In [ ]:
```
    Heart Disease Analysis
```

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [132…
```
df = pd.read_csv("heart.csv")
df
```

Out[132]:

	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak
0	63	1	Non-Typical	145	233	1	0	150	0	2.3
1	37	1	Nonanginal	130	250	0	1	187	0	3.5
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4
3	56	1	Asymptomatic	120	236	0	1	178	0	0.8
4	57	0	Typical	120	354	0	1	163	1	0.6
...	...	...	...	...	...	...	...	...	...	...
298	57	0	Typical	140	241	0	1	123	1	0.2
299	45	1	Non-Typical	110	264	0	1	132	0	1.2
300	68	1	Typical	144	193	1	1	141	0	3.4
301	57	1	Typical	130	131	0	1	115	1	1.2
302	57	0	Asymptomatic	130	236	0	0	174	0	0.0

303 rows × 12 columns

In [133…
```
#Top 10 Data
df.head(10)
```

Out[133]:

	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak	Slo
0	63	1	Non-Typical	145	233	1	0	150	0	2.3	
1	37	1	Nonanginal	130	250	0	1	187	0	3.5	
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4	
3	56	1	Asymptomatic	120	236	0	1	178	0	0.8	
4	57	0	Typical	120	354	0	1	163	1	0.6	
5	57	1	Typical	140	192	0	1	148	0	0.4	
6	56	0	Asymptomatic	140	294	0	0	153	0	1.3	
7	44	1	Asymptomatic	120	263	0	1	173	0	0.0	
8	52	1	Nonanginal	172	199	1	1	162	0	0.5	
9	57	1	Nonanginal	150	168	0	1	174	0	1.6	

In [134…

```
#Bottom 10 Data
df.tail(10)
```

Out[134]:

	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak
293	67	1	Nonanginal	152	212	0	0	150	0	0.8
294	44	1	Typical	120	169	0	1	144	1	2.8
295	63	1	Typical	140	187	0	0	144	1	4.0
296	63	0	Typical	124	197	0	1	136	1	0.0
297	59	1	Typical	164	176	1	0	90	0	1.0
298	57	0	Typical	140	241	0	1	123	1	0.2
299	45	1	Non-Typical	110	264	0	1	132	0	1.2
300	68	1	Typical	144	193	1	1	141	0	3.4
301	57	1	Typical	130	131	0	1	115	1	1.2
302	57	0	Asymptomatic	130	236	0	0	174	0	0.0

In [135…

```
#Shape
df.shape
```

Out[135]: (303, 12)

In [136…
```
#No. of Rows = 303
#No. of Column = 12
```

In [ ]:

In [137…
```
#Removes rows containing any missing values (NaN values)
df.dropna(inplace = True)
```

In [138…
```
#Checking Missing Values
df.isna()
```

Out[138]:

	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak	Sl
0	False	False	False	False	False	False	False	False	False	False	F
1	False	False	False	False	False	False	False	False	False	False	F
2	False	False	False	False	False	False	False	False	False	False	F
3	False	False	False	False	False	False	False	False	False	False	F
4	False	False	False	False	False	False	False	False	False	False	F
...	...	...	...	...	...	...	...	...	...	...	
298	False	False	False	False	False	False	False	False	False	False	F
299	False	False	False	False	False	False	False	False	False	False	F
300	False	False	False	False	False	False	False	False	False	False	F
301	False	False	False	False	False	False	False	False	False	False	F
302	False	False	False	False	False	False	False	False	False	False	F

303 rows × 12 columns

In [ ]:
```
#True : If cell has a missing value (NaN), and False : If it's not a missing value.
```

In [ ]:

In [139…
```
#Count of number of missing(Nan) values in each column

df.isna().sum()
```

Out[139]:
```
Age                                0
Sex                                0
ChestPain                          0
Resting Blood Pressure (mm Hg)     0
Cholestrol (mg/dl)                 0
Fasting Blood Sugar > 120 mg/dl    0
Rest ECG                           0
Maximum Heart Rate                 0
Exercise Induced Angina            0
Previous Peak                      0
Slope                              0
Thal                               0
dtype: int64
```

In [ ]:

In [140…
```
#Array containing all the unique values present in the 'Age' column

Unique_Age = df['Age'].unique()

print("Unique Age : ", Unique_Age)
```

```
Unique Age :  [63 37 41 56 57 44 52 54 48 49 64 58 50 66 43 69 59 42 61 40 71 51 6
5 53
 46 45 39 47 62 34 35 29 55 60 67 68 74 76 70 38 77]
```

In [ ]:

In [141…
```
#Number of unique values in the 'Age' column:

Count_Age = df['Age'].nunique()

print("Count of Unique Age : ", Count_Age)
```

```
Count of Unique Age :  41
```

In [ ]:

In [142…
```
#Statistical summary of the 'Age' column:

df['Age'].describe()
```

Out[142]:
```
count    303.000000
mean      54.366337
std        9.082101
min       29.000000
25%       47.500000
50%       55.000000
75%       61.000000
max       77.000000
Name: Age, dtype: float64
```

In [ ]:

In [143…

```
#Bins for various age categories:
young = df['Age'].quantile(0.25) #find the 25th percentile (Q1) of the 'Age' column

mid_age = df['Age'].median() #find the median value in the 'Age' column

senior = df['Age'].quantile(0.75) #find the 75th percentile (Q3) value in the 'Age'

elder = df['Age'].max() #find the maximum (highest) value in the 'Age' column
```

In [145…

```
# Define the labels for each bin:
bin_labels = ["Young_Adult", "Middle_Aged" , "Senior_Citizen", "Elderly"]

bins = [0, young, mid_age, senior, elder]
```

In [146…

```
# Create a new column 'Age_Category' based on the bins and labels

df['Age_Category'] = pd.cut(df['Age'], labels = bin_labels, bins = bins)
```

