Heart Disease Diagnostic Analysis

DETAILED PROJECT REPORT

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PROJECT DETAIL

Project Title	Heart Disease Diagnostic – Analysis
Technology	Business Intelligence
Domain	Healthcare
Project Difficulty level	Advanced
Programming Language Used	Python
Tools Used	Jupyter Notebook, MS-Excel, MS-Power BI

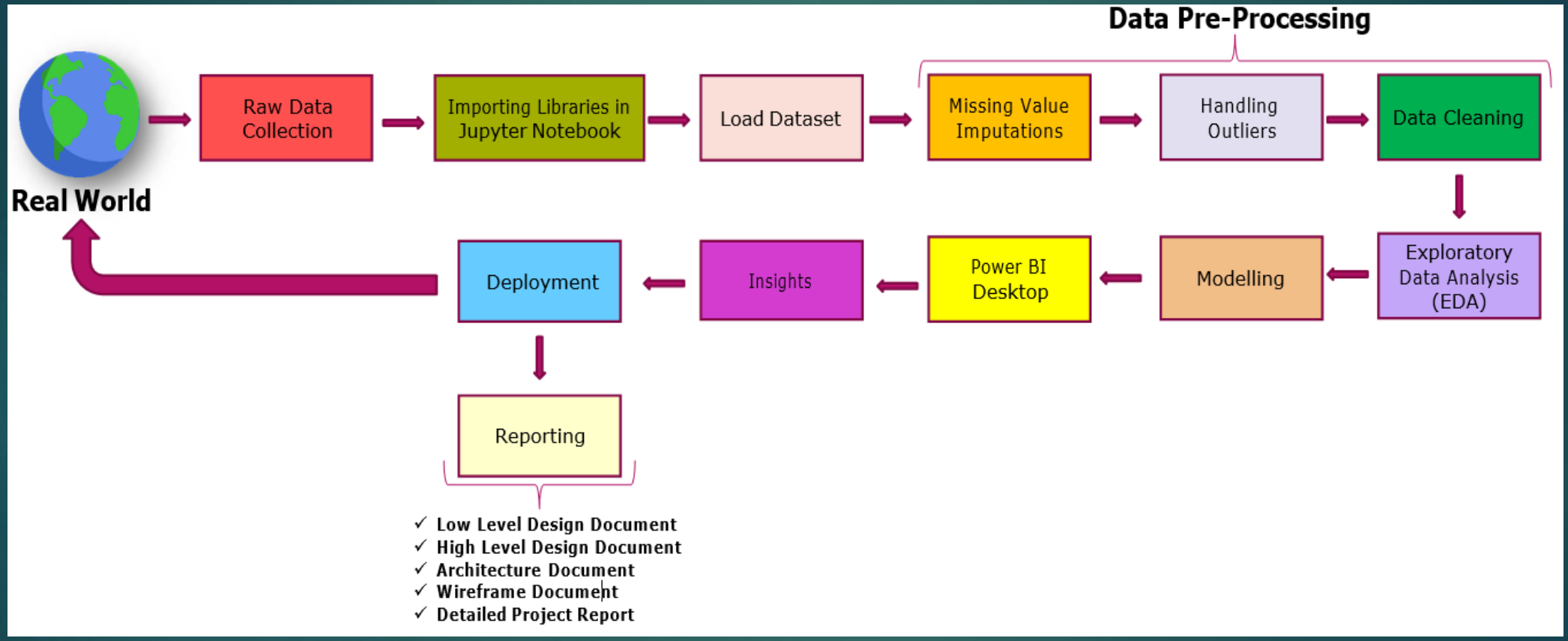
OBJECTIVE

The goal of this project is to analyze the heart disease occurrence, based on a combination of features that describes the heart disease.

