

Analyzing Risk Factors that are Reasons for Heart Disease

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Abstract: *This study analyses the various risk factors that contribute to heart disease, one of the leading causes of death worldwide. It focuses on identifying both modifiable factors—such as lifestyle habits, diet, smoking, and physical inactivity—and non-modifiable factors like age, gender, and family history. The research is based on data collected from 271 patients at Jayadeva Hospital, Bengaluru, and analysed using Power BI to interpret demographic and clinical patterns. Through statistical and descriptive analysis, the study evaluates how this risk factors influence the likelihood of developing heart disease. The findings highlight that age, blood pressure, chest pain type, ECG results, and maximum heart rate play a significant role in determining risk levels. The study emphasizes the importance of early detection, preventive healthcare, and lifestyle modification to reduce the incidence of heart disease and supports the need for targeted public health interventions and awareness programs.*

Keywords: *Heart Disease, Risk Factors, Cardiovascular Health, Lifestyle Factors, Age and Gender, Blood Pressure, Cholesterol, ECG Analysis, Preventive Healthcare, Public Health, Power BI, Data Analysis*

I. INTRODUCTION

Heart disease, encompassing a range of cardiovascular conditions, remains one among the main reasons for mortality worldwide. Despite significant advances in medical science, the frequency of cardiac disorders continues to pose a substantial public health challenge. It is essential to comprehend the causes of heart disease in order to create preventative and therapeutic plans that work. The identification and examination of risk variables that facilitate the formation and development of heart disease are essential to this knowledge. Cardiovascular disease has become more expensive grown significantly over the past decades, affecting millions of individuals globally and placing a substantial strain on healthcare systems.

Despite advances in medical studies further options, the regularity of cardiac disease continues to rise, underscoring the necessity of a deeper understanding of its underlying causes. There are two categories of heart disease risk factors, modifiable and non-modifiable. Modifiable risk factors are lifestyle choices that may be changed, such as eating poorly, exercising infrequently, smoking, or drinking too much alcohol to decrease the incidence of heart disease, these factors are crucial objectives for public health initiatives. Non-modifiable risk factors include things like age, gender, and family history, and genetic predisposition, which cannot be changed but can inform personalized risk assessment and management strategies. In addition, recent studies have revealed that importance of psychological factors, such as stress and depression, and their potential link to heart disease. Furthermore, comorbid diseases like obesity, diabetes, and hypertension greatly raise the chance of getting heart disease and frequently compound it by combining with other risk factors. The complication of heart disease etiology necessitates a comprehensive approach to identifying and analyzing risk factors. This entails identifying specific risk factors as well as understanding their interactions and cumulative effects on cardiovascular health. Improving heart disease risk prediction algorithms is the study's ultimate objective, provide a basis effective prevention strategy.



II. REVIEW OF LITERATURE

Lloyd-Jones, D. M., Hong, Y., Labarthe, D., et al. (2010): The research study "Defining and Setting National Goals for Cardiovascular Health Promotion and Disease Reduction" conducted a literature review, 'The American Heart Association's Strategic Impact Goal Through 2020 and Beyond,' by Lloyd-Jones et al. (2010) describes the organization's strategic objectives for enhancing cardiovascular health. The study highlights how critical it is to address major hazard those are changeable, such obesity, inadequate diet, and inactivity, and smoking. It establishes goals for controlling blood sugar, raising cholesterol and elevated blood pressure levels, and other cardiovascular health measures. The study promotes a comprehensive strategy to lower the incidence and cardiac disease's consequences that combines individual and population-level tactics.

Wilson, P. W., D'Agostino, R. B., Levy, D., et al. (2013) titled "Prediction of utilizing risk factor categories for coronary heart disease" examines the effectiveness of different types of risk variables in predicting cardiac heart disease (CHD). The study utilized data from the Heart Study in Framingham to develop a risk prediction model based on possibility factors like age group, gender, blood pressure, cholesterol levels, and smoking status. The risk factors discovered by the authors could be categorized into specific groups to approximate the likelihood of CHD more accurately. The study's model helps in stratifying patients based on their risk levels, guiding preventive strategies.