In [147…

```
# Display the DataFrame with the new 'Age_Category' column

print(df)
```

```
     Age  Sex     ChestPain  Resting Blood Pressure (mm Hg)  \
0     63    1   Non-Typical                             145
1     37    1    Nonanginal                             130
2     41    0  Asymptomatic                             130
3     56    1  Asymptomatic                             120
4     57    0       Typical                             120
..   ...  ...           ...                             ...
298   57    0       Typical                             140
299   45    1   Non-Typical                             110
300   68    1       Typical                             144
301   57    1       Typical                             130
302   57    0  Asymptomatic                             130

     Cholestrol (mg/dl)  Fasting Blood Sugar > 120 mg/dl  Rest ECG  \
0                   233                               1         0
1                   250                               0         1
2                   204                               0         0
3                   236                               0         1
4                   354                               0         1
..                  ...                             ...       ...
298                 241                               0         1
299                 264                               0         1
300                 193                               1         1
301                 131                               0         1
302                 236                               0         0

     Maximum Heart Rate  Exercise Induced Angina  Previous Peak  Slope  Thal  \
0                   150                        0            2.3      0     1
1                   187                        0            3.5      0     2
2                   172                        0            1.4      2     2
3                   178                        0            0.8      2     2
4                   163                        1            0.6      2     2
..                  ...                      ...            ...    ...   ...
298                 123                        1            0.2      1     3
299                 132                        0            1.2      1     3
300                 141                        0            3.4      1     3
301                 115                        1            1.2      1     3
302                 174                        0            0.0      1     2

       Age_Category
0           Elderly
1       Young_Adult
2       Young_Adult
3    Senior_Citizen
4    Senior_Citizen
..              ...
298  Senior_Citizen
299     Young_Adult
300         Elderly
301  Senior_Citizen
302  Senior_Citizen

[303 rows x 13 columns]
```

In [148…

```
# Display the table with 'Age' and  'Age_Category' column
```

```
df[['Age', 'Age_Category']]
```

Out[148]:

	Age	Age_Category
0	63	Elderly
1	37	Young_Adult
2	41	Young_Adult
3	56	Senior_Citizen
4	57	Senior_Citizen
...	...	...
298	57	Senior_Citizen
299	45	Young_Adult
300	68	Elderly
301	57	Senior_Citizen
302	57	Senior_Citizen

303 rows × 2 columns

In [149…

```
# Display the table with 'Age' and  'Age_Category'  Top 10 values

df[['Age', 'Age_Category']].head(10)
```

Out[149]:

	Age	Age_Category
0	63	Elderly
1	37	Young_Adult
2	41	Young_Adult
3	56	Senior_Citizen
4	57	Senior_Citizen
5	57	Senior_Citizen
6	56	Senior_Citizen
7	44	Young_Adult
8	52	Middle_Aged
9	57	Senior_Citizen

In [150…

```
# Display the table with 'Age' and  'Age_Category'  Bottom 10 values

df[['Age', 'Age_Category']].tail(10)
```

Out[150]:

	Age	Age_Category
293	67	Elderly
294	44	Young_Adult
295	63	Elderly
296	63	Elderly
297	59	Senior_Citizen
298	57	Senior_Citizen
299	45	Young_Adult
300	68	Elderly
301	57	Senior_Citizen
302	57	Senior_Citizen

In [151…

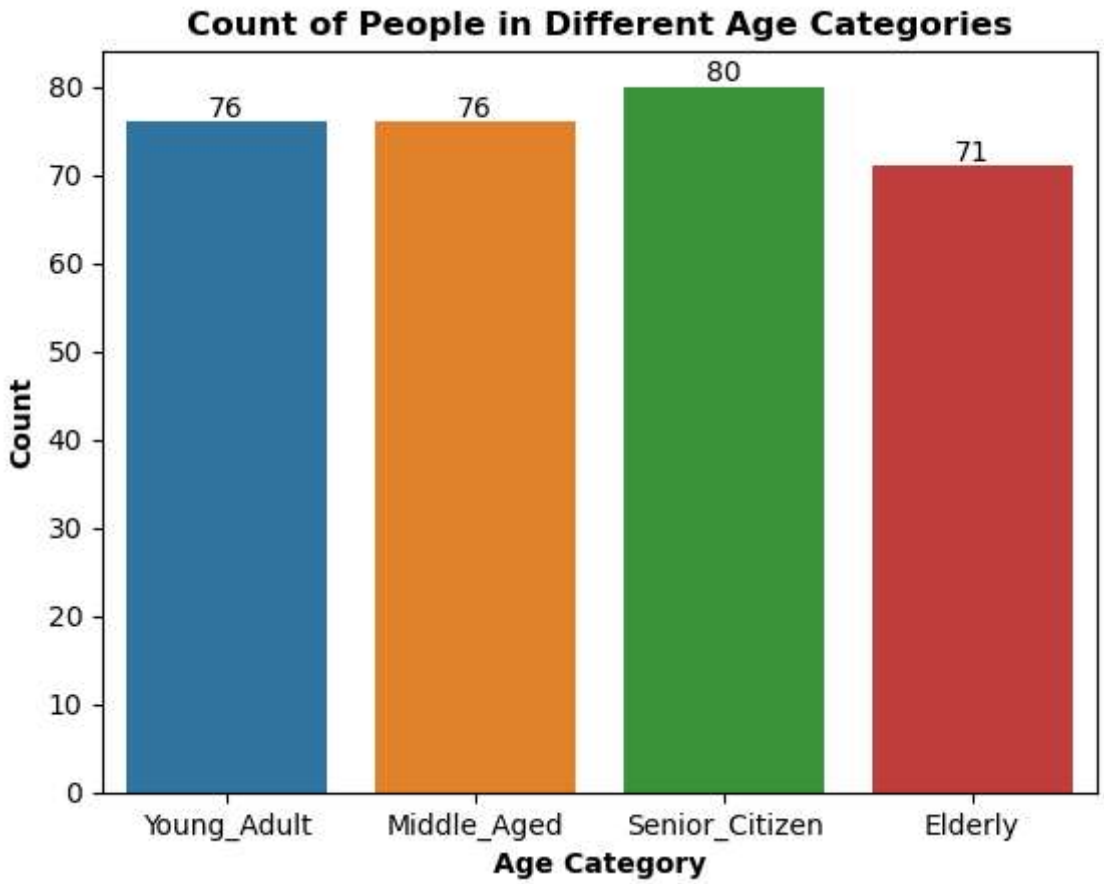
```
#Creating a visualization on Age_Category Column

fig = sns.countplot(x = "Age_Category" , data = df)


# Add count labels on top of each bar
for bars in fig.containers:
    fig.bar_label(bars)

# Set plot labels and title
plt.xlabel('Age Category', fontweight = 'bold')
plt.ylabel('Count', fontweight = 'bold')
plt.title('Count of People in Different Age Categories', fontweight = 'bold')

# Show the plot
plt.show()
```