PROBLEM STATEMENT

- Heart disease is a leading cause of mortality in India, contributing significantly to the country's health burden. The prevalence of cardiovascular diseases (CVDs) has risen sharply due to lifestyle changes, urbanization, and aging populations. Key risk factors include hypertension, diabetes, high cholesterol, smoking, obesity, and physical inactivity. Rapid economic growth and associated lifestyle shifts have exacerbated these issues. Access to healthcare varies widely across urban and rural areas, often limiting timely diagnosis and treatment.
- Public health initiatives aim to address these challenges through awareness campaigns, improved healthcare infrastructure, and preventive measures. Despite these efforts, the burden of heart disease remains high, requiring continued focus on both prevention and treatment strategies.
- Thus, preventing heart diseases has become more than necessary. Good data-driven systems for predicting heart diseases can improve the entire research and prevention process, making sure that more people can live healthy lives.

ARCHITECTURE



DATASET COLUMN DETAILS

- **age:** The person's age in years
- **sex:** The person's sex (1 = male, 0 = female)
- **cp:** The chest pain experienced (Value 1: typical angina, Value 2: atypical angina, Value 3: non-anginal pain, Value 4: asymptomatic)
- **trestbps:** The person's resting blood pressure (mm Hg on admission to the hospital)
- **chol:** The person's cholesterol measurement in mg/dl
- **fbs:** The person's fasting blood sugar (> 120 mg/dl, 1 = true; 0 = false)
- **restecg:** Resting electrocardiographic measurement (0 = normal, 1 = having ST-T wave abnormality, 2 = showing probable or definite left ventricular hypertrophy by Estes' criteria)
- **thalach:** The person's maximum heart rate achieved

- **exang:** Exercise induced angina (1 = yes; 0 = no)
- **oldpeak:** ST depression induced by exercise relative to rest
- **slope:** the slope of the peak exercise ST segment (Value 1: upsloping, Value 2: flat, Value 3: down sloping)
- **ca:** The number of major vessels (0-3)
- **thal:** A blood disorder called thalassemia (3 = normal; 6 = fixed defect; 7 = reversable defect)
- **num:** Heart disease (0 = no, 1 = yes)

- **Age:** Age is the most important risk factor in developing cardiovascular or heart diseases, with approximately a tripling of risk with each decade of life. Coronary fatty streaks can begin to form in adolescence. It is estimated that 82 percent of people who die of coronary heart disease are 65 and older. Simultaneously, the risk of stroke doubles every decade after age 55.

- **Sex:** Men are at greater risk of heart disease than pre-menopausal women. Once past menopause, it has been argued that a woman's risk is similar to a man's although more recent data from the WHO and UN disputes this. If a female has diabetes, she is more likely to develop heart disease than a male with diabetes.

- **ST Depression:** In unstable coronary artery disease, ST-segment depression is associated with a 100% increase in the occurrence of three-vessel/left main disease and to an increased risk of subsequent cardiac events. In these patients an early invasive strategy substantially decreases death/myocardial infarction.

- **Resting Blood Pressure:** Over time, high blood pressure can damage arteries that feed your heart. High blood pressure that occurs with other conditions, such as obesity, high cholesterol or diabetes, increases your risk even more.

- **Fasting Blood Sugar:** Not producing enough of a hormone secreted by your pancreas (insulin) or not responding to insulin properly causes your body's blood sugar levels to rise, increasing your risk of heart attack.

- **Cholesterol:** A high level of low-density lipoprotein (LDL) cholesterol (the "bad" cholesterol) is most likely to narrow arteries. A high level of triglycerides, a type of blood fat related to your diet, also ups your risk of heart attack. However, a high level of high-density lipoprotein (HDL) cholesterol (the "good" cholesterol) lowers your risk of heart attack.

- **Resting ECG:** For people at low risk of cardiovascular disease, the USPSTF concludes with moderate certainty that the potential harms of screening with resting or exercise ECG equal or exceed the potential benefits. For people at intermediate to high risk, current evidence is insufficient to assess the balance of benefits and harms of screening.

