



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.699**

**Volume 15, Issue 3, March 2026**

# Heart disease Analysis Using Tableau Visualization

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**ABSTRACT:** This project focuses on the analysis of heart disease using patient health data to identify patterns and risk factors associated with cardiovascular conditions. The system utilizes Tableau dashboards to visualize tabular data and compare different patient groups effectively. By applying data analytics and visualization techniques, the project aims to support healthcare professionals in making informed medical decisions. The analysis helps in understanding key indicators such as heart rate and other clinical parameters, enabling better insights for doctors, researchers, and policymakers. Overall, this project demonstrates how data-driven approaches can improve the accuracy and efficiency of heart disease analysis and healthcare decision-making.

**KEYWORDS:** Heart Disease Analysis, Cardiovascular Disease, Healthcare Analytics, Data Visualization, Tableau, Exploratory Data Analysis (EDA), Risk Factor Identification, Demographic Analysis, Lifestyle risk Factors Statistical Analysis, Predictive Insights, Data-Driven Decision Making.

## I. INTRODUCTION

Heart disease is one of the leading causes of mortality worldwide and pose a significant challenge to healthcare systems. With the rapid increase in the volume of medical data, there is a growing need for effective techniques to analyze and interpret patient information. Traditional methods often face limitations in handling large and complex datasets, making it essential to adopt data-driven approaches that can provide accurate and meaningful insights into heart-related conditions.

Data visualization plays a vital role in transforming raw healthcare data into clear and actionable information. In this study, heart disease data is analyzed using Tableau, a powerful data visualization tool, to create interactive dashboards and graphical representations. By examining key clinical parameters such as heart rate and related factors, the system helps in identifying patterns and trends within the data. This approach enhances the understanding of heart disease and supports healthcare professionals in making informed decisions, ultimately contributing to improved patient care and outcomes.

## II. PROBLEM STATEMENT

Heart disease is one of the leading causes of mortality worldwide, making early detection and analysis extremely important. Although large amounts of patient health data are available, extracting meaningful insights from this data remains a significant challenge. Traditional data analysis methods are often inefficient when handling large and complex datasets, and they may fail to identify important patterns and relationships among key clinical parameters such as heart rate and other health indicators.

In addition, the lack of effective data visualization techniques makes it difficult for healthcare professionals to interpret complex information and make timely decisions. Without clear and interactive representations, valuable insights may be overlooked. Therefore, there is a need for an efficient system that can analyze heart disease data and present it in a visually meaningful way. This project addresses this need by using Tableau to transform tabular data into interactive

dashboards and graphical representations, thereby improving data understanding and supporting better decision-making in healthcare.

### III. LITERATURE SURVEY

Previous studies have analyzed heart disease data using statistical methods and data analytics techniques. Researchers have found that factors such as age, cholesterol levels, blood pressure, and lifestyle habits significantly influence the occurrence of heart disease, including conditions like Coronary Artery Disease. Recent studies emphasize the use of visualization tools like Tableau to present complex healthcare data in an interactive and easy-to-understand format.

#### A. Heart Disease Data Analysis

Many studies have analyzed heart disease datasets using statistical and analytical techniques. Researchers have identified that factors such as age, gender, cholesterol level, blood pressure, and lifestyle habits (such as smoking and physical activity) influence the risk of heart disease. These studies help in understanding patterns and relationships among different medical attributes and disease occurrence.

#### B. Role of Data Visualization in Healthcare Analysis

Data visualization tools help transform complex medical datasets into meaningful insights through charts, graphs, and dashboards. Visualization platforms such as Tableau allow analysts to explore relationships between various health parameters, identify trends, and compare patient groups. However, many visualization tools mainly provide descriptive analysis rather than predictive insights.

