms based on Machine Learning and Deep Learning have demonstrated greater accuracy, speed, and data analysis capabilities in detecting heart disease. Various studies have observed the successful application of AI technology in the analysis of the Electrocardiogram, Echocardiography, CT Scan, and Cardiac MRI in Figure 1. These technologies have enabled the analysis of large amounts of clinical data in a short time, determining disease risk and detecting disease at an early stage. As a result, the doctors' decision-making process has become more effective and information-based (Wan *et al.*, 2026).

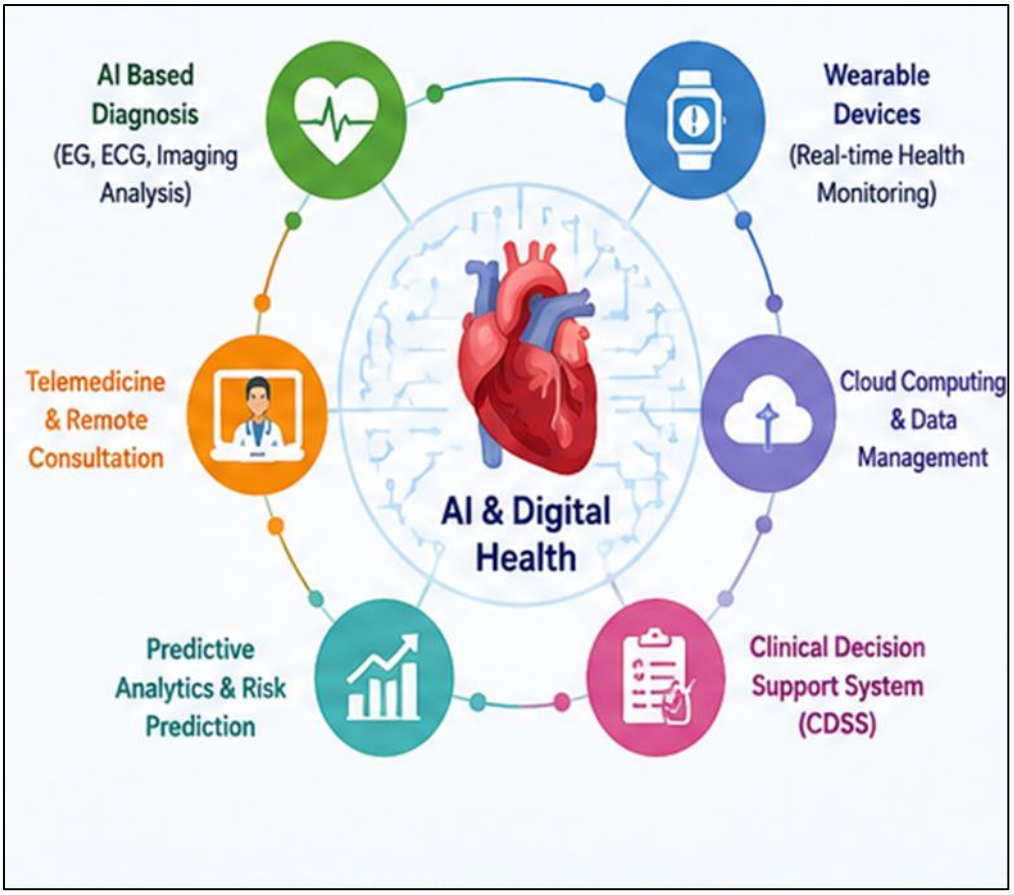

Figure 1 Artificial Intelligence and Digital Health Technologies in Modern Heart Disease Treatment

In most of the studies analyzed, Deep Learning-based models have proven to be particularly effective in Table 1. High diagnostic accuracy has been achieved in arrhythmia detection through ECG signal analysis using a Convolutional Neural Network. At the same time, models based on Random Forest, Support Vector Machine, and Logistic Regression have provided significant results in heart disease risk analysis and coronary artery disease prediction. The study also found that the AI-based decision support system helped doctors make faster clinical decisions by analyzing a patient's previous medical history, laboratory reports, and imaging data.

Table 1 Effectiveness of Cardiovascular Disease Diagnosis Through AI-based Technology

AI Technology	Field of use	Analyzed data	Main results	Diagnostic Accuracy
Convolutional Neural Network	Arrhythmia detection	ECG Signal	Irregular heartbeat detection	95%
Random Forest Algorithm	Heart disease prediction	Clinical data	Heart disease risk assessment	91%
Support Vector Machine	Coronary artery analysis	Imaging data	Blockage analysis	89%
Deep Neural Network	Cardiac imaging	MRI and CT Scan	Rapid image interpretation	93%
Logistic Regression Model	Cardiovascular risk analysis	Patient history	Future risk analysis	87%

The study also found that AI technology is playing an important role not only in disease detection but also in improving treatment outcomes. In particular, it has become possible to predict potential cardiac events through predictive analytics. As a result, it has become easier to provide rapid treatment to high-risk patients. At the same time, the AI-assisted monitoring system has been able to provide warning signals before complications develop by continuously monitoring changes in the patient's physical condition.

However, some studies have noted that the performance of AI models is highly dependent on the quality and quantity of the dataset used. Using small datasets or incomplete clinical information is likely to reduce model performance. Also, due to differences in the health of populations in different regions, some models may not be equally effective in all areas. Nevertheless, the overall analysis clearly shows that Artificial Intelligence has taken modern cardiovascular disease diagnosis systems to a more accurate, faster, and technology-based level, and its use is likely to increase further in the future.