Nichols, M., Townsend, N., Scarborough, P., et al. (2014). "Cardiovascular disease in Europe: epidemiological update." European Heart Journal. This study provides an epidemiological update on cardiovascular disease (CVD) in Europe, highlighting its continued impact as a leading cause of death and disease incidence. It examines trends in CVD incidence and mortality, emphasizing the progress in prevention and treatment. The paper discusses variations across European countries, noting improvements in outcomes due to better management of risk factors and healthcare advancements. However, it also underscores ongoing challenges, including more effective healthcare programs are necessary to reduce inequities and stop the growing prevalence of heart disease.

Haffner, S. M., Lehto, S., Rönkämaa, T., et al. (2016). Individuals with type 2 diabetes and those without diabetes who have already experienced myocardial infarctions die from coronary heart disease. The New England Journal of Medicine has published an important study paper. Through comparisons between those with and without type 2 diabetes, it looks at the death rate from coronary heart disease (CHD). Heart attacks are considerably more common cause of death for those with type 2 diabetes than for those without the condition. Their prior history of heart attacks is relevant. According to a study, type 2 diabetes poses a major risk to heart health. Managing diabetes well is super important. It can help lower the chances of dying from CHD. The findings make it clear

□ Berenson, G. S., Srinivasan, S. R., Bao, W., et al. (2018). "Atherosclerosis in adolescents and young adults is associated with multiple cardiovascular risk factors." It was published in the New England Journal of Medicine that research looks at how different heart health risks affect kids & young people. To exposure to things like high blood pressure, high cholesterol and being overweight can lead to a problem called atherosclerosis. That's when plaque builds up in your arteries Not good. These results show us why it's key to tackle heart health risks early on. The study really points out how important it is to start acting early with preventive steps. This way, we can lower the risk of heart troubles later in life.

Mendis, S., Puska, P., Norrving, B., & others (2011) created a great resource called "Global Network on Prevention and Control of Cardiovascular Disease." The World Health Organization released this book talks a lot about how we can fight cardiovascular disease (CVD) all over the world. It really shows us how big of a problem C is and what we can do about it. There's a lot of useful information on public health steps that can help. The report says we need to look at many angles to make things better. This means improving healthcare systems, putting preventive steps into action, & encouraging people to live healthy lives. Also, it points out the importance of sharing resources globally to help lower the number of people with CVD. It's a team effort.

Manson, J. E., Colditz, G. A., Stampfer, M. J., et al. (2020) A study looks at how obesity can affect the chances of getting heart disease to women. It's from the 'New England Journal of Medicine' and it pretty interesting. Using information from the Nurses' Health Study, researchers found something important. They noticed that a higher body mass index (BMI) and a bigger-to-hip ratio are linked to a greater risk of CHD. What's more, the research showed that being obese is a considerable cardiac disease threat in women That's why it's super important to pay attention to weight



management and make healthy lifestyle choices. Making these changes can help prevent heart disease, which is something we all want. So let's take care of our hearts together.

III. RESEARCH GAP

Although several studies have explored the causes and prevention of heart disease globally, there remains a lack of region-specific analysis focusing on how multiple risk factors interact within the Indian population, particularly in Karnataka. Existing research often emphasizes either medical or lifestyle aspects in isolation, without integrating demographic, behavioral, and clinical data for a comprehensive understanding. Moreover, limited studies use data visualization and analytical tools like Power BI to interpret real-world hospital data. There is also a gap in understanding how modifiable factors such as diet, exercise, and stress collectively influence heart disease alongside non-modifiable factors like age and genetics. This study aims to bridge these gaps by providing a data-driven, localized, and holistic analysis of heart disease risk factors to support early detection and preventive strategies.