In [ ]:

In [152…

```
#Adding a new column 'Sex_Category' based on the values in the 'Sex' column

df['Sex_Category'] = np.where(df['Sex']==1, 'Male', 'Female')

#It assigns 'Male' to the 'Sex_Category' column if the corresponding value in the '
```

In [153…

```
#Adding a new column 'ExAng_Category' based on the values in the 'Exercise Induced

df['ExAng_Category'] = np.where(df['Exercise Induced Angina'] == 1, 'Yes', 'No')

#It assigns 'Yes' to the 'ExAng_Category' column if the corresponding value in the
```

In [154…

```
df.head()
```

Out[154]:

	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak	Slo
0	63	1	Non-Typical	145	233	1	0	150	0	2.3	
1	37	1	Nonanginal	130	250	0	1	187	0	3.5	
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4	
3	56	1	Asymptomatic	120	236	0	1	178	0	0.8	
4	57	0	Typical	120	354	0	1	163	1	0.6	

In [ ]:

In [155…

```
#Creating a visualization on ChestPain Column  at different Age_Categories

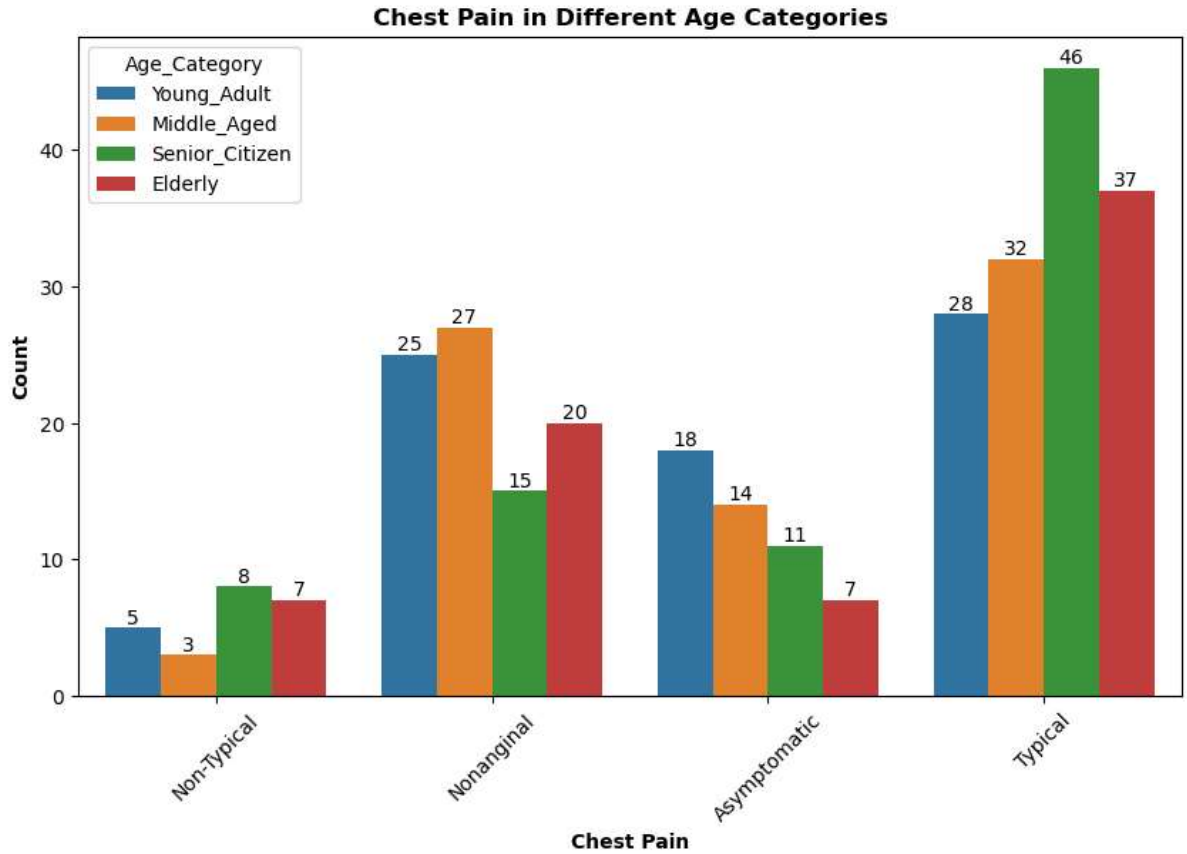
# Set the figure size using plt.figure
plt.figure(figsize=(10, 6))

fig = sns.countplot(x = 'ChestPain', hue = 'Age_Category' , data = df)


# Add count labels on top of each bar
for bars in fig.containers:
    fig.bar_label(bars)

# Set plot labels and title
plt.xlabel('Chest Pain', fontweight = 'bold')
plt.xticks(rotation = 45)
plt.ylabel('Count', fontweight = 'bold')
plt.title('Chest Pain in Different Age Categories', fontweight = 'bold')

# Show the plot
plt.show()
```



In [ ]:
```
#Typical - Characteristic chest pain associated with heart-related issues like a he

#Asymptomatic - Absence of chest pain, even in the presence of heart-related condit

#Nonanginal - Chest pain that is not related to the heart and does not fit the typi

#Non-Typical - Chest pain with atypical characteristics, not fitting the classic he
```

In [ ]:

In [ ]:
```
#Resting BP - BP when person at rest and not engaged in any physical activity or st
```

