

## International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

*IJCSMC, Vol. 3, Issue. 2, February 2014, pg.34 – 38*

### **RESEARCH ARTICLE**

# Decision Support System for Precluding Coronary Heart Disease (CHD)

**K. Cinetha<sup>1</sup>, Dr. P. Uma Maheswari<sup>2</sup>**

<sup>1</sup>P.G Scholar, Department of Computer Science and Engineering, Info Institute of Engineering Affiliated to Anna University, India

<sup>2</sup>Professor, Department of Computer Science and Engineering, Info Institute of Engineering Affiliated Anna University, India

<sup>1</sup>cinethak@gmail.com; <sup>2</sup>dr.umasundar@gmail.com

*Abstract— Cardiovascular diseases (CVD) remains the biggest cause of deaths worldwide and the Heart Disease Prediction at the early stage is importance. Coronary heart disease (CHD) is the leading cause of death for both men and women and accounts for approximately 600,000 deaths in the United States every year. To design a Decision support System for Precluding Coronary Heart Disease (CHD) risk of patient for the next ten-years for prevention. To assist medical practitioners to diagnose and predict the probable complications well in advance. Identifying the major risk factors of Coronary Heart Disease (CHD) categorizing the risk factors in an order which causes high damages such as high blood cholesterol, diabetes, smoking, poor diet, obesity, hyper tension, stress, etc. Data mining functionalities are used to identify the level of risk factors to help the patients in taking precautionary actions to stretch their life span. Primary prevention is recommended as promoting healthy lifestyle and habits through increased awareness and consciousness, to prevent development of any risk factors.*

*Keywords— Heart disease; Data mining; Coronary Heart Disease (CHD); Risk factors; Clustering*

## I. INTRODUCTION

Data mining is the process of finding previously unknown patterns and trends in databases and using that information to build predictive models. In healthcare, data mining is becoming increasingly popular, if not increasingly essential. Healthcare industry today generates large amount of complex data about patients, hospitals resources, disease diagnosis, electronic patient records, medical devices, etc. The large amount of data is a key resource to be processed and analysed for knowledge extraction that enables support for cost-savings and decision making. Data mining provides a set of tools and techniques that can be applied to this processed data to discover hidden patterns and also provides healthcare professionals an additional source of knowledge for making decisions.

Coronary heart disease (CHD) can be caused due to risk factors like high blood pressure, high blood cholesterol, tobacco use, obesity, unhealthy diet, physical inactivity, diabetes, advancing age, inherited disposition. Coronary heart disease (CHD) is the narrowing or blockage of the coronary arteries, usually caused by atherosclerosis. Atherosclerosis (sometimes called “hardening” or

“clogging” of the arteries) is the build-up of cholesterol and fatty deposits (called plaques) on the inner walls of the arteries. These plaques can restrict blood flow to the heart muscle by physically clogging the artery or by causing abnormal artery tone and function.

Without an adequate blood supply, the heart becomes starved of oxygen and the vital nutrients it needs to work properly. This can cause chest pain called angina. If blood supply to a portion of the heart muscle is cut off entirely, or if the energy demands of the heart become much greater than its blood supply, a heart attack (injury to the heart muscle) may occur. Coronary heart disease (CHD) is the leading cause of death for both men and women and accounts for approximately 600,000 deaths in the United States every year.

It is most commonly equated with atherosclerotic coronary artery disease, but coronary disease can be due to other causes, such as coronary vasospasm, where the stenosis to be caused by spasm of the blood vessels of the heart it is then usually called Prinzmetal's angina. In figure-1, shows Coronary heart disease (CHD) is epidemic in India and one of the major causes of disease-burden and deaths. the leading cause of death worldwide. Previously thought to affect primarily high-income countries, CHD now leads to more death and disability in low- and middle-income countries, such as India, with rates that are increasing disproportionately compared to high-income countries. CHD affects people at younger ages in low- and middle-income countries, compared to high-income countries, thereby having a greater economic impact on low- and middle-income countries. Effective screening, evaluation, and management strategies for CHD are well established in high-income countries, but these strategies have not been fully implemented in India.

