

1. Total # of patients=297
2. Average age- 54- middle-aged which aligns with typical heart disease demographics.
3. 201 male 96 female Male patients account for roughly 2/3 of the dataset → heart disease may be more prevalent in males here
4. Number of high cholesterol patients (>240) A significant portion of patients have high cholesterol, which is a risk factor for heart disease
5. Patients grouped by chest pain(grouoed by pain level)

3	142
2	83
1	49
0	23

 - Chest pain type 3 is the most common among patients, suggesting that this type of symptom is prevalent in heart disease cases

Intermediate Queries+ Insights

1. **Female patients (Gender = 0) have a higher average cholesterol level (262 mg/dl) compared to male patients (240 mg/dl).** This suggests that in this dataset, women may be at a **higher risk for high cholesterol**, which is an important factor in heart disease risk assessment
- 2.

Age and Sex:

- Males between **55–70 years** are disproportionately represented in the high-risk group.

Chest Pain Type (CP):

- Patients with **CP = 3** (typical angina) show a significantly higher likelihood of having heart disease.

Exercise-Induced Angina (Exang):

- **Exang = 1** (presence of angina during exercise) is strongly associated with heart disease.

ST Depression (Oldpeak):

- **Oldpeak > 2** indicates higher ST depression, correlating with increased risk.

Additional Factors:

- Some high-risk patients also exhibit **elevated cholesterol (>300 mg/dL)** and **high resting blood pressure (>160 mmHg)**.
- 3. the highest cholesterol values are:
 - **564 mg/dL** (Age 67, Male, Condition 0)
 - **417 mg/dL** (Age 65, Male, Condition 0)
 - **409 mg/dL** (Age 56, Male, Condition 1)
 - **407 mg/dL** (Age 63, Male, Condition 1)
 - **394 mg/dL** (Age 62, Male, Condition 0)

These are extreme values and stand out compared to the rest of the dataset.

Step 2: Patterns / Insights

1. **High cholesterol mostly occurs in older males** in this subset (ages 56–67, sex = 0).
 2. Some with extremely high cholesterol do **not yet have heart disease** (Condition = 0), which might indicate **risk factors before onset**.
 3. Patients with **condition = 1** and high cholesterol also show **higher resting blood pressure** and **older age**, hinting at **comorbidity patterns**.
 4. Analysis of the Cleveland Heart Disease dataset reveals that the highest cholesterol readings are primarily in older male patients. Interestingly, some of these patients have not yet developed heart disease, highlighting the importance of monitoring cholesterol as a predictive risk factor
4. **chest_pain_type 1** → 26 patients over 50 with an **average cholesterol of 259**.
 - **chest_pain_type 2** → 53 patients over 50 with **average 255**.
 - **chest_pain_type 3** → 108 patients over 50 with **average 253**.
 - **chest_pain_type 0** → 18 patients over 50 with **average 240**.

✓ Observations:

- Chest pain type 1 has the **highest average cholesterol** but fewer patients than type 3.
- Type 3 has the **most patients over 50** but slightly lower average cholesterol.

Insights:

1. Chest Pain Type vs. Cholesterol

- `chest_pain_type 1` patients have the **highest average cholesterol** (259 mg/dL).
- `chest_pain_type 0` patients have the **lowest average cholesterol** (240 mg/dL).
- This suggests that certain types of chest pain may correlate with higher cholesterol levels, which could indicate higher cardiovascular risk.

2. Patient Distribution

- Most patients fall under `chest_pain_type 3` (108 patients), despite their average cholesterol being slightly lower than type 1.
- The least common is `chest_pain_type 0` (18 patients).

3. Cholesterol Patterns

- There's a trend where `chest_pain_type 1` and `2` patients tend to have higher cholesterol than type 3 and 0.
- High cholesterol in type 1 (259 mg/dL) is clinically significant, as levels above 240 mg/dL are generally considered **high**.

4. Risk Implications

- Patients with type 1 chest pain are a smaller group but have **higher cholesterol**, potentially a **higher cardiovascular risk group**.
- Type 3 patients are numerous but slightly lower cholesterol, suggesting that while chest pain is common, cholesterol may not always align with patient count.

ChestPainType	PatientCount	Average
3	142	55
2	83	53
1	49	51
0	23	55

Insights:

1. Most common chest pain type:

- Type 3 is the most frequent, with 142 patients (~50% of the total in this sample).
- This suggests that type 3 chest pain is the dominant symptom among patients in this dataset.

2. Least common chest pain type:

- Type 0 is the rarest, with only 23 patients.
- Clinically, this may indicate that this type of chest pain is less typical among patients who get tested or present with heart disease symptoms.

3. Age trends:

- Type 1 patients are the youngest on average (51), while types 0 and 3 average 55 years.
- This could suggest that certain chest pain types manifest slightly earlier or later in life.

4. Patient distribution:

- The majority of patients ($142 + 83 = 225$ out of 297) fall into chest pain types 2 and 3, indicating that these types are most relevant for targeted studies or interventions.

5. Clinical implication:

- If a physician sees a patient with chest pain type 3 or 2, statistically, they're more likely to encounter this scenario.
- Age alone may not be a strong differentiator because average ages are fairly close (51–55 years).

6. Insights:

1. Age trends by chest pain type:

- Type 1 patients are the youngest on average (51 years).
- Types 0 and 3 are the oldest on average (55 years).
- Type 2 is in the middle (53 years).
- This suggests some correlation between chest pain type and age, with more severe or atypical types potentially appearing later.

2. Symptom prevalence by age:

- Older patients (55 years) show types 0 and 3, which could indicate these types are more common in older adults.
- Younger patients (51 years) show type 1, which might be an earlier manifestation.

3. Overall pattern:

- There's a gradual increase in average age from type 1 → type 2 → types 0/3.
- Clinicians could consider age when evaluating the likelihood of chest pain type, though the differences are modest (4 years max).

Key Findings from the Heart Disease Data Analysis

General Demographics and Risk

- The dataset comprises **297 patients** with an average age of **54**, aligning with typical heart disease demographics.
 - The patient population is predominantly male, with **201 male** and **96 female** patients, meaning males account for roughly two-thirds of the dataset.
 - **Exercise-Induced Angina (Exang=1)** is strongly associated with heart disease.
 - **ST Depression (Oldpeak>2)** also correlates with an increased risk of heart disease.
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Cholesterol Trends

- **Female patients** have a significantly **higher average cholesterol** level (262 mg/dL) compared to male patients (240 mg/dL).
 - The highest cholesterol readings are found primarily in **older male patients** (ages 56-67), with extreme values reaching up to **564 mg/dL**.
 - Some patients with extremely high cholesterol values (e.g., 564 mg/dL) **do not yet have heart disease** (Condition=0), suggesting cholesterol is an important predictive risk factor before the disease onset.
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Age and Gender Patterns

- **Males between 55–70 years** are disproportionately represented in the high-risk group for heart disease.
 - Patients with **heart disease (Condition=1)** and **high cholesterol** also tend to show **higher resting blood pressure** and are of **older age**, hinting at comorbidity patterns.
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Chest Pain Patterns

- **Chest pain type 3** (typical angina) is the **most frequent symptom**, with 142 patients, making it the dominant type in the dataset.

- Patients with **chest pain type 1** have the **highest average cholesterol** (259 mg/dL). This smaller group may represent a higher cardiovascular risk.
- There's a subtle age trend:
Type 1 patients are the **youngest** on average (51 years), while **Types 0 and 3** are the **oldest** on average (55 years)