In [156…
```
#Creating a visualization on ChestPain Column with respect to Resting Blood Pressur

# Set the figure size using plt.figure
plt.figure(figsize=(10, 6))

fig = sns.boxplot(x = 'ChestPain', y = 'Resting Blood Pressure (mm Hg)' , data = df

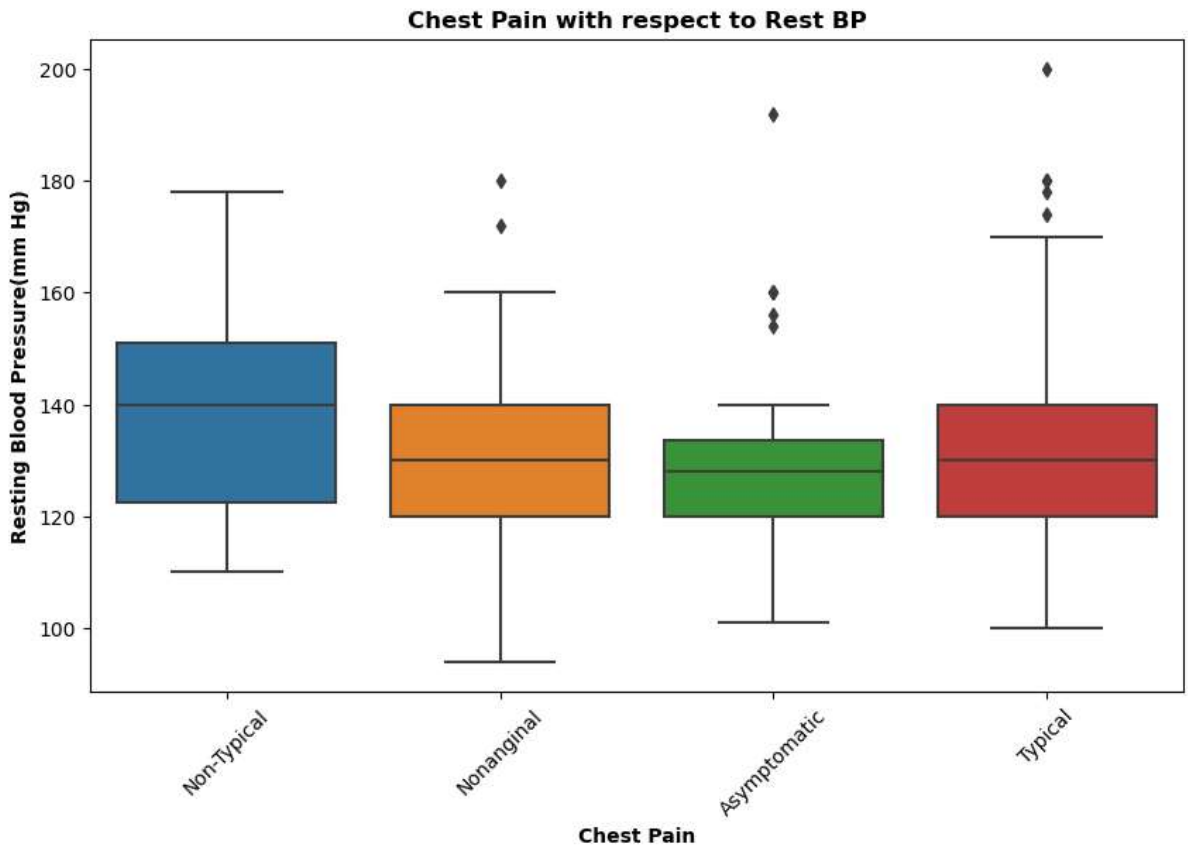
# Calculate the count for each category
count_data = df.groupby(['Resting Blood Pressure (mm Hg)', 'ChestPain']).size().res



# Set plot labels and title
plt.xlabel('Chest Pain', fontweight = 'bold')
plt.xticks(rotation = 45)
plt.ylabel('Resting Blood Pressure(mm Hg)', fontweight = 'bold')
```

```
plt.title('Chest Pain with respect to Rest BP', fontweight = 'bold')

# Show the plot
plt.show()
```



In [ ]:

In [157…

```
#Creating a visualization on ChestPain Column with respect to Sex_Category

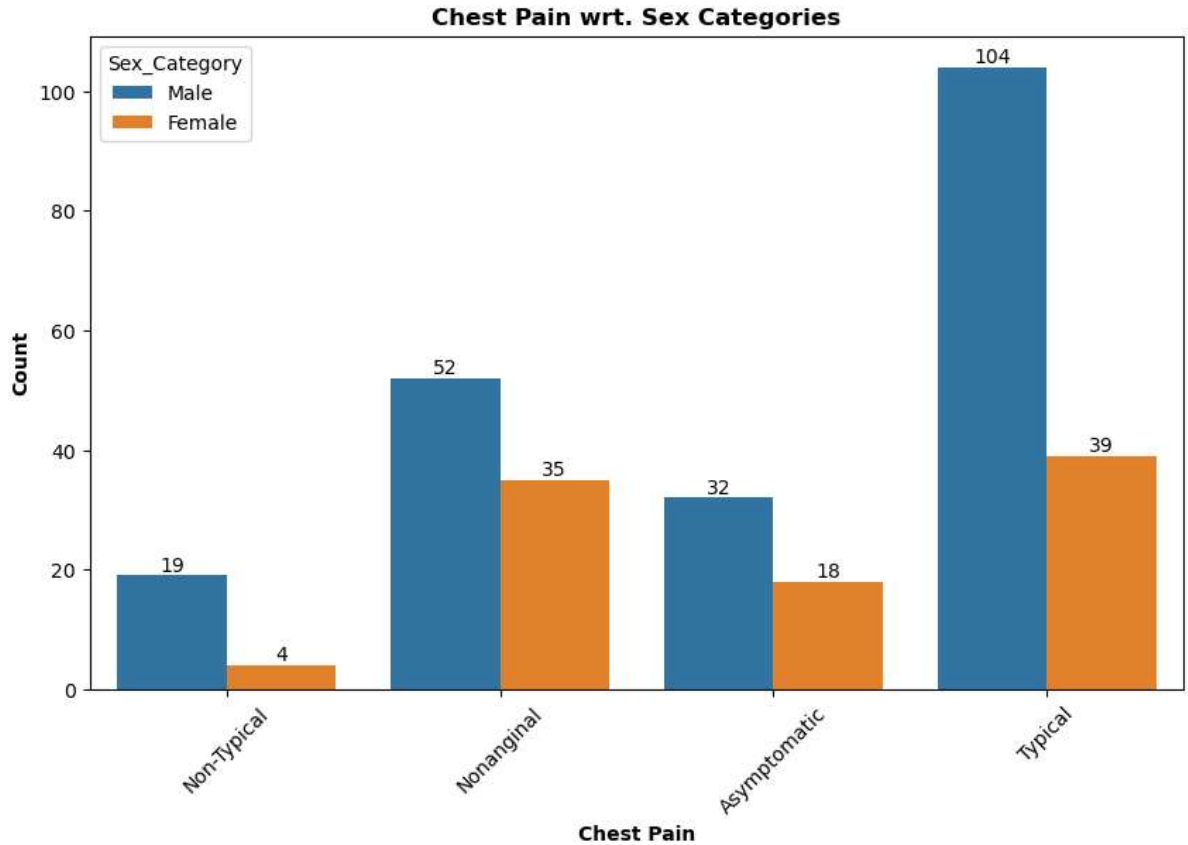
plt.figure(figsize = (10,6))

fig = sns.countplot(x = 'ChestPain', hue = 'Sex_Category', data=df)

# Add count labels on top of each bar
for bars in fig.containers:
    fig.bar_label(bars)

# Set plot labels and title
plt.xlabel('Chest Pain', fontweight = 'bold')
plt.xticks(rotation = 45)
plt.ylabel('Count', fontweight = 'bold')
plt.title('Chest Pain wrt. Sex Categories', fontweight = 'bold')

# Show the plot
plt.show()
```