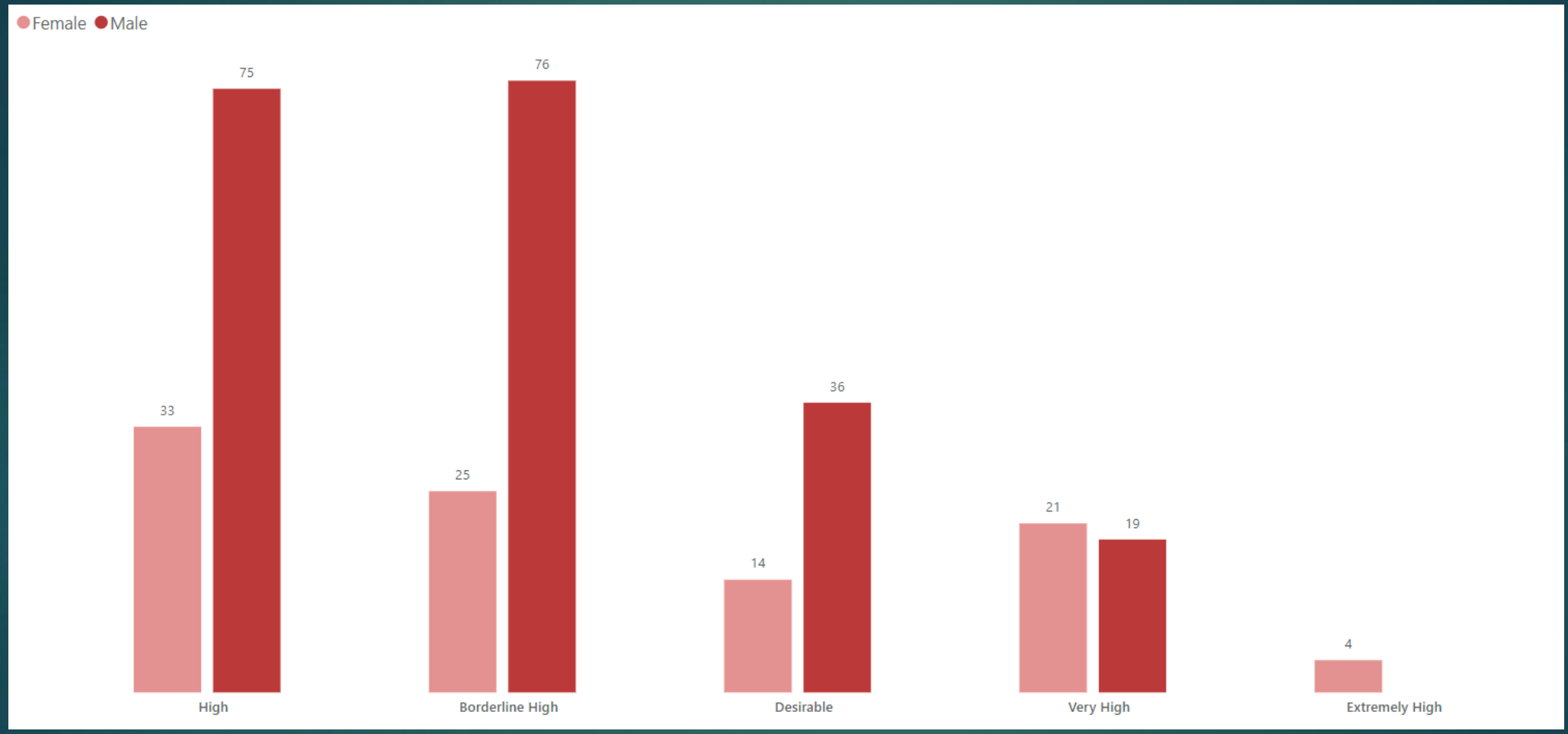
- **Max heart rate achieved:** The increase in the cardiovascular risk, associated with the acceleration of heart rate, was comparable to the increase in risk observed with high blood pressure. It has been shown that an increase in heart rate by 10 beats per minute was associated with an increase in the risk of cardiac death by at least 20%, and this increase in the risk is similar to the one observed with an increase in systolic blood pressure by 10 mm Hg.