#### C. Use of Business Intelligence Tools in Healthcare Analytics

Business Intelligence (BI) tools like Tableau and Microsoft Power BI are widely used for analyzing healthcare data. These tools help users examine relationships between medical features such as cholesterol levels, heart rate, and blood pressure. BI dashboards also help identify patterns and variations in heart disease occurrence across different patient groups.

#### D. Data Analytics for Heart Disease Trends

Recent research focuses on applying data analytics techniques to identify heart disease trends. Data analytics helps in analyzing large medical datasets and understanding how risk factors change over time. However, interpreting complex analytical results can sometimes be difficult without proper visualization methods.

#### E. Visualization-Based Analytical Approaches

Recent studies emphasize integrating data analytics with visualization tools to improve understanding of heart disease patterns. Visualization platforms like Tableau enable users to analyze healthcare data interactively and identify important medical insights. Combining analytics with visualization improves both interpretation and clinical decision-making.

#### F. Research Gap Identified

From the existing studies, the following research gaps are identified:

- Many studies focus mainly on heart disease prediction or statistical analysis without effective visualization.
- Some research emphasizes machine learning models but lacks interactive dashboards for better understanding.
- Limited studies integrate data analytics and visualization platforms like Tableau to provide both analytical insights and user-friendly visual exploration of heart disease data.

Author(s) / Year	Study Focus	Methodology	Tools Used	Key Findings
Various Researchers (2018–2022)	Heart disease risk factor analysis	Statistical analysis of medical datasets	Statistical tools	Identified key factors such as age, cholesterol, and blood pressure influencing diseases like <u>Coronary Artery Disease</u>
Various Researchers (2019–2023)	Healthcare data visualization	Graphical representation using charts and dashboards	<u>Tableau</u>	Visualization improves understanding of complex healthcare data and supports decision-making
Various Researchers (2020–2024)	Use of BI tools in healthcare analytics	Data exploration using dashboards	<u>Tableau</u> , <u>Microsoft Power BI</u>	BI tools help analyze relationships between attributes like heart rate, BP, and cholesterol
Various Researchers (2017–2021)	Heart disease trend analysis	Data analytics and trend analysis	Analytical tools + visualization	Helped identify patterns and variations in heart disease occurrence over time
Various Researchers (2021–2024)	Visualization-based healthcare analysis	Integration of analytics with dashboards	<u>Tableau</u>	Interactive dashboards improve data interpretation and user engagement
Various Researchers (Recent Studies)	Combined analytics and visualization	Data analysis + visual exploration	<u>Tableau</u>	Combining visualization with analytics provides better insights than using either alone

### DATASET DESCRIPTION

The project uses the Cleveland Heart Disease Dataset, containing patient medical records with attributes including:

- Age, Gender
- Blood Pressure, Cholesterol
- Heart Rate, Chest Pain Type
- Lifestyle Factors (smoking, exercise)

The dataset contains approximately 5000 records and is widely used for research in heart disease studies.

### IV. PROPOSED METHODOLOGY

The project follows the **Agile methodology** (Scrum framework) to iteratively develop interactive dashboards.

#### Data Collection

- Dataset: Kaggle Heart Disease Dataset
- Attributes: Age, gender, BP, cholesterol, heart rate, alcohol, smoking, difficulty in breathing, other lifestyle factors, etc

#### Data Preprocessing

- Clean missing values
- Remove duplicates
- Convert categorical data to dimensions
- Normalize numerical data for charts

#### Data Import

- Import cleaned dataset into Tableau
- Define measures (numerical) and dimensions (categorical)

#### Visualization

- **Bar charts:** Compare risk factors across patients
- **Line charts:** Identify trends in heart disease occurrence
- **Pie charts:** Show patient distribution
- **Scatter plots:** Analyze correlations between variables
- **Heatmaps:** Visualize relationships among features

#### Dashboard Development

- Combine charts into interactive dashboards
- Add filters for age, gender, cholesterol, BP
- Enable drill-down for detailed analysis