In [ ]:

In [158…

```
#Creating a visualization on Maximum Heart Rate wrt Sex Category
plt.figure(figsize = (10,6))

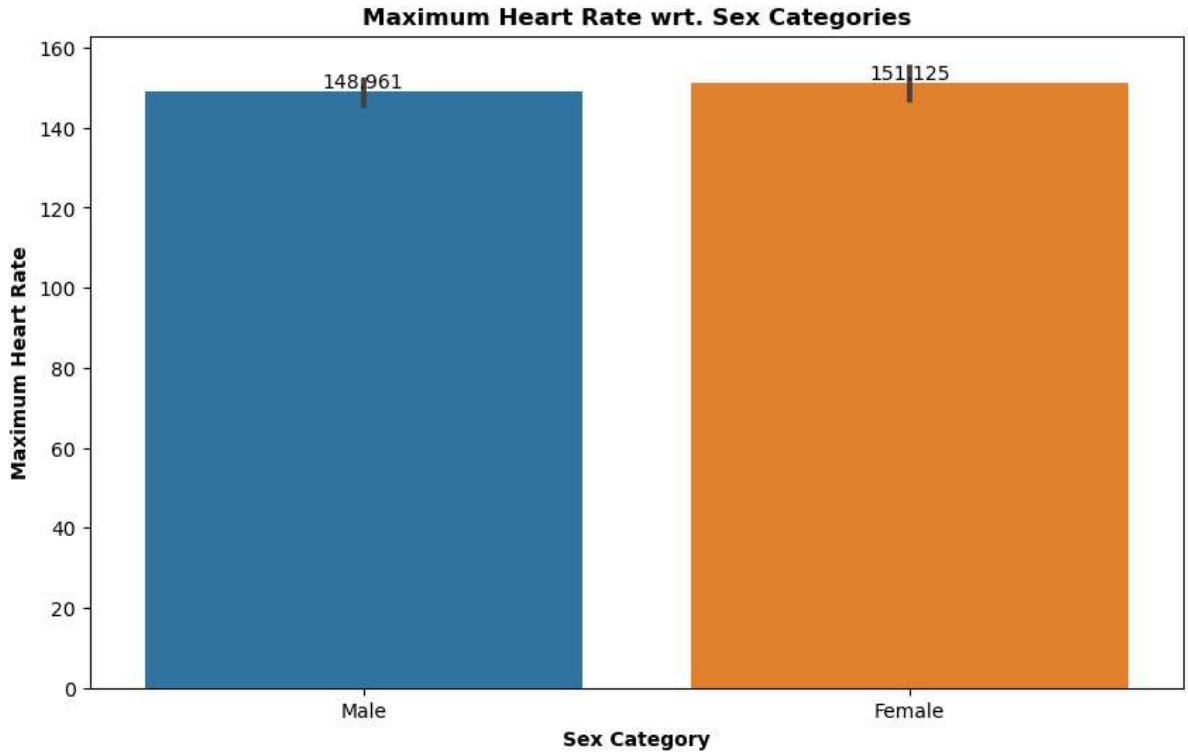
fig = sns.barplot(y = 'Maximum Heart Rate', x = 'Sex_Category' , data = df)


# Add count labels on top of each bar
for bars in fig.containers:
    fig.bar_label(bars)

# Set plot labels and title
plt.xlabel('Sex Category', fontweight = 'bold')
plt.ylabel('Maximum Heart Rate', fontweight = 'bold')
plt.title('Maximum Heart Rate wrt. Sex Categories', fontweight = 'bold')



# Show the plot
plt.show()
```



In [ ]:

In [159…

```
#Summary statistics for non-numeric columns

df.describe(exclude = [np.number])
```

Out[159]:

	ChestPain	Age_Category	Sex_Category	ExAng_Category
count	303	303	303	303
unique	4	4	2	2
top	Typical	Senior_Citizen	Male	No
freq	143	80	207	204