INSIGHTS FROM THE DATASET

1. What Kind of Blood Pressure according to Age Group?

- Old Age people (>56 years) suffers more Blood Pressure

2. How much Male & Female suffers from Cholesterol in Age Wise?

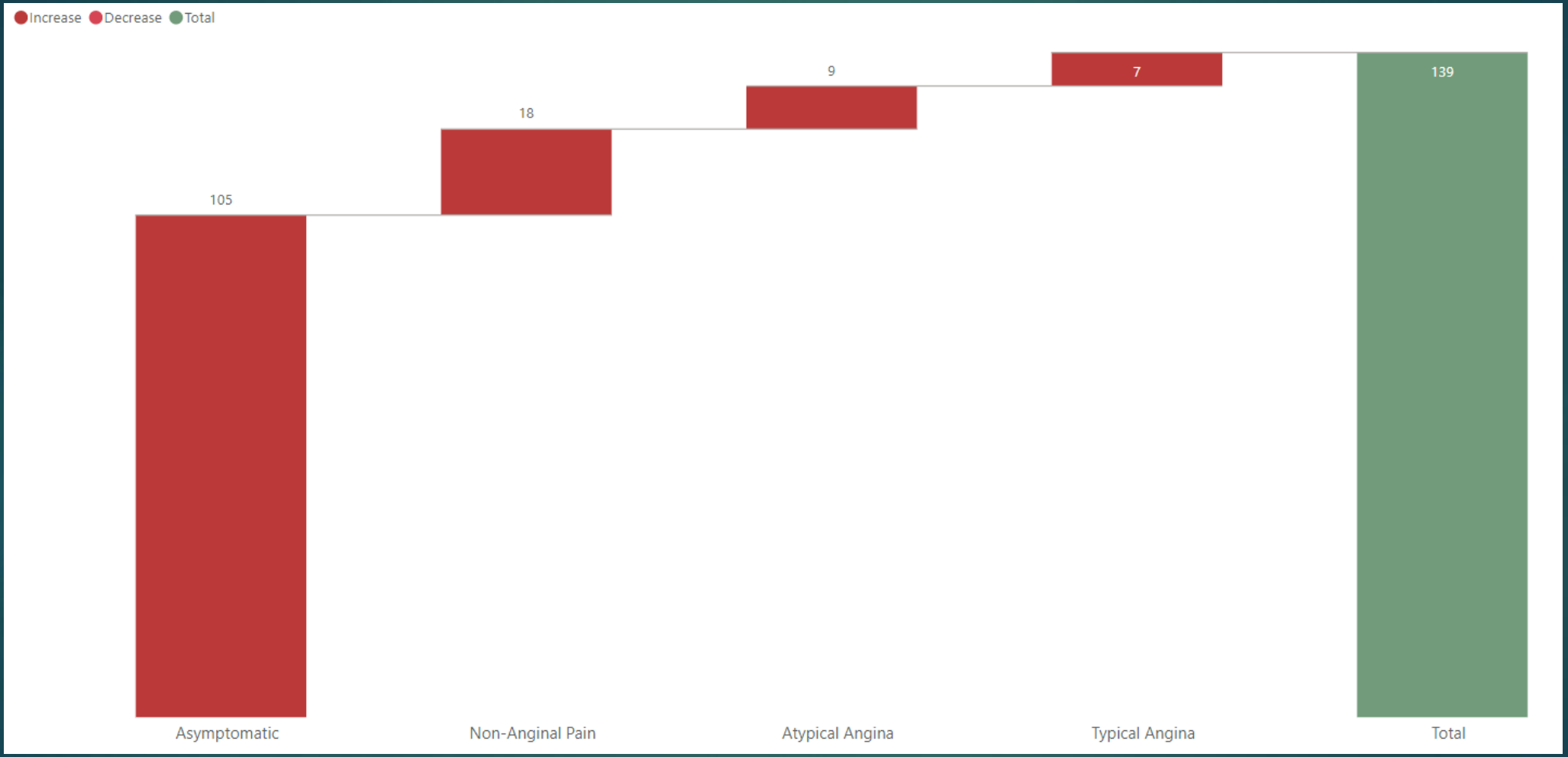


- Males have higher cholesterol levels across all types and age groups.