#### Iterative Agile Process

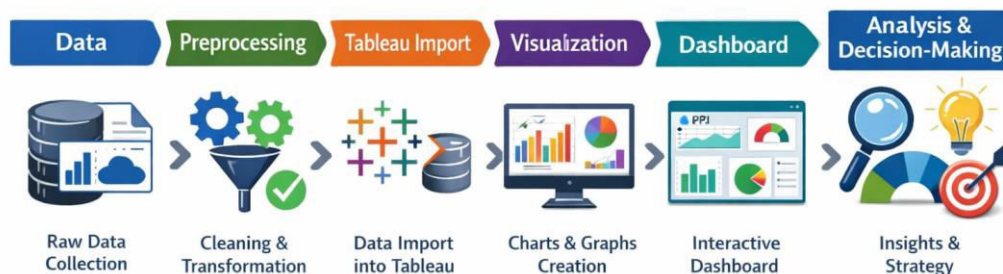
- Work divided into sprints (1–2 weeks each)
- Daily stand-ups for progress tracking
- Sprint review and retrospective for feedback

### V. SYSTEM ARCHITECTURE

#### Components:

- **Data Source:** Patient dataset (CSV/Excel)
- **ETL Layer:** Preprocessing and cleaning
- **Visualization Layer:** Tableau dashboards (bar, line, pie, scatter, heatmap)
- **User Interface:** Interactive dashboards for doctors and researchers
- **Decision Support:** Insights generated from visualizations guide healthcare decisions

**Workflow:** Data → Preprocessing → Tableau Import → Visualization → Dashboard → Analysis & Decision-Making



## VI. IMPLEMENTATION DETAILS

- **Software:** Tableau Desktop
- **Dataset:** Kaggle Heart Disease Dataset
- **Visualizations Implemented:**
  - Bar charts for risk factor comparison
  - Line charts for trend analysis
  - Pie charts for distribution analysis
  - Scatter plots for correlation analysis
  - Heatmaps for feature relationship visualization
- **Interactive Features:** Filters for age, gender, cholesterol, BP; drill-down for detailed patient insights

## VII. DATA ANALYSIS AND VISUALIZATION

### Risk Factor Analysis

- Patients with higher cholesterol and BP show higher heart disease occurrence
- Age is a significant factor in disease prevalence

### Trend Analysis

- Line charts show increased risk with age
- Gender-based differences in heart disease are visualized

### Correlation Analysis

- Scatter plots show positive correlation between cholesterol, BP, and disease occurrence
- Heatmaps highlight strong relationships among risk factors

### Dashboard Insights

- Interactive dashboards allow doctors to filter patients by attributes
- Enable quick identification of high-risk groups
- Supports decision-making in preventive healthcare

## VIII. RESULTS AND DISCUSSION

The results of the study were obtained through various visualizations developed using Tableau to analyze heart disease data. Different graphical representations such as bar charts, pie charts, line graphs, and scatter plots were used to examine the relationships between clinical parameters including age, heart rate, cholesterol levels, and blood pressure. The analysis revealed noticeable patterns in the dataset, indicating that factors such as higher cholesterol levels, abnormal heart rate, and increasing age are associated with a greater risk of heart disease. These visualizations made it easier to identify trends and compare different patient groups effectively.