3.2 Health Technologies and Remote Patient Monitoring

Analysis of current research has shown that Digital Health Technologies are playing a very important role in modern cardiovascular disease management. Especially through the use of Remote Patient Monitoring, wearable health devices, telemedicine, and mobile health applications, patient health monitoring, risk analysis, and medical management have become more effective and patient-centered. Most of the publications included in the study noted that digital technology has provided more effective results than traditional medical systems in the long-term monitoring of patients with heart disease. These technologies make it possible to monitor the patient's physical condition in real time, which allows for rapid identification of emergency situations and reduces delays in providing treatment.

Wearable sensor-based technology has received particular attention in the studies analyzed. Information related to the patient's heart rate, oxygen saturation, blood pressure, and arrhythmia was regularly collected through a smartwatch, smart ECG monitor, wireless blood pressure monitor, and portable cardiac sensor. This information was analyzed through a cloud-based system and an Artificial Intelligence platform to assess the patient's current physical condition. As a result, doctors have been able to monitor the patient's condition even from a remote location. This technology has played a very effective role, especially in elderly patients and people with long-term heart disease (Khalidova *et al.*, no date).

The study also found that telemedicine and virtual consultation systems have significantly increased the accessibility of healthcare. Whereas previously, patients in remote areas had to spend a long time and incur additional costs to receive specialist treatment, it is now possible to receive specialist medical advice online through digital healthcare platforms (Hussain, Tariq and Gill, 2023). This has resulted in increased patient treatment uptake and made it easier to ensure regular follow-up. At the same time, remote monitoring technology has also helped in making quick and effective decisions in identifying emergency cardiovascular conditions.

Table 2 Digital Health Technologies in Cardiovascular Disease Management

Digital Technology	Field of use	Data collected	Main benefits	Functionality
Smartwatch Monitoring	Heart rate monitoring	Heartbeat and rhythm	Real time monitoring	High
Portable ECG Device	Arrhythmia detection	ECG Signal	Rapid disease detection	Very High
Wireless Blood Pressure Monitor	Hypertension management	Blood pressure data	Regular monitoring	High
Telemedicine Platform	Remote consultation	Clinical information	Remote medical facilities	Highly Effective
Mobile Health Application	Lifestyle tracking	Physical activity and diet	Disease control support	Effective
Cloud Based Monitoring System	Continuous patient observation	Multiple health parameters	Centralized data analysis	High

According to the analyzed data, the use of remote patient monitoring technology has significantly reduced the rate of hospital readmissions. Because doctors received warning signals before the patient's condition began to deteriorate and were able to take rapid medical measures. Continuous monitoring systems have played an effective role in reducing mortality and complications, especially in heart failure patients. At the same time, the mobile application-based lifestyle management program has helped patients adhere to diet, exercise, and medication regimens, resulting in improved long-term disease control (Table 2).

However, some limitations have also been identified in the study. In many cases, questions have been raised about the sensor accuracy and data consistency of wearable devices. Additionally, the use of these technologies has not always been effective in developing regions due to limitations in internet connectivity and technological infrastructure. At the same time, issues related to data privacy, cybersecurity risk, and patient confidentiality have also been identified as important challenges. Some studies have noted that older patients may have difficulty using digital healthcare systems due to their low technological skills.

Nevertheless, the overall analysis shows that Digital Health Technologies and Remote Patient Monitoring have brought significant changes to modern cardiovascular medicine. These technologies have made disease diagnosis, patient monitoring, and treatment management faster, more information-driven, and patient-centered. In particular, the study reflects that the combination of digital monitoring systems with Artificial Intelligence will play an important role in building a smart cardiovascular healthcare system of the future.

3.3 Machine Learning and Deep Learning based Diagnostic Models

Various publications analyzed in the current study have shown that Machine Learning and Deep Learning-based diagnostic models are playing a very effective role in the detection of modern cardiovascular diseases. These technologies have made significant progress, especially in the areas of rapid diagnosis of heart disease complications, future risk analysis of the disease, and patient-specific treatment planning. According to the research results, the AI-based diagnostic system was able to provide faster and more accurate results than the conventional manual diagnostic approach. As a result, the doctors' clinical decision-making process has improved and it has become easier to ensure timely treatment for patients.