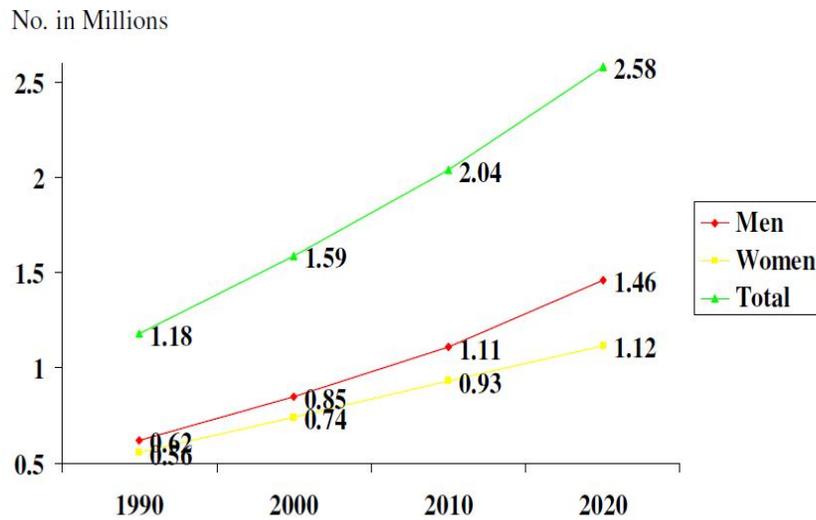


Figure -1 Projections for Coronary Heart Disease (CHD) Mortality in India.

The World Health Statistics 2012 report enlightens the fact that one in three adults worldwide has raised blood pressure – a condition that causes around half of all deaths from stroke and heart disease. Heart disease, also known as cardiovascular disease (CVD), encloses a number of conditions that influence the heart – not just heart attacks. Heart disease also includes functional problems of the heart such as heart-valve abnormalities or irregular heart rhythms. These problems can lead to heart failure, arrhythmias and a host of other problems. Effective and efficient automated heart disease prediction systems can be beneficial in healthcare sector for heart disease prediction.

Prediction involves using some variables or fields in the database to predict unknown or future values of other variables of interest. Description focuses on finding human interpretable patterns describing the data. Data Mining has potential applications in several fields, not the least of which is Health Care. The primary purpose of the Data Mining is to help determine trends in patient records to improve Health Care.

## II. LITERATURE REVIEW

Chaitrali S. *et al*. [16] developed a Heart disease prediction system (HDPS) using data mining and artificial neural network (ANN) technique. From the ANN, a multilayer perception neural network along with back propagation algorithm is used to develop the system. Because MLPNN model proves the better results and helps the domain experts and even person related with the field to

plan for a better diagnose and provide the patient with early diagnosis results as it performs realistically well even without retraining. The experimental result shows that using neural networks the system predicts Heart disease with nearly 100% accuracy.

Srinivas K. et al. [7] developed different algorithms for predicting combinations of several target attributes for heart diseases. In this paper, they have automated and effective heart attack prediction methods using data mining techniques. Other data mining techniques, Time Series, Clustering and Association Rules are also can be used to analyse patients behaviour. Time series modelling can be used design the false alarm rate in the predictions. All these models could answer complex queries in predicting heart attack. This can further enhanced and expanded. For predicting heart attack significantly 15 attributes are listed in medical literature. Besides this list, they have to incorporate other attributes which will effect on results such as financial status, stress, pollution and previous medical history. Other data mining techniques, Time Series, Clustering and Association Rules are also can be used to analyse patients behaviour. Time series modelling can be used design the false alarm rate in the predictions.

Rajalaxmi R et al. [6] designed prediction of various sort of metabolic syndromes and hence various sorts of diseases can be discovered using data mining techniques. As a result, the causes and the symptoms related to each event will be made in accordance with the record related to each patient and thereby CHD can be reduced to a great extent.

Sulabha S. et al. [5] developed a system to predict more accurately the presence of heart disease. In this paper, three data mining classification techniques were applied namely Decision trees, Naive Bayes & Neural Networks. From results it has been seen that Neural Networks provides accurate results as compare to Decision trees & Naive Bayes.