3. What is the number of Heart Beats in Heart Patients?

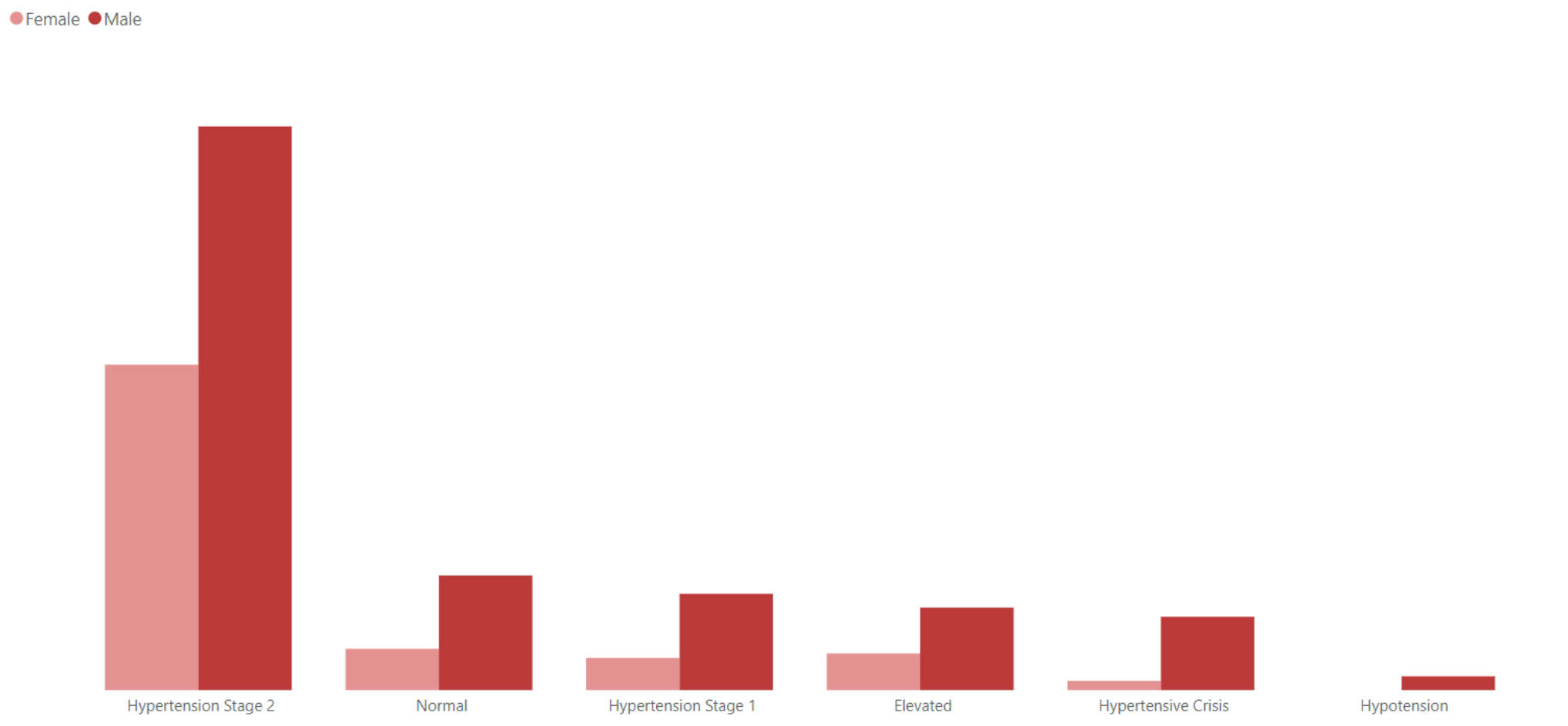
- Tachycardia (Heart Rate 120 - 160) is the most common type of heartbeat observed in heart patients.