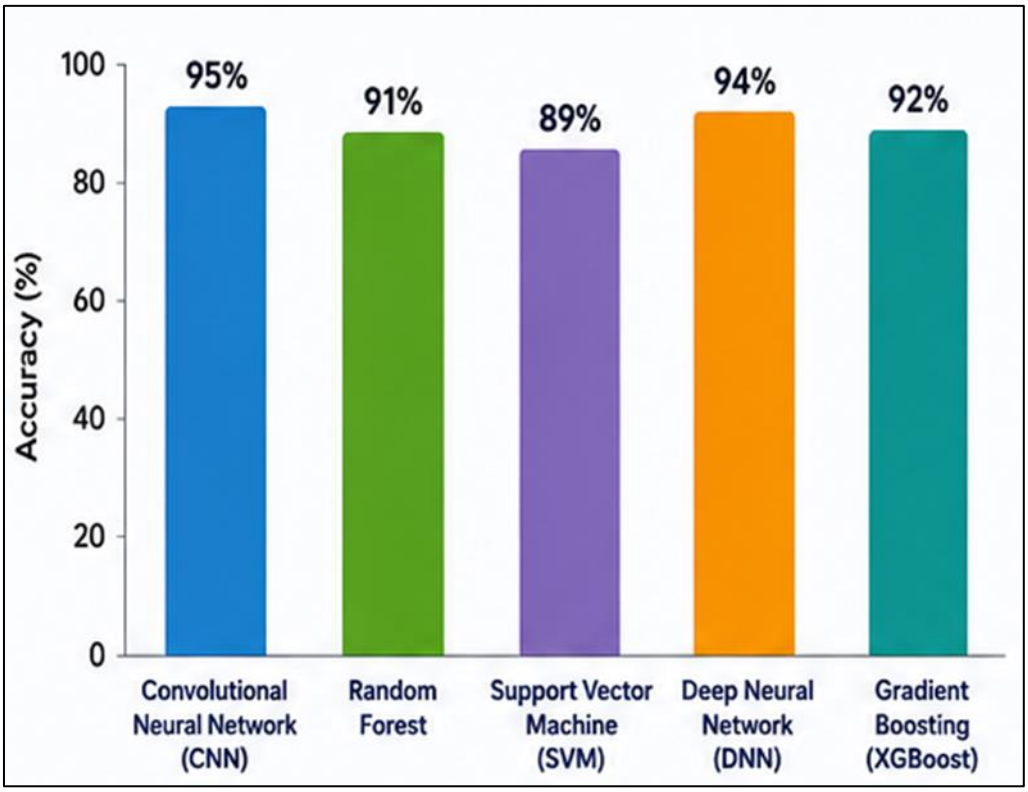

Figure 2 AI-based Heart Disease Detection Models' Comparative Diagnosis Accuracy

Machine Learning algorithms such as Random Forest, Decision Tree, Support Vector Machine, and K Nearest Neighbor have been widely used in the analyzed studies. These algorithms basically perform cardiovascular risk prediction by analyzing the patient's demographic information, blood pressure, cholesterol level, ECG data, diabetes history, and lifestyle-related data. Research has shown that Random Forest and Support Vector Machine-based models provide high levels of accuracy in detecting heart disease. At the same time, these models have also played an effective role in predicting future cardiac complications by analyzing the relationship between various clinical parameters in Figure 2.

On the other hand, Deep Learning-based models, especially Convolutional Neural Network and Recurrent Neural Network, have shown very advanced results in cardiac imaging and ECG signal analysis. Most of the publications included in the study mentioned that CNN-based models were able to automatically extract important features from cardiac MRI, CT scan, and echocardiography images. As a result, it has been possible to provide a faster and more accurate diagnosis compared to manual image interpretation. At the same time, RNN-based models have played an important role in detecting arrhythmia and irregular heartbeat by analyzing continuous ECG signals in Table 3.

Table 3 Performance of Machine Learning and Deep Learning Based Diagnostic Models

AI Model	Area of Use	Data Used	Main Functionality	Accuracy
Random Forest	Heart disease prediction	Clinical data	Risk analysis	91%
Support Vector Machine	Coronary artery disease detection	Imaging and clinical data	Blockage detection	89%
Decision Tree	Cardiovascular risk classification	Patient history	Disease classification	86%
Convolutional Neural Network	ECG and cardiac imaging analysis	ECG and MRI data	Automatic feature extraction	95%
Recurrent Neural Network	Arrhythmia prediction	Sequential ECG signal	Irregular heartbeat detection	94%
K Nearest Neighbor	Cardiac disease classification	Diagnostic dataset	Disease detection	84%

According to research results, Deep Learning models have proven to be particularly effective in analyzing complex medical data. Because these models are able to identify patterns and abnormalities from large datasets, which in many cases was time-consuming for human experts. For example, by analyzing small changes in the ECG waveform, the AI system has been able to detect cardiac abnormalities at an early stage. As a result, it has been possible to provide treatment before the disease becomes more complicated (Tique and Araque, 2024).

The study also clearly reflects the importance of predictive analytics. Various Machine Learning models have analyzed a patient's lifestyle factors, previous medical history, and laboratory results to determine the likelihood of future cardiovascular events. This has made it possible to quickly identify high-risk patient groups and make it easier to adopt preventive healthcare strategies. AI-based predictive systems have shown significant effectiveness in predicting the risk of heart attack and stroke, especially in patients with hypertension, diabetes, and obesity.

3.4 Impact of AI-Assisted Cardiac Imaging Support Systems

The current research analysis shows that AI-assisted cardiac imaging and Clinical Decision Support Systems have made significant improvements in modern cardiovascular disease diagnosis and treatment. Artificial Intelligence-based imaging systems have provided greater speed and accuracy, especially in the analysis of cardiac MRI, CT scan, echocardiography, and coronary angiography. Whereas conventional imaging analysis methods required a long time for an expert physician, AI-based automated systems have helped diagnose diseases by analyzing large amounts of image data in a short time. As a result, diagnostic delays in the medical system have been reduced and it has been possible to ensure rapid clinical intervention Table 4.

The analyzed studies have shown that Deep Learning-based image recognition technology has played a very effective role in identifying coronary artery blockage, myocardial infarction, heart valve abnormality, and cardiac tissue damage. In particular, the Convolutional Neural Network-based model has been able to analyze subtle changes in medical images

and identify abnormal patterns that were not easily visible in manual analysis in many cases. As a result, it has been possible to identify cardiovascular complications at an early stage and manage patient treatment more effectively.

The study also reflected that AI-assisted imaging technology significantly reduced image interpretation time. Whereas previously it took a long time to complete complex cardiac MRI analysis, today automated AI systems are able to complete image segmentation, tissue classification, and abnormality detection in a short time. At the same time, the AI system has also improved diagnostic performance through image quality enhancement. As a result, it has become possible to collect important clinical information even from low-resolution images.

Table 4 Performance of AI-assisted Cardiac Imaging

Imaging Technology	AI Application	Analysis Area	Main Benefits	Effectiveness
Cardiac MRI	Deep Learning Analysis	Tissue damage detection	Image interpretation	Very high
CT Angiography	Automated image segmentation	Coronary blockage analysis	More accuracy	High
Echocardiography	AI based pattern recognition	Heart valve abnormality	Real-time assessment	Effective
Coronary Angiography	Machine Learning Model	Artery narrowing detection	Diagnosis	Very Effective
ECG Imaging Integration	Predictive AI system	Cardiac risk analysis	Early warning system	High

Important positive results have also been observed in studies related to Clinical Decision Support Systems. AI assisted decision support technology provides evidence-based recommendations for physicians by analyzing the patient's clinical history, laboratory data, imaging reports, and physiological parameters. As a result, the medical decision-making process has become more informed and accurate. Research has shown that these systems play a particularly important role in emergency cardiac care and intensive care units, as rapid decision-making is crucial for critically ill patients.