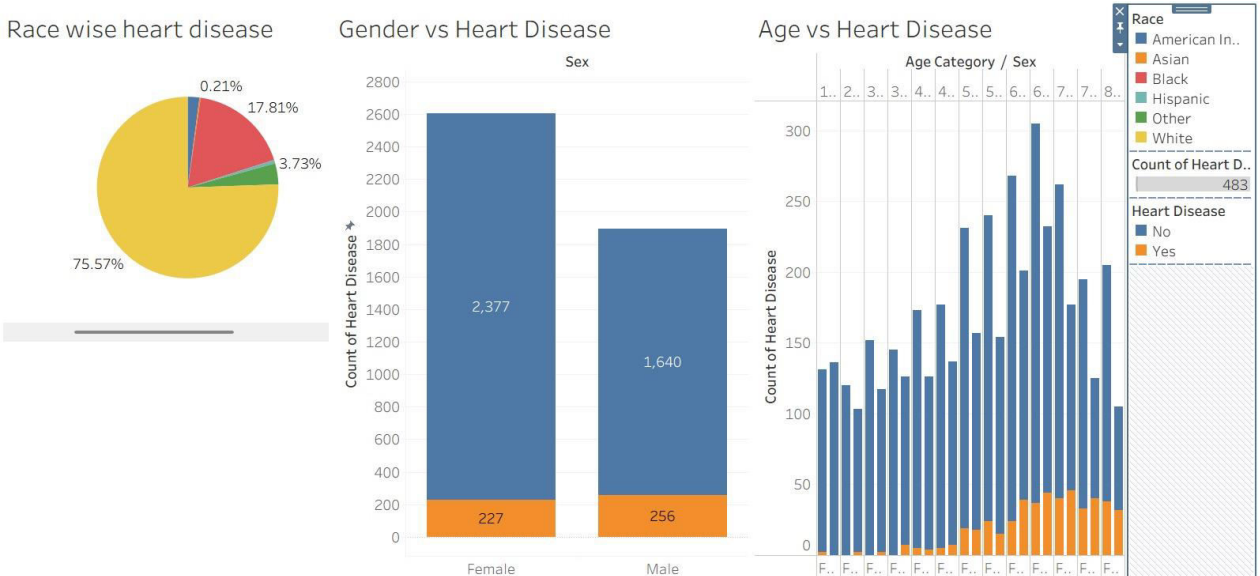
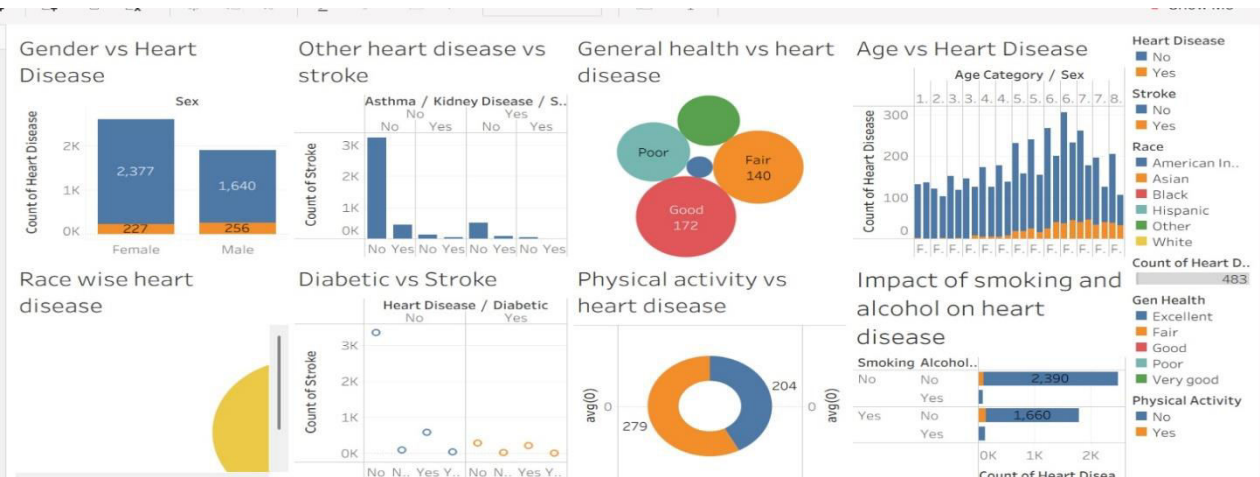
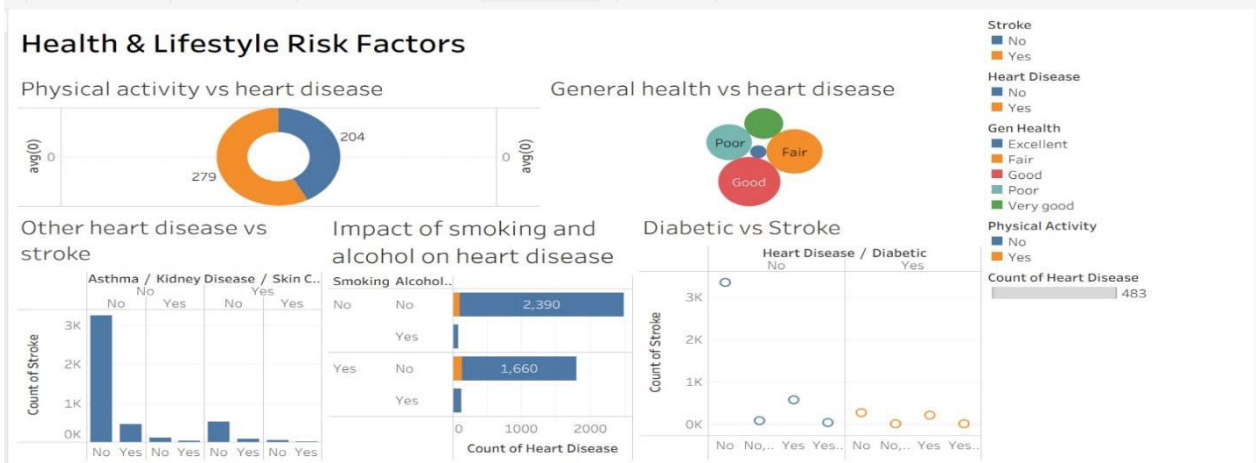
Furthermore, the use of interactive dashboards enhanced the analysis by allowing dynamic filtering and exploration of data based on specific attributes such as gender and age groups. This improved the interpretability of complex datasets and enabled a clearer understanding of the relationships between multiple variables. Overall, the results demonstrate that data visualization using Tableau is an effective approach for analyzing heart disease data, providing meaningful insights that can support healthcare professionals in making informed decisions and improving patient outcomes.