4. What is the most type of Chest pains patients will be suffered?



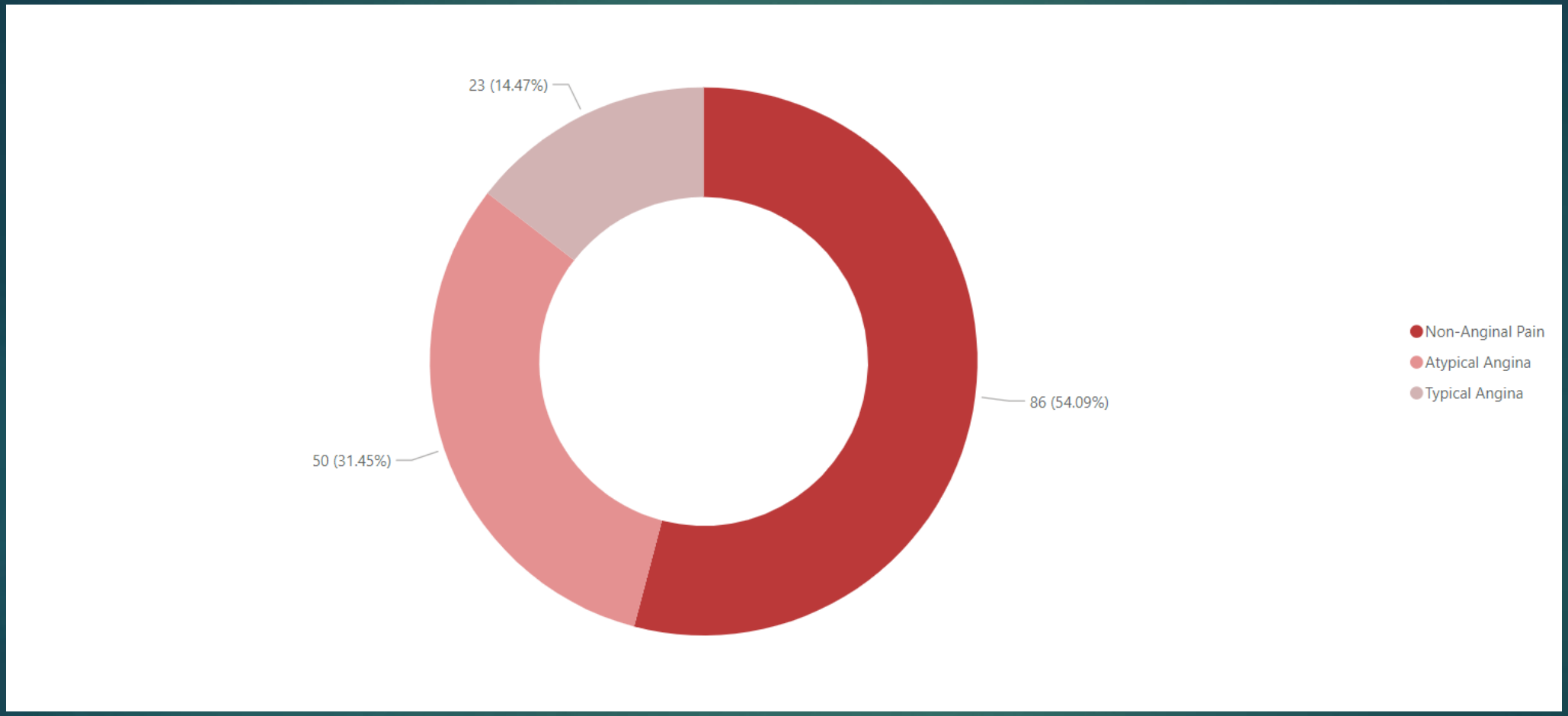
- Asymptomatic Chest Pain (CP=4) is the most common among patients.

5. Which gender, male or female, suffers more from various types of blood pressure issues?



- Males are more frequently affected by Hypertension Stage 2 (140 - 180) compared to females.

6. Which are the Top 3 Chest pains according to Age types?



- According to age-wise data, the most common types of chest pain people experience are non-anginal pain (CP = 3), atypical angina (CP = 2), and typical angina (CP = 1).

7. Provide the patient's details, including blood pressure range, categorized by gender and age.

BP Range	Asymptomatic	Atypical Angina	Non-Anginal Pain	Typical Angina	Total
Hypertension Stage 2	72	38	68	16	**194**
Normal	25	2	6	1	**34**
Hypertension Stage 1	17	3	6	2	**28**
Elevated	20	1	3	2	**26**
Hypertensive Crisis	7	6	3	2	**18**
Hypotension	3				**3**
Total	**144**	**50**	**86**	**23**	**303**

- This displays the total number of patients suffering from high blood pressure, categorized by age range and gender, providing comprehensive details.