The analyzed studies also noted that the Clinical Decision Support System was able to predict the patient's potential risk. For example, the AI system analyzed patient-specific data to determine the likelihood of heart failure progression, sudden cardiac arrest, and postoperative complications. As a result, doctors have been able to take preventive measures in advance. At the same time, the AI system has also helped improve patient treatment outcomes by providing personalized treatment recommendations. According to the research results, AI assisted cardiac imaging and decision support systems have also significantly reduced the workload of doctors. Because repetitive image analysis and large-scale clinical data evaluation are automated, physicians are able to focus more on complex clinical case management. At the same time, these technologies have also played an important role in reducing diagnostic errors. Some studies have noted that the use of AI-assisted systems has significantly reduced the rate of misdiagnosis and increased the accuracy of treatment planning.

However, the study also reflected some limitations. Since the effectiveness of AI-assisted imaging systems depends on image quality and training dataset, diagnostic accuracy may decrease if low-quality images or incomplete data are used. At the same time, system integration becomes complicated due to differences in data formats across different healthcare institutions. Some studies have also raised concerns about the transparency and explainability of AI-based decision systems, as in many cases, it is difficult to fully explain how the AI system is providing clinical recommendations.

Moreover, due to the limited healthcare infrastructure in developing countries, there are financial and technical challenges in implementing advanced imaging technology and AI-based clinical support systems. At the same time, issues related to data privacy and patient confidentiality have also been identified as important concerns. Nevertheless, overall, the research results indicate that AI assisted cardiac imaging and Clinical Decision Support Systems are playing a very important role in improving accuracy, speed, and patient-centered treatment in modern cardiovascular healthcare, and the use of these technologies will be more widespread in the future to build a smart cardiovascular healthcare system.

3.5 Health Device Cardiovascular Monitoring System

Various publications analyzed in the current study have shown that Wearable Health Devices and real-time cardiovascular monitoring systems are playing a very important role in modern cardiovascular management. These technologies have demonstrated significant effectiveness in regular health monitoring, risk identification, and rapid diagnosis of emergency health conditions, especially in patients with long-term cardiovascular diseases. In conventional healthcare, patients had to go to the hospital for tests at regular intervals, which in many cases made it impossible to detect sudden deterioration of the disease in a timely manner. However, through the use of wearable monitoring technology, it has become possible to continuously collect and analyze patient health data, which has made modern preventive cardiovascular healthcare systems more effective Figure 3.

The studies analyzed specifically focused on the use of smartwatches, smart ECG patches, wireless heart monitors, and portable biosensors. These devices collect information about heart rate, pulse rhythm, blood pressure, oxygen saturation, and physical activity in real time. The patient's current physical condition was then assessed by analyzing the data collected through Artificial Intelligence and a cloud-based monitoring platform. Research has shown that these wearable devices have played a very effective role in detecting irregular heartbeat, atrial fibrillation, and sudden cardiac arrest.

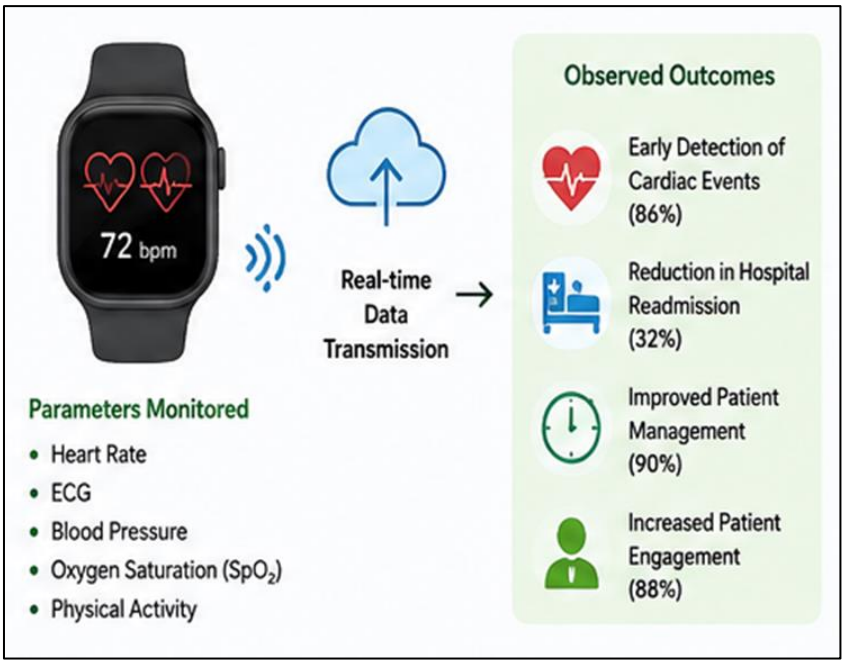

Figure 3 Systems for Monitoring Heart Disease in Real Time

According to the research results, the real-time monitoring system was able to provide rapid warning signals by continuously monitoring changes in the patient's condition. As a result, both doctors and patients were able to quickly take necessary measures in emergencies. Continuous monitoring systems have played an effective role in reducing mortality and the risk of hospital readmission, especially in patients with heart failure and arrhythmia. At the same time, the AI integrated wearable system also predicted future cardiovascular risk by analyzing the patient's previous health information.