Bahadur Patel et al. [3] designed a system to identify the chances of a coronary heart disease. They have divided all parameters in two levels according to criticality and each level is assigned separate weight age. Finally both levels are considered to derive a final decision. They have implemented neuro-fuzzy integrated approach at two levels. So, error rate is very low and work efficiency is high. In this paper, they have performed the analysis for coronary heart disease.

Heon Gyu Lee et al. [4] projected the HRV indexes developed in this study showed consistent result for analysing linear and nonlinear features. Also, the HRV features can be used to classify the patients with CAD from heart healthy people. For classification, we employed the proposed various features allowing us to choose a classifier from a large pool of well studied classification methods. They suggest the possibility that multi-parametric features, taking into consideration all the whole possible features of HRV as a diagnostic supplementary tool, may be helpful in making a diagnosis of cardiovascular disease. Last, they considered several supervised methods including extended Bayesian classifiers, C4.5, MDA, CMAR, and the SVM. In our experimental results, CPAR and the SVM outperformed the other classification methods.

Aqueel Ahmed et al. [18] proposed the classification techniques in data mining and shows the performance of classification among them. In this classification accuracy among these data mining techniques has discussed. The result shows the difference in error rates. However there are relatively differences in different techniques. Decision tree and SVM perform classification more accurately than the other methods. Data mining application in heart disease prediction using data mining technique shows the 92.1 % 91.0 % accuracy for the heart disease. They suggest that the age, sex, chest pain, blood pressure, personnel history, previous history, cholesterol, fasting blood sugar, resting ECG, Maximum heart rate, slope, etc. that may be used as reliable indicators to predict presence of heart disease. They also suggest that data should be explored and must be verified from the team of heart disease specialist doctors.

Nidhi Bhatla et al. [9] projected the study of different data mining techniques that can be employed in automated heart disease prediction systems. Various techniques and data mining classifiers are defined in this work which has emerged in recent years for efficient and effective heart disease diagnosis. The analysis shows that Neural Network with 15 attributes has shown the highest accuracy i.e. 100% so far. On the other hand, Decision Tree has also performed well with 99.62% accuracy by using 15 attributes. Moreover, in combination with Genetic Algorithm and 6 attributes, Decision Tree has shown 99.2% efficiency.

Chitra R. et al. [10] developed the computer aided heart disease prediction system that helps the physician as a tool for heart disease diagnosis. Some Heart Disease classification system is reviewed in this paper. From the analysis it is concluded that, data mining plays a major role in heart disease classification. Neural Network with offline training is a good for disease prediction in early stage and the good performance of the system can be obtained by pre-processed and normalized dataset. The classification accuracy can be improved by reduction in features.

Yosawin Kangwanariyakul *et al*. [11] projected the comparative analysis of prediction model for IHD identification by using three algorithms of neural network and three kernels of support vector machine. The 125 cases were randomly separated into 74 cases for training set and 51 cases for testing set. In order to optimize the neural network structure, they used a 10- fold cross-validation on training set. The optimal parameters of neural network was determined by averaging the values from 10 runs. Comparison of the prediction performance of IHD identification was performed using three neural network algorithms and three support vector machine kernels as applied on the 51 cases of testing sets. The result shows that BPNN and BNN gave the highest classification accuracy of 78.43 %, while RBF kernel SVM gave the lowest classification accuracy of 60.78 %. BNN presented the best sensitivity of 96.55 % and RBF kernel SVM displayed the lowest sensitivity of 41.38 %. Both polynomial kernel SVM and RBF kernel SVM presented the minimum and maximum specificity of 45.45 % and 86.36 %, respectively.

Mai Shouman *et al*. [12] projected the data mining techniques to help health care professionals in the diagnosis of heart disease is having some success, the use of data mining techniques to identify a suitable treatment for heart disease patients has received less attention. Hybrid data mining techniques has shown promising results in the diagnosis of heart disease, so applying hybrid data mining techniques in selecting the suitable treatment for heart disease patients needs further investigation. This paper identifies gaps the research on heart disease diagnosis and treatment and proposes a model to systematically close those gaps to discover if applying data mining techniques to heart disease treatment data can provide as reliable performance as that achieved in diagnosing heart disease patients.