### Dashboards:

Fig 1 : Health and Lifestyle Risk Factors Dashboard

Fig 2 : Overall Analysis Dashboard

Fig 3 : Demographic Dashboard



### IX. DATA VISUALIZATION

Visualizations are central to this project:

- **Bar Charts:** Highlight major risk factors
- **Pie Charts:** Show distribution of patients with/without heart disease
- **Line Charts:** Analyze trends across age groups
- **Scatter Plots & Heatmaps:** Display correlations and relationships among multiple variables
- **Dashboard:** Combines all charts for interactive exploration and decision support

### X. CONCLUSION

This study demonstrates that using Tableau for heart disease data analysis provides meaningful insights through interactive visualizations. By integrating analytics and visualization, healthcare professionals can better understand risk factors, identify patterns, and make data-driven decisions. The approach supports preventive care and improves clinical decision-making, benefiting both patients and the healthcare system.

#### Future Scope

- Integrate predictive analytics and machine learning models in Tableau dashboards
- Include real-time patient monitoring data for dynamic analysis
- Expand to include multiple datasets for cross-regional studies
- Use dashboards for patient education and awareness

### XI. ACKNOWLEDGMENT

We would like to express our sincere gratitude to our project guide **S.Saraswathi** for providing valuable guidance, support, and encouragement throughout the development of this research work. Her suggestions and continuous support helped us successfully complete this project.

We also thank the management and faculty members of **Kallam Haranadhareddy Institute of Technology**, Department of **Data Science** for providing the necessary facilities and resources to carry out this research work.

Finally, we extend our appreciation to all those who directly or indirectly contributed to the completion of this study.

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