Research methodology

The study is Exploratory in nature. Data is gathered through secondary data from the organization as it is Hospital industry and analyzed for research. Jayadeva Hospital is the organization where the data is collected. Data Visualization is done using a Power BI tool which is used for the visualization of the data. Total sample size considered is 271 heart disease patients between 20-80 years age group is considered for the study.

Method of Research

This research follows an exploratory research method using quantitative analysis based on secondary data collected from Jayadeva Hospital, Bengaluru. Data from 271 patients aged 20– 80 years were analyzed using Power BI to identify patterns and relationships among factors such as age, gender, blood pressure, cholesterol, ECG results, and chest pain type. Descriptive statistics and visual analysis were applied to understand how these variables contribute to the risk of heart disease.

IV. OBJECTIVES OF THE STUDY

- To Explore the data set to uncover patterns, distributions and relationships within the data.
- Identifying and understanding the various elements that have a role in the onset of heart disease by weighing their respective contributions.
- Investigating possible connections between different risk variables, which will eventually guide strategies for managing and preventing heart disease.
- To Analyze Demographic Variances and to investigate how demographic variables such as age, gender.
- To Contribute to Public Health Awareness to distribute research findings and recommendations in an effort to increase public awareness of the significance of detecting and managing heart disease risk factors.

Source of Data Collection

For this study, data was obtained from secondary sources, which was collected from Jayadeva Hospital, Bengaluru. The dataset includes medical records of 271 patients aged between 20 and 80 years. The research relied entirely on existing patient records and hospital databases for analysis.



V. DATA ANALYSIS AND INTERPRETATION

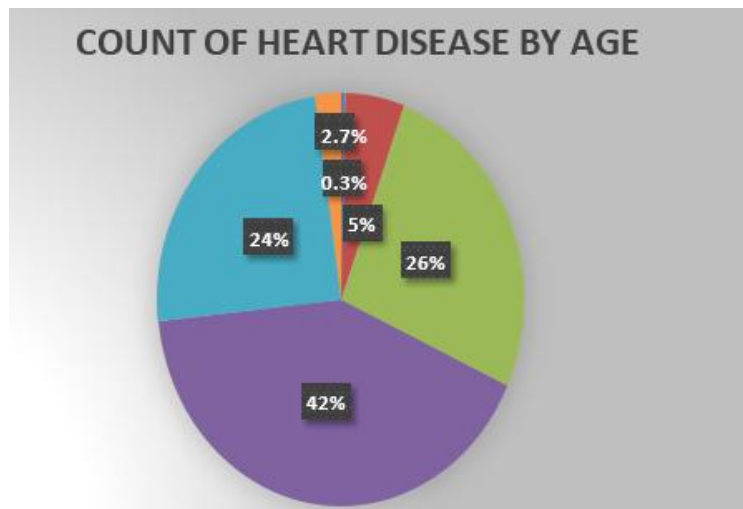
How does age correlate with the occurrence of heart disease?

Age	Count of heart disease	Percentage
21 – 30	1	0.3%
31 - 40	14	5%
41 - 50	71	26%
51 - 60	112	42%
61 - 70	66	24%
71 - 80	6	2.7%
Grand Total	270	100%

ANALYSIS:

The above table represents that; the age group (51- 60) has the highest percentage of heart disease cases, accounting for 42%. The second highest incidence is seen in this age group of (41- 50) making up 26% of the cases. The age group (61-70) contributes to 24% of heart disease cases.

From age group (31- 40) a small percentage of cases, only 5%. The age group (71-80) represents 2.7% of the total. The least affected age group (21- 30) with 0.3% of cases. The incidence of age-related increases in illness are substantial, peaking in the 61-70 age range, and it drastically declines in those younger than 50. The lowest risk is observed in the 21- 30 age.