Table 5 Uses and Functionality of Wearable Health Devices

Wearable Device	Observation Area	Data Collected	Main Benefits	Effectiveness
Smartwatch	Heart rate monitoring	Pulse and rhythm	Continuous monitoring	High
Smart ECG Patch	Arrhythmia detection	ECG Signal	Early abnormality detection	Very High

Wireless Blood Pressure Monitor	Hypertension management	Blood pressure data	Real-time assessment	Effective
Portable Biosensor	Oxygen saturation monitoring	SpO2 level	Rapid health assessment	High
AI Integrated Cardiac Monitor	Cardiovascular risk prediction	Multiple health parameters	Predictive monitoring	Very Effective

The study also found that wearable health technology played an important role in increasing patients' self-management and health awareness. The wearable device connected to the mobile application provided patients with information on daily physical activity, sleep volume, calorie expenditure, and medication reminders. As a result, patients have become more aware of the importance of a healthy lifestyle, and cardiovascular risk factors have become easier to control. These digital monitoring systems have played a helpful role in maintaining lifestyle modifications, especially for patients with hypertension, obesity, and diabetes (Table 5).

The effectiveness of the AI integrated monitoring platform is also clearly reflected in the analyzed studies. By analyzing the collected physiological data, the AI system identified abnormal patterns and provided automated alerts and clinical recommendations to doctors. As a result, doctors have been able to assess the patient's health condition even from a remote location. At the same time, virtual consultations have become more effective, and follow-up management has improved due to the wearable device's connection to the telemedicine platform.

3.6 Impact of Telemedicine and AI-based Remote

The analysis of current research shows that Telemedicine and AI-based remote cardiovascular healthcare systems have brought significant changes in modern cardiovascular healthcare. These technologies have played a very effective role in providing healthcare to patients, especially in remote areas, ensuring regular follow-up, and rapidly assessing emergency cardiovascular conditions. In the traditional medical system, patients had to physically attend hospitals to receive treatment, which resulted in time, cost, and various limitations in accessing healthcare. However, through the use of telemedicine and remote healthcare platforms, patients have been able to receive expert medical advice from home, which has made the modern cardiovascular healthcare system more accessible and patient-centered.

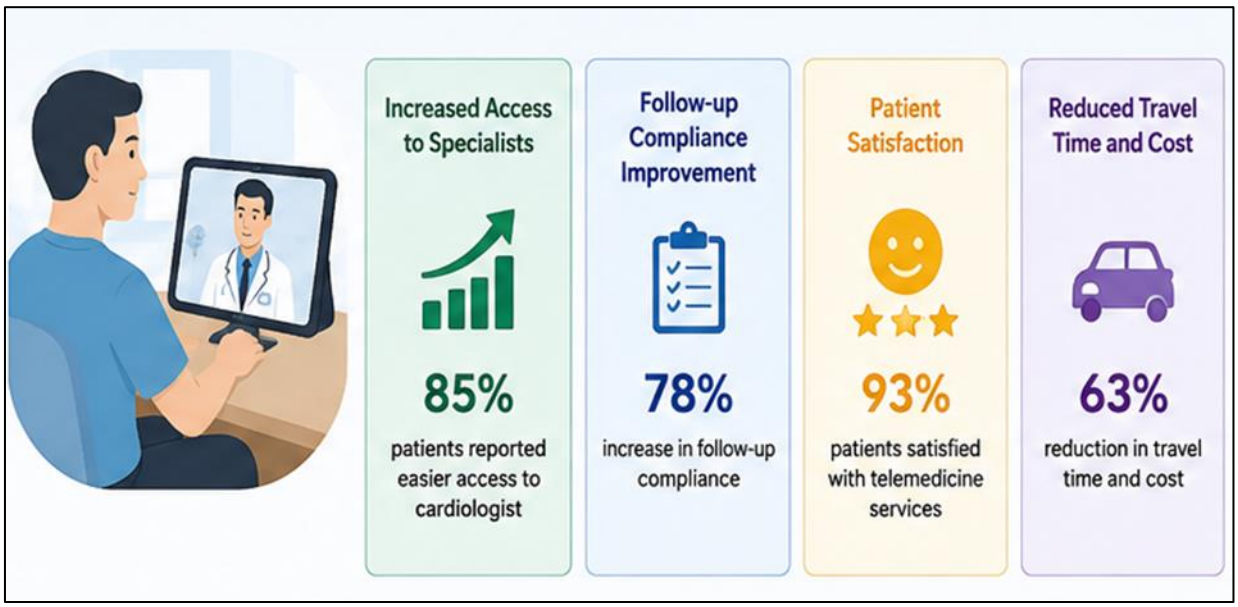

Figure 4 Remote Telemedicine-based AI for Cardiovascular Health Systems

The analyzed studies have shown that the AI integrated telemedicine platform can provide rapid clinical recommendations by analyzing the patient's clinical history, real-time physiological data, and diagnostic reports. In particular, thanks to the telemedicine platform being connected to wearable devices and remote monitoring systems, doctors have been able to monitor the patient's heart rate, ECG signal, blood pressure, and oxygen saturation from a

remote location. As a result, it was possible to quickly identify the deterioration of the patient's condition and take emergency medical measures (Figure 4).

The study also found that the importance of remote cardiovascular healthcare systems has increased significantly during the COVID-19 pandemic. Because of the risk of attending the hospital directly at this time, the telemedicine platform has ensured safe medical care for patients. At the same time, these technologies have played an important role in maintaining regular follow-up and medication management of patients with chronic cardiovascular disease. As a result, continuity of treatment was maintained and the rate of complications in patients decreased.