### III. PROPOSED SYSTEM

The proposed system is to build the Decision Support System for precluding Coronary Heart Disease (CHD) using data mining techniques to identify the level of risk in coronary heart diseases. Coronary heart disease can be caused due to risk factors like high blood pressure, high blood cholesterol, tobacco use, obesity, unhealthy diet, physical inactivity, diabetes, advancing age, inherited disposition. This system helps the patients in take precautionary actions to stretch their life span and to assist medical practitioners to diagnose and predict the probable complications well in advance. Identifying the major risk factors of CHD categorizing the risk factors in an order which causes high damages such as high blood cholesterol, diabetes, smoking, poor diet, obesity, hyper tension, stress, etc.

Primary prevention is recommended as promoting healthy lifestyle and habits through increased awareness and consciousness, to prevent development of any risk factors. This system which predicts the possibility of heart disease risk of patient for the next ten-years for prevention using clustering algorithm. To assist medical practitioners to diagnose and predict the probable complications well in advance.

### IV. CONCLUSIONS

Cardiovascular diseases remain the biggest cause of deaths worldwide especially in India. Cardiovascular diseases are the largest cause of mortality, accounting for around half of all deaths resulting from NCDs. Overall, CVDs accounted for around one-fourth of all deaths in India in 2008. CVDs are expected to be the fastest growing chronic illnesses between 2005 and 2015, growing at 9.2% annually, and accounting for the second largest number of NCD patients after mental illnesses. A more worrying fact is that the incidences of CVDs have gone up significantly for people between the ages 25 and 69 to 24.8%, which means we are losing more productive people to these diseases. In existing system, the treatments for coronary heart diseases are taken place only after the symptoms of coronary heart diseases occurred. The major risk factors of Coronary Heart diseases Categorizing the risk factors in an order which causes high damages such as high blood cholesterol, diabetes, smoking, poor diet, obesity, hyper tension, stress, etc.

We plan to prevent development of any risk factors parameters a decision support system for Coronary Heart disease (CHD) which predicts the possibility of heart disease risk of patients for next ten-years prevention. To help the patients in taking precautionary actions to stretch their life span. To assist medical practitioners to diagnose and predict the probable complications well in advance. Primary prevention is recommended as promoting healthy lifestyle and habits through increased awareness and consciousness, to prevent development of any risk factors, system which predicts the possibility of heart disease risk for prevention.

### REFERENCES

- [1] Allahverdi N, Torun S and Saritas I, "Design of a Fuzzy Expert System for Determination of Coronary Heart Disease Risk and Technologies," Computer Systems and Technologies 2006, Veliko Turnovo, 14-15 June 2007.
- [2] Burch P R J, "Coronary Disease: Risk Factors, Age, and Time," American Heart Journal, Vol. 97, No. 4, 1979, pp. 415-419. doi:10.1016/0002-8703(79)90385-5, 2012.