INTERPRETATION:

The above graph represents that majority of heart disease cases occur between the ages of 41 and 70, accounting for 92% of the total cases. The peak risk of heart disease appears in the 51- 60 age group, which alone accounts for 42% of the total. Heart disease incidence is relatively low in people under 40 and over 70. The data highlights the importance of targeting middle- aged adults (especially 41 - 60 years) for preventive measures against heart disease. An elevated risk of heart disease can be attributed to age-related changes such as weakening blood arteries and diminished cardiac flexibility.



What is the distribution of chest pain types among different age groups?

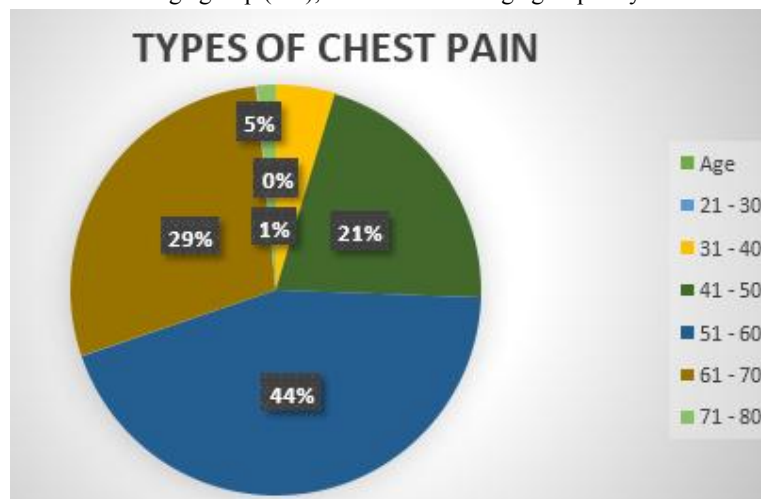
Age group	Asymptom atic	Atypical Angina	Non angial Pain	Typial Angia	Grand Total	percentage
21 - 30	0	1	0	0	1	0%
31 - 40	6	1	4	3	14	5%
41 - 50	27	19	24	1	71	21%
51 - 60	57	14	32	9	112	44%
61 - 70	37	5	17	7	66	29%
71 - 80	2	2	2	0	6	1%
Grand Total	129	42	79	20	270	100

ANALYSIS:

The 51-60 age group has the highest percentage of cases, comprising 41% of the total. This suggests that the likelihood of heart disease significantly increases during this decade.

Across all age groups, a large number of cases are "Asymptomatic." This is particularly true in the 51-60 and 61-70 groups, where 57 and 37 cases are asymptomatic, respectively. Non- Anginal Pain is the second most common symptom type, especially in the 41-70 age range, highlighting the majority of people with heart disease do not often suffer chest discomfort, but rather non-specific pain.

Typical Angina is the traditional difficulty in the chest related to heart disease, are most common in the 51-60 age group (9 cases). Atypical Angina is type of prominent in the 41-50 age group (19 cases), and while less frequent in older groups. Individuals younger than 40 and older than 70 show significantly lower heart disease cases. Only 1 case is reported for individuals in the 21-30 age group (0%), while the 71-80 age group only has 6 cases (2%).



INTERPRETATION:

The pie chart indicates that chest pain is most commonly experienced by individuals aged 41– 60 years, representing a significant 65% of cases. The second most affected group is those aged 61–70 years, accounting for 29%, followed by 31–40 years at 5%. Chest pain is rare in the 71– 80 years group, with only 1% of cases, and there are no reported cases in the 21–30 years or above 80 years groups. Overall, the likelihood of chest pain appears to increase with age, peaking in middle-aged adults.



What is the distribution of resting blood pressure in various groups?