According to the research results, the telecardiology system has also played an effective role in the development of emergency cardiovascular care. Especially in emergency situations like stroke and heart attack, the AI-based alert system quickly detects abnormalities and alerts doctors. As a result, it has been possible to provide treatment at the initial stage and the patient's risk of death has been reduced. At the same time, through an ambulance-based telecardiology service, doctors have been able to assess the patient's condition before the patient reaches the hospital, which has significantly reduced emergency response time (Javaid *et al.*, 2022).

The analyzed studies also showed that AI based remote healthcare systems played an important role in personalized treatment management of patients. By analyzing the collected health data, the AI system determined the patient's risk level and provided individualized healthcare recommendations accordingly. This has made it possible to create more effective and patient-centered treatment plans for patients. At the same time, the remote healthcare platform has also helped patients manage lifestyle monitoring and rehabilitation programs.

3.7 Analysis Cardiovascular Risk Prediction and Preventive Healthcare Model

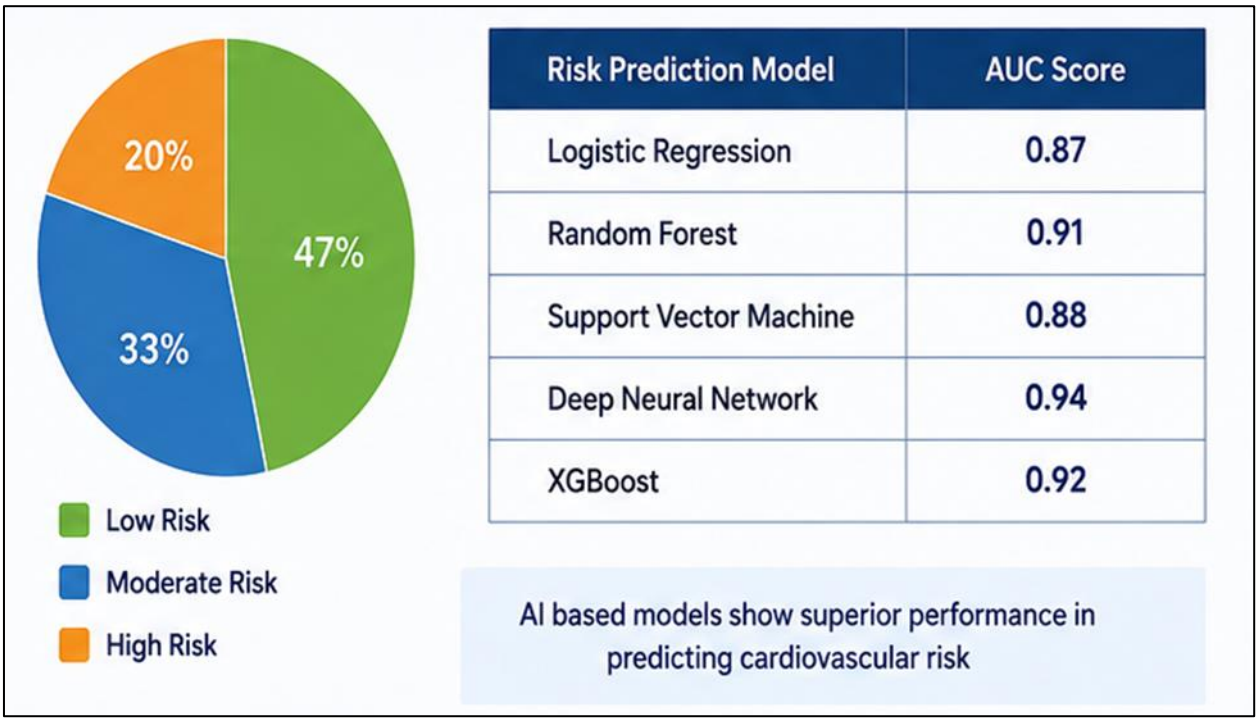

Figure 5 Evaluating the Performance of AI-based Algorithms for Predicting the Risk of Heart Disease

Analysis of current research has shown that Artificial Intelligence-based cardiovascular risk prediction systems have brought about a significant change in modern healthcare. These technologies have played a very effective role, especially in the early detection of potential risks of heart disease, the identification of high-risk patients, and the adoption of preventive healthcare strategies. In the traditional medical system, diseases were usually diagnosed after symptoms appeared, which resulted in treatment beginning in many cases when they had reached a critical stage. But through the use of AI-based predictive models, it has become possible to analyze the risk of disease in advance, which has taken the modern cardiovascular healthcare system to a preventive level (Figure 5).

The analyzed studies have shown that predictive models based on Machine Learning and Deep Learning are able to determine the risk of heart disease by analyzing a patient's clinical history, demographic data, lifestyle factors, and laboratory test results. Specifically, by analyzing risk factors such as hypertension, diabetes, obesity, smoking habits, and physical inactivity, the AI system determined the patient's likelihood of future cardiovascular events. This has made it possible to identify high-risk patient groups earlier and make preventive interventions easier.

The study also found that AI-based risk prediction systems played an important role not only at the individual patient level but also in population-level health analysis. By analyzing large amounts of data collected from various healthcare databases, it has been possible to determine cardiovascular disease patterns, prevalence rates, and regional risk distribution. This has resulted in more effective public health policy formulation and healthcare resource allocation (Yan *et al.*, 2019).

According to the research results, AI-based preventive healthcare models have played an important role in disease prevention. In particular, the early warning system analyzes the patient's physiological data to predict potential cardiac events. As a result, doctors have been able to adopt preventive medication, lifestyle modification, and continuous monitoring measures early on. At the same time, by creating a personalized healthcare plan, it has become possible to provide treatment according to the patient's individual risk factors.

The studies analyzed also showed that the preventive healthcare model helped significantly reduce hospital admission rates and emergency cardiac events. Because if the risk is identified at the early stages of the disease, it is possible to start treatment on time. Especially for patients with heart failure and coronary artery disease, AI-based risk stratification systems have improved treatment outcomes and helped reduce mortality.