In [160…

```
#Visualizations of above data

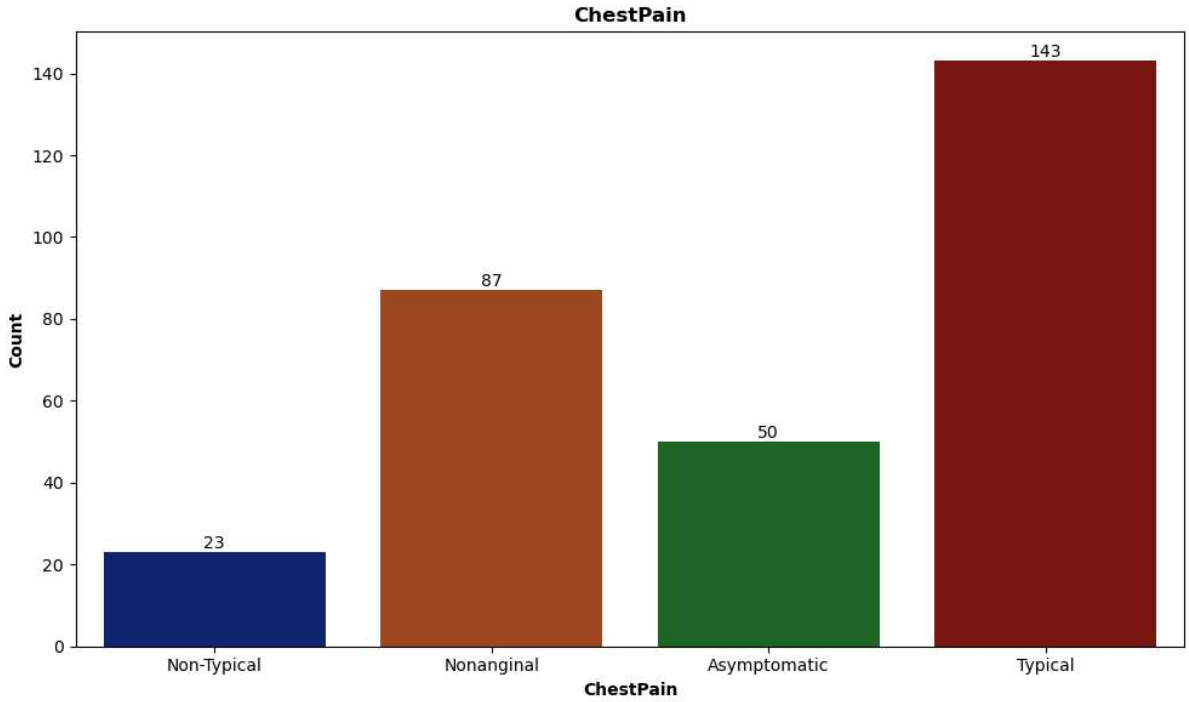
columns = ['ChestPain', 'Age_Category', 'Sex_Category', 'ExAng_Category']

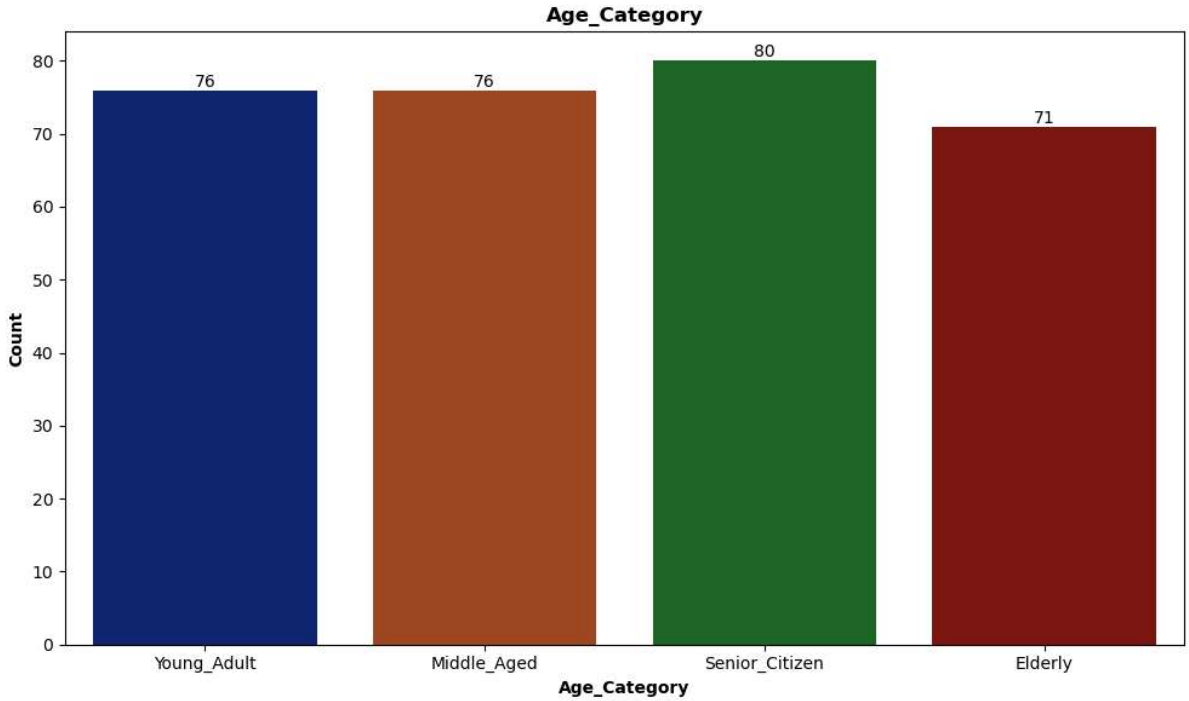
def plot_cat_count():
    for c in columns :
        plt.figure(figsize=(10, 6))
        fig = sns.countplot(x = c, data = df, palette='dark')
        plt.title(c, fontweight = 'bold')
        plt.ylabel('Count', fontweight = 'bold')
        plt.xlabel(c, fontweight = 'bold')
        plt.tight_layout()

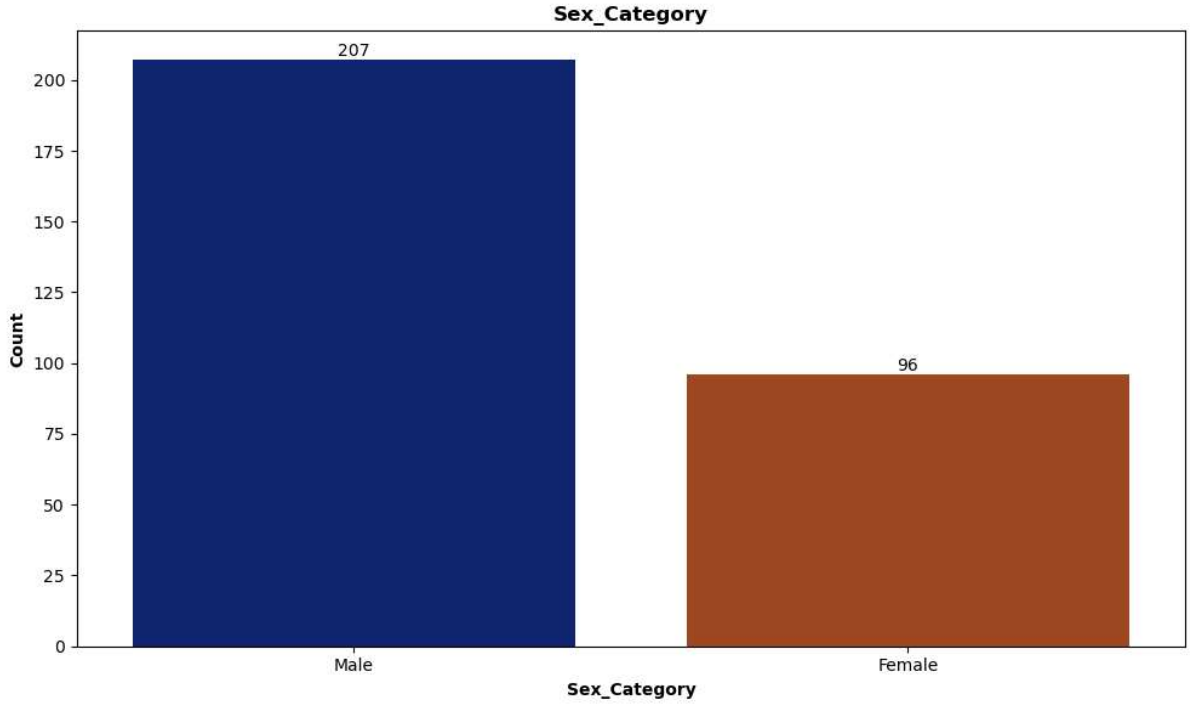
        # Add count labels on top of each bar
        for bars in fig.containers:
                fig.bar_label(bars)
```