Count of resting blood pressure	Sex		Total	Percentage
Age	F	M		
21-30	1	0	1	0.5%
31-40	10	4	14	5%
41-50	49	22	71	26%
51-60	83	29	112	42.5%
61-70	39	27	66	24%
71-80	1	5	6	2%
Grand Total	183	87	270	100%

ANALYSIS:

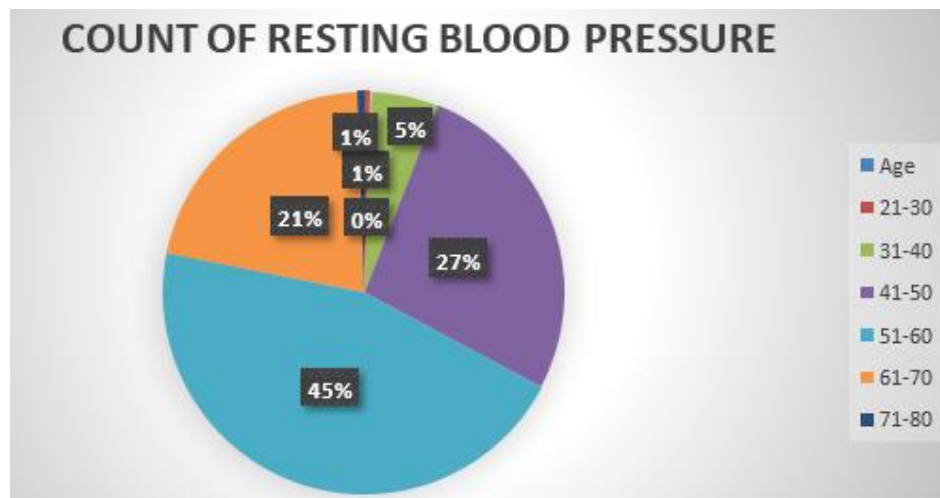
The table represents that the age group of 21-30 years has the smallest group, with only 1 female and no males, accounting for just 0.5% of the total cases.

31-40 years of age group relatively small group, with 10 females and 4 males, representing 5% of the total. 41-50 years of age group larger than the previous groups, comprising 49 females and 22 males, making up 26% of the total cases.

51-60 years of age group is the largest group by far, with 83 females and 29 males, total 42.5% of the population. This age shows the highest frequency of blood pressure issues.

61-70 years of age group is the second largest group, with 39 females and 27 males, contributing 24% to the total cases.

71-80 years is the smallest group after the 21-30 age range, with only 1 female and 5 males, accounting for 2% of the total.



INTREPRETATION:

Overall, females have a higher count of resting blood pressure cases (183) compared to males (87). In all age groups except 71 - 80, females have a higher count of cases than males. The largest disparity is in the age group 51 - 60, where females (83) far out number males (29).

Special attention should be given to females, who represent a higher count of cases across most age groups. Preventive measures such as lifestyle modifications, dietary changes, regular exercise, and routine health check-ups should be emphasized for middle-aged and older adults. Since females are more affected, gender-specific approaches might be necessary. This could include tailored educational programs and healthcare services to address the specific needs and risks associated with females.

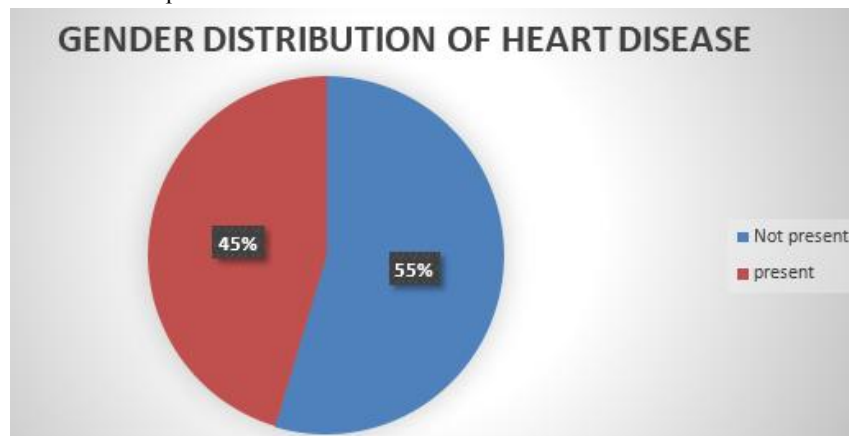


What is the gender distribution among individuals with heart disease?