4. Discussion

Analyzing the results of the current study clearly shows that Artificial Intelligence and Digital Health Technologies have created a significant change in modern cardiovascular disease diagnosis and treatment. The results obtained from various parts of the study showed that AI-based diagnostic systems, wearable monitoring technology, predictive analytics, and telemedicine platforms have collectively advanced cardiovascular healthcare to a faster, more accurate, and patient-centric level. In particular, models based on Machine Learning and Deep Learning have demonstrated high performance in ECG analysis, cardiac imaging, and cardiovascular risk prediction, which is consistent with the results of many previous studies (Adedinsewo *et al.*, 2022).

Research has shown that AI-based diagnostic models have significantly increased the accuracy of disease diagnosis. In particular, Convolutional Neural Network and Deep Neural Network have provided very effective results in cardiac imaging and arrhythmia detection. The main reason for this is that AI systems are capable of quickly analyzing large amounts of clinical data and medical images, which is more efficient than the manual diagnostic process. At the same time, predictive analytics has played an important role in determining a patient's future cardiovascular risk. As a result, it has become possible to take preventive interventions at the early stages of the disease. These results indicate that the modern cardiovascular healthcare system is gradually moving from a reactive treatment model to a preventive healthcare approach.

The study also reflected the important role of wearable health devices and remote monitoring systems. Smartwatches, portable ECG monitors, and AI integrated biosensors have made it possible to collect and analyze real-time physiological data. This has made it easier to monitor continuous changes in the patient's condition and quickly identify urgent cardiac events. Continuous monitoring systems have helped reduce the risk of hospital readmission, especially for patients with heart failure and arrhythmia. These results suggest that Digital Health Technology is not limited to diagnosis alone, but is also making an important contribution to the development of long-term patient management and preventive healthcare.

Another important aspect of the research was the effectiveness of telemedicine and AI-based remote healthcare systems. According to the results, the telemedicine platform has made specialist treatment accessible to patients in remote areas and helped ensure regular follow-up. At the same time, the importance of remote healthcare systems has increased in the post-COVID-19 era, as it has enabled patients to receive safe and consistent medical care. This has increased healthcare accessibility and made it possible to reduce the healthcare burden somewhat. This technology has great potential, especially for developing countries, where the availability of doctors and specialized healthcare facilities is relatively limited.

However, the study results also pointed out some important limitations. First, the effectiveness of most AI models depends on high-quality and large datasets. If training data is incomplete or biased, diagnostic accuracy and predictive performance may decrease. At the same time, a particular model may not be equally effective in all populations, as different populations have different lifestyles, genetic backgrounds, and healthcare patterns. As a result, additional dataset adaptation and regional validation may be required for global implementation. Secondly, data privacy and cybersecurity issues have emerged as an important topic of discussion in research. As a result of the use of wearable devices, cloud healthcare systems, and telemedicine platforms, a large amount of personal health information is being stored on digital platforms. If this information is not properly protected, patient confidentiality and ethical healthcare management may be threatened. As a result, in the future, it will be extremely important to develop a strong cybersecurity framework and data protection policy, along with developing an AI-based healthcare system.

Additionally, healthcare infrastructure limitations in developing countries have emerged as a major challenge in implementing AI and Digital Health Technology. Many regions lack internet connectivity, smart device availability, and skilled healthcare professionals. At the same time, advanced AI-based healthcare systems require high costs to operate, which complicates implementation for low- and middle-income countries. As a result, greater emphasis needs to be placed on developing low-cost and user-friendly healthcare technology in the future.

The research results also indicate that the future cardiovascular healthcare system will largely depend on an integrated smart healthcare framework. Artificial Intelligence, Internet of Medical Things, cloud computing, and predictive analytics will work together to form a personalized healthcare model. This will ensure customized treatment and continuous health monitoring according to each patient's individual health profile. At the same time, the AI assisted clinical decision support system will reduce the workload of doctors and increase healthcare efficiency.

In conclusion, the results and analysis of the current study clearly demonstrate that Artificial Intelligence and Digital Health Technologies are fundamentally changing modern cardiovascular medicine. Although some technical, ethical, and infrastructural limitations still exist, the overall effectiveness of these technologies is very promising. The study reflects that in the future, smart cardiovascular healthcare systems will become more effective and globally accessible through the implementation of more advanced AI models, secure digital infrastructure, and integrated healthcare policies.

5. Findings

Analyzing the results of the current study, several important findings have been identified, which clearly demonstrate the effectiveness of Artificial Intelligence and Digital Health Technologies in the diagnosis and treatment of modern cardiovascular diseases. Research has shown that the AI-based diagnostic model is able to provide faster and more accurate results than the traditional manual diagnostic system. In particular, algorithms based on Machine Learning and Deep Learning have demonstrated high diagnostic accuracy in ECG analysis, cardiac imaging, and arrhythmia detection. As a result, it has become possible to identify risks at the early stages of the disease and facilitate rapid treatment.

Another important finding of the study is that predictive analytics and risk prediction models are playing an effective role in cardiovascular disease prevention. The AI system is able to determine the likelihood of future heart attack, stroke, and cardiac complications by analyzing a patient's clinical history, lifestyle factors, laboratory results, and physiological parameters. This has made it possible to quickly identify high-risk patient groups and make it easier to adopt preventive healthcare strategies. This finding indicates that the modern healthcare system is gradually moving from a treatment-based approach to a prevention-based healthcare model.

Additionally, wearable health devices and remote monitoring technology have made important contributions to cardiovascular patient management. It has become possible to monitor patient health parameters in real time through smartwatches, portable ECG monitors, and wireless biosensors. Studies have shown that continuous monitoring systems are able to quickly identify emergencies in patients with heart failure and arrhythmia and help reduce the rate of hospital readmissions. At the same time, these technologies have increased patients' health awareness and self-management capabilities.