- [3] Bahadur Patel, Ashish Kumar Sen D P, Shamsheer Shukla, "A Data Mining Technique for Prediction of Coronary Heart Disease Using Neuro-Fuzzy Integrated Approach Two Level", International Journal Of Engineering And Computer Science ISSN:2319-7242, Page No. 2663-2671, Volume 2 Issue 9 Sept., 2013.
- [4] Heon Gyu Lee, Ki Yong Noh, and Keun Ho Ryu, "A Data Mining Approach for Coronary Heart Disease Prediction using HRV Features and Carotid Arterial Wall Thickness", International Conference on Bio Medical Engineering and Informatics, 2008.
- [5] Sulabha S. Apte, "Improved Study of Heart Disease Prediction System using Data Mining Classification Techniques", International Journal of Computer Applications (0975 – 888) Volume 47– No.10, June 2012.
- [6] Rajalaxmi R R, "A Data mining Model for predicting the Coronary Heart Disease using Random Forest Classifier", International Conference on Recent Trends in Computational Methods, Communication and Controls (ICON3C 2012) International Journal of Computer Applications (IJCA), 2012.
- [7] Srinivas K, Raghavendra Rao R, Govardhan A, "Analysis of Coronary Heart Disease and Prediction of Heart Attack in Coal Mining Regions Using Data Mining Techniques", The 5th International Conference on Computer Science & Education Hefei, China. August 24–27, 2010.
- [8] Aqueel Ahmed, Shaikh Abdul Hannan, "Data Mining Techniques to Find Out Heart Diseases", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-1, Issue-4, September 2012.
- [9] Nidhi Bhatla and Kiran Jyoti, "An Analysis of Heart Disease Prediction using Different Data Mining Techniques", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 1 Issue 8, October - 2012.
- [10] Chitra R and Seenivasagam V, "REVIEW OF HEART DISEASE PREDICTION SYSTEM USING DATA MINING AND HYBRID INTELLIGENT TECHNIQUES", ISSN: 2229-6956(ONLINE) ICTACT JOURNAL ON SOFT COMPUTING, JULY 2013, VOLUME: 03, ISSUE: 04, 2013.
- [11] Yosawin Kangwanariyakul, Chanin Nantasenamat, Tanawut Tantimongcolwat, Thanakorn Naenna, "DATA MINING OF MAGNETOCARDIOGRAMS FOR PREDICTION OF ISCHEMIC HEART DISEASE", EXCLI Journal 2010;9:82-95 – ISSN 1611-2156, published: July 30, 2010.
- [12] Mai Shouman, Tim Turner, Rob Stocker, "USING DATA MINING TECHNIQUES IN HEART DISEASE DIAGNOSIS AND TREATMENT", 978-1-4673-0483-2-c 2012 IEEE, 2012.
- [13] Alberto Porta, Giuseppe Baselli, Stefano Guzzetti, Massimo Pagani, Alberto Malliani, and Sergio Cerutti, Senior Member, "Prediction of Short Cardiovascular Variability Signals Based on Conditional Distribution", 2010, IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 47, NO. 12, DECEMBER 2000.
- [14] Tuan D. Pham, Stephen T. C. Wong, "Computational Prediction Models for Early Detection of Risk of Cardiovascular Events Using Mass Spectrometry Data", IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 12, NO. 5, SEPTEMBER 2008.
- [15] Nurul Hikmah Kamaruddin, M.Murugappan, Mohammad Iqbal Omar, "Early Prediction of Cardiovascular Diseases Using ECG signal: Review", IEEE 2012.
- [16] Chaitrali S. Dangare, Sulabha S. Apte, "A DATA MINING APPROACH FOR PREDICTION OF HEART DISEASE USING NEURAL NETWORKS", INTERNATIONAL JOURNAL OF COMPUTER ENGINEERING & TECHNOLOGY(IJCET), ISSN 0976 – 6367, Volume 3, Issue 3, October - December (2012), pp. 30-40, 2012.
- [17] Novruz ALLAHVERDI, Serhat TORUN, Ismail SARITAS "DESIGN OF A FUZZY EXPERT SYSTEM FOR DETERMINATION OF CORONARY HEART DISEASE RISK", International Conference on Computer Systems and Technologies - CompSysTech'07, 2007.
- [18] Rajeswari K, Vaithyanathan V and Amirtharaj P, "A Novel Risk Level Classification of Ischemic Heart Disease using Artificial Neural Network Technique – An Indian Case Study", International Journal of Machine Learning and Computing, Vol. 1, No. 3, August 2011.
- [19] Persi Pamela I , Gayathri P and Jaisankar N, "A Fuzzy Optimization Technique for the Prediction of Coronary Heart Disease Using Decision Tree", International Journal of Engineering and Technology (IJET), 2013.
- [20] Rajeswari K, Vaithyanathan V, "Fuzzy based modeling for diabetic diagnostic decision support using Artificial Neural Network", IJCSNS International Journal of Computer Science and Network Security, VOL.11 No.4, April 2011