Count of sex	Count of heart disease		Total	Percentage
	Not present	present		
F	100	83	183	68%
M	20	67	87	32%
Grand Total	120	150	270	100%

ANALYSIS:

In dataset among 270 individuals, with 68% females and 32% males. Female have 45.4% (83 out of 183) have heart disease. Males have 77% (67 out of 87) have heart disease. 55.6% of population (150 individuals) are affected by heart disease. Males are major to have heart disease compared to females. Even though females make up the majority of the population, heart disease is more prevalent in males.



INTREPRETATION:

The graph represents that the count of heart disease in the by the sex as male and female divided, the data indicates a need for targeted interventions and preventive measures for males who have heart disease. Given the higher percentage of females without heart disease, healthcare initiatives could focus on maintaining this status through regular health check-ups and promoting heart-healthy lifestyles.

The pie chart provide valuable insights into the distribution of cardiac disease across genders. It highlights a higher prevalence of heart disease in males when comparable there is lower incidence in females, suggesting a require for gender-specific health strategies to manage and prevent heartdisease effectively.

VI. FINDINGS

- High blood pressure: This condition puts excessive strain on the heart and arteries.
- High cholesterol: Elevated levels of LDL (bad) cholesterol can lead to plaque buildup in the arteries.
- Diabetes: People with diabetes are at a higher risk of heart disease due to factors like high blood sugar and insulin resistance.
- Obesity: Excess weight can contribute to high blood pressure, high cholesterol, and diabetes.
- Physical inactivity: A sedentary lifestyle increases the risk of heart disease.
- Family history: A family history of heart disease can make individuals more susceptible.
- The risk of heart disease increases with age. Men are generally at a higher risk than women, but this gap narrows after menopause.
- Chronic stress can contribute to heart disease. A diet high in saturated and trans fats and sodium can increase the risk.



VII. CONCLUSION

The study “Analyzing the Risk Factors for Heart Disease” concludes that heart disease results from a complex interaction of multiple factors rather than a single cause. It highlights both modifiable factors such as diet, exercise, smoking, cholesterol, and hypertension, and non-modifiable factors like age, gender, and genetics. The findings emphasize that lifestyle changes—healthy eating, regular physical activity, stress control, and quitting smoking can significantly reduce heart disease risk. It also notes emerging risks such as stress, inflammation, and sleep disorders, along with social inequalities that affect access to healthcare. Overall, the study calls for a comprehensive approach combining individual lifestyle management, medical care, and public health policies to prevent and reduce the growing burden of heart disease.

SUGGESTIONS

- **Enhanced Public Health Campaigns:** There is a requirement for continued public health efforts to promote heart-healthy lifestyles. These campaigns should concentrate on educating the public about the dangers of weight gain, tobacco elevated cholesterol, and elevated hypertension and diabetes, and encourage behaviors that support heart health, such as balanced diets, regular exercise, and smoking cessation.
- **Targeted Interventions for High-Risk Groups:** Healthcare systems should prioritize early detection and preventative steps for those who are at high hazard of developing heart disease, especially if they have a family history of illness or other possible factors that cannot be changed. This includes regular screenings and personalized lifestyle advice.
- **Addressing Emerging Risk Factors:** Recognizing and mitigating emerging risk factors like stress, inflammation, and sleep disorders can provide a more comprehensive approach to heart disease prevention. Integrating mental health support and stress management into standard healthcare practices is recommended.
- **Reducing Health Disparities:** The study highlights significant disparities in heart disease outcomes across different socioeconomic and ethnic groups. In order to close these gaps, efforts should concentrate on improving access to healthcare, providing education on heart health, and ensuring equitable availability of nutritious foods and safe spaces for physical activity.
- **Policy Initiatives:** Policymakers are encouraged to provide encouraging surroundings that enable healthy living, such as implementing regulations to reduce tobacco use, ensuring food labeling transparency, and promoting physical activity in communities.

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