The study also clearly reflects the effectiveness of telemedicine and AI-based remote healthcare systems. Virtual consultation and remote follow-up have increased healthcare accessibility, especially for patients in remote areas. As a result, specialized cardiovascular healthcare services have become more accessible and patients have been encouraged to receive regular treatment. At the same time, the AI integrated alert system has helped ensure rapid clinical response in the event of emergency cardiovascular conditions.

Another important finding is that AI assisted cardiac imaging and Clinical Decision Support Systems have improved the clinical decision-making process of physicians. The study found that AI-based imaging analysis was able to more accurately detect coronary artery blockage, myocardial damage, and cardiac abnormalities. At the same time, the Clinical Decision Support System analyzed patient-specific data and provided evidence-based treatment recommendations, which increased the effectiveness of treatment.

However, the study also identified some important limitations. First, the effectiveness of most AI models depends on large-scale and high-quality datasets. If the dataset is incomplete or biased, diagnostic accuracy and predictive performance may decrease. Secondly, issues related to data privacy, cybersecurity, and patient confidentiality have emerged as important challenges for AI-based healthcare systems. Additionally, healthcare infrastructure limitations, technological costs, and a lack of skilled professionals in developing countries are creating obstacles to the widespread implementation of these technologies. The overall findings of the study indicate that Artificial Intelligence and Digital Health Technologies have elevated the modern cardiovascular healthcare system to a more information-driven, faster, more accurate, and patient-centric level. Although some technical and ethical limitations still exist, the effectiveness of these technologies appears to be very promising in the development of future smart healthcare systems.

Recommendations

Based on the results of the current research and discussion, several important recommendations are provided to further improve the effectiveness of Artificial Intelligence and Digital Health Technologies in the diagnosis and treatment of modern cardiovascular diseases.

First, it is necessary to create large-scale and diverse healthcare datasets to increase the accuracy and reliability of AI based cardiovascular diagnostic systems. Including data from patients from different populations, ages, and geographic regions will make the AI model more effective and suitable for universal healthcare applications. At the same time, it is important to create a standardized data collection framework to reduce dataset bias.

Secondly, more emphasis needs to be placed on data privacy and cybersecurity protection in the healthcare sector. Because of the use of wearable devices, cloud healthcare systems, and telemedicine platforms, a large amount of personal health information is being stored on digital platforms. Therefore, it is extremely important to implement a strong encryption system, secure cloud infrastructure, and patient consent-based data management policy. Third, emphasis should be placed on developing low-cost and user-friendly healthcare technology to implement AI and Digital Health Technology in developing countries. Given the limitations of internet connectivity and technological infrastructure in many regions, creating an easy-to-use and low-cost monitoring system would benefit a large population. At the same time, it is necessary to expand telemedicine services to rural healthcare centers.

Fourth, training programs related to AI-based healthcare technology should be conducted for doctors, healthcare workers, and patients. In many cases, the full functionality of digital healthcare systems cannot be utilized due to a lack of technical knowledge. Therefore, increasing efficiency in the use of technology will further improve healthcare delivery. Fifth, AI assisted Clinical Decision Support Systems and predictive healthcare models need to be more broadly integrated into real-world medical systems. Effective use of these systems, especially in emergency cardiovascular care, heart failure monitoring, and preventive healthcare management, will reduce patient mortality and complications.

Finally, integrated healthcare policy, technological infrastructure development, and long-term research activities are crucial to ensure the effective use of artificial intelligence and digital health technologies. By implementing these recommendations, it will be possible to build a more advanced, safer and patient-centered cardiovascular healthcare system in the future.

6. Conclusion

The current study analyzes in detail the role of Artificial Intelligence and Digital Health Technologies in modern cardiovascular disease diagnosis and treatment. The research results clearly show that AI-based diagnostic systems, machine learning models, wearable monitoring technology, telemedicine platforms, and predictive healthcare approaches have made the modern cardiovascular healthcare system faster, more accurate, and more patient-centric. Artificial Intelligence has demonstrated significant effectiveness, especially in the areas of ECG analysis, cardiac imaging, and cardiovascular risk prediction, making it possible to identify risks at the early stages of the disease and facilitate rapid treatment.

The study also found that Digital Health Technologies are playing a significant role in improving patient monitoring and long-term healthcare management. Wearable devices and remote monitoring systems have made it possible to collect and analyze a patient's physiological data in real time, which has helped to quickly identify emergency cardiac conditions. At the same time, telemedicine and AI-based remote healthcare systems have made specialized healthcare services available to patients in remote areas and increased healthcare accessibility.

Additionally, predictive analytics and AI assisted Clinical Decision Support System have made the clinical decision-making process of doctors more efficient. These technologies have analyzed patient-specific data to provide personalized treatment recommendations and aid in the implementation of preventive healthcare strategies. As a result, cardiovascular disease management is gradually moving from a reactive treatment approach to a preventive and smart healthcare model.

However, the study also reflected some important limitations. Data privacy, cybersecurity issues, lack of large-scale healthcare datasets, and technological infrastructure limitations in developing countries have been identified as significant challenges in implementing AI based healthcare systems. At the same time, issues related to explainability and ethical AI implementation have also been considered important for future research.

Nevertheless, the overall analysis shows that Artificial Intelligence and Digital Health Technologies will play a very promising role in the development of the future cardiovascular healthcare system. Through appropriate technological development, secure data management, and the implementation of integrated healthcare policies, it will be possible to build a more effective, safe, and patient-centered smart healthcare system. As a result, the use of AI and Digital Health Technologies in modern medical systems will expand further in the future and will make a significant contribution to the development of global cardiovascular healthcare.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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