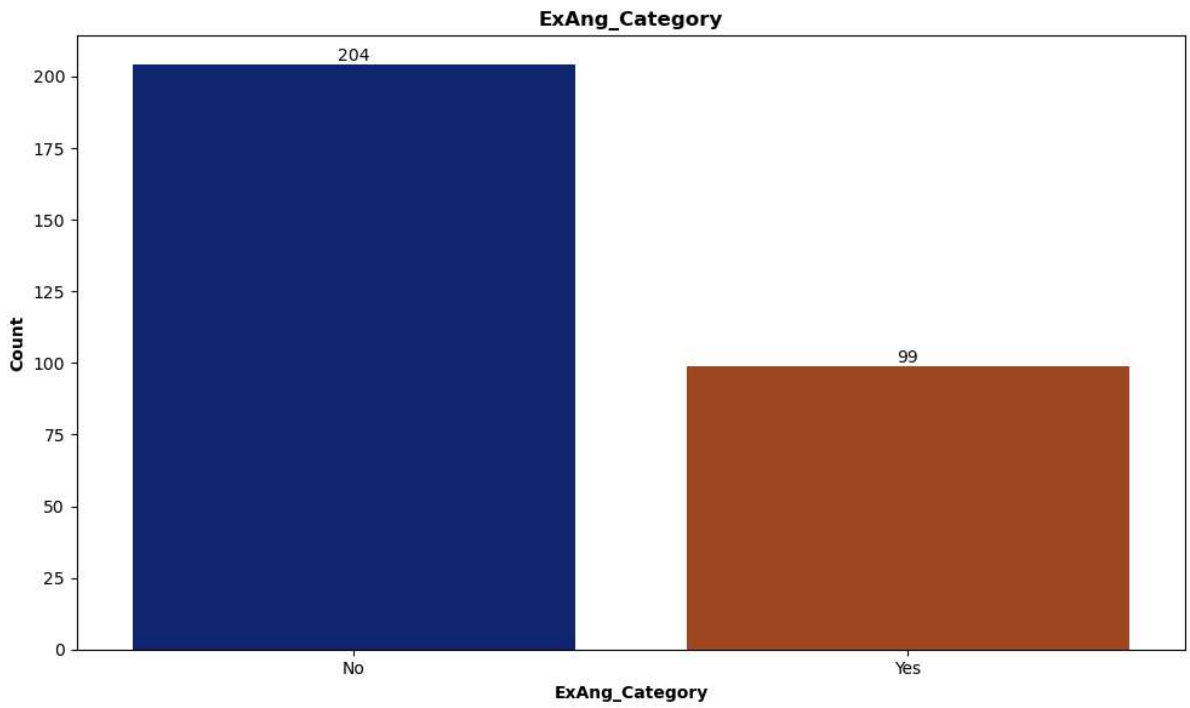
```
        plt.show()

plot_cat_count()
```









In [ ]:

In [202…

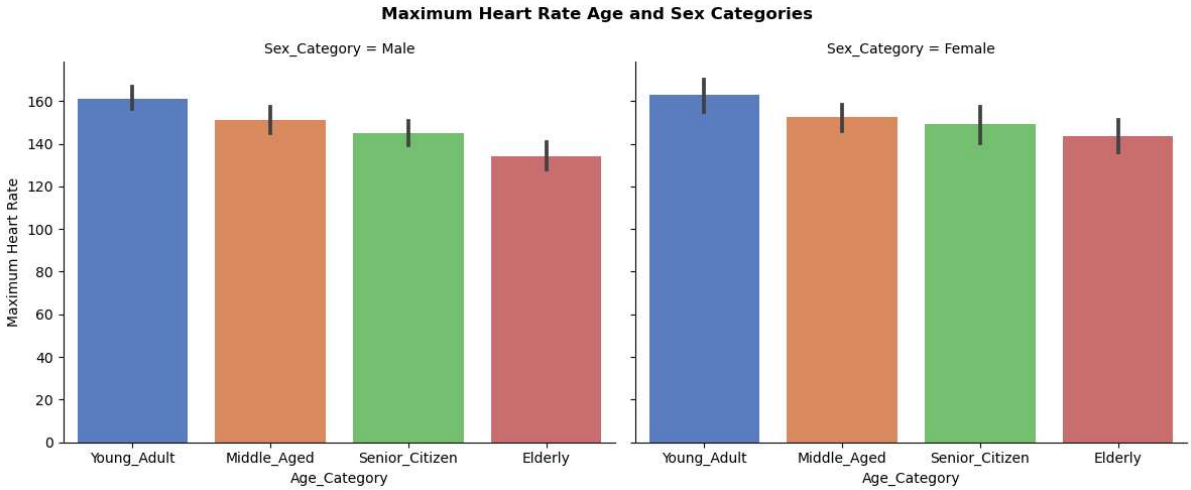
```
#Creating visualization of Maximum Heart Rate wrt Age Category for different Sex Ca
plt.figure(figsize = (10,10))
fig = sns.catplot(x='Age_Category', y='Maximum Heart Rate', data=df, col='Sex_Categ

plt.suptitle('Maximum Heart Rate Age and Sex Categories', fontweight='bold')

plt.tight_layout()

plt.show()
```

```
<Figure size 1000x1000 with 0 Axes>
```



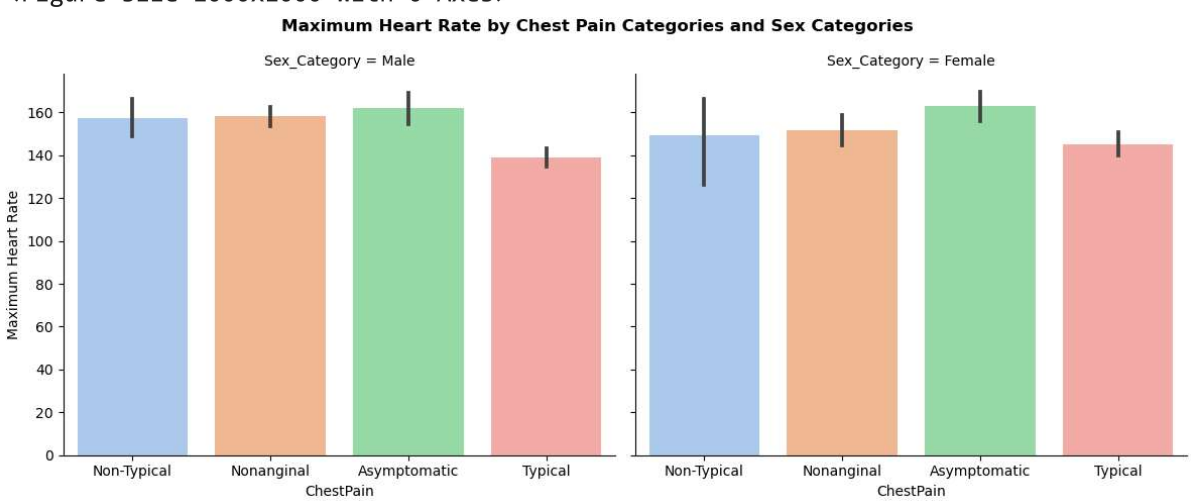
In [200…

```
#Creating visualization of Maximum Heart Rate wrt Chest pain for different Sex Cate

plt.figure(figsize = (10,10))
sns.catplot(x='ChestPain', y='Maximum Heart Rate', data=df, kind='bar', col='Sex_Ca
plt.suptitle('Maximum Heart Rate by Chest Pain Categories and Sex Categories', font

plt.tight_layout()
plt.show()
```

```
<Figure size 1000x1000 with 0 Axes>
```

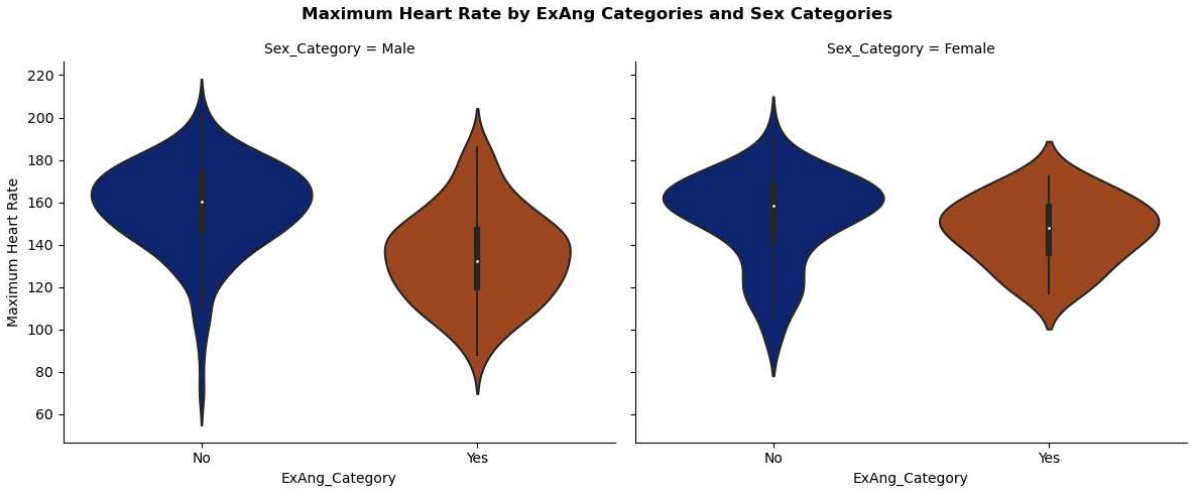


In [201…

```
#Creating visualization of Maximum Heart Rate wrt ExAng for different Sex Category

sns.catplot(x='ExAng_Category', y='Maximum Heart Rate', data=df, kind='violin', col
plt.suptitle('Maximum Heart Rate by ExAng Categories and Sex Categories', fontweigh

plt.tight_layout()
plt.show()
```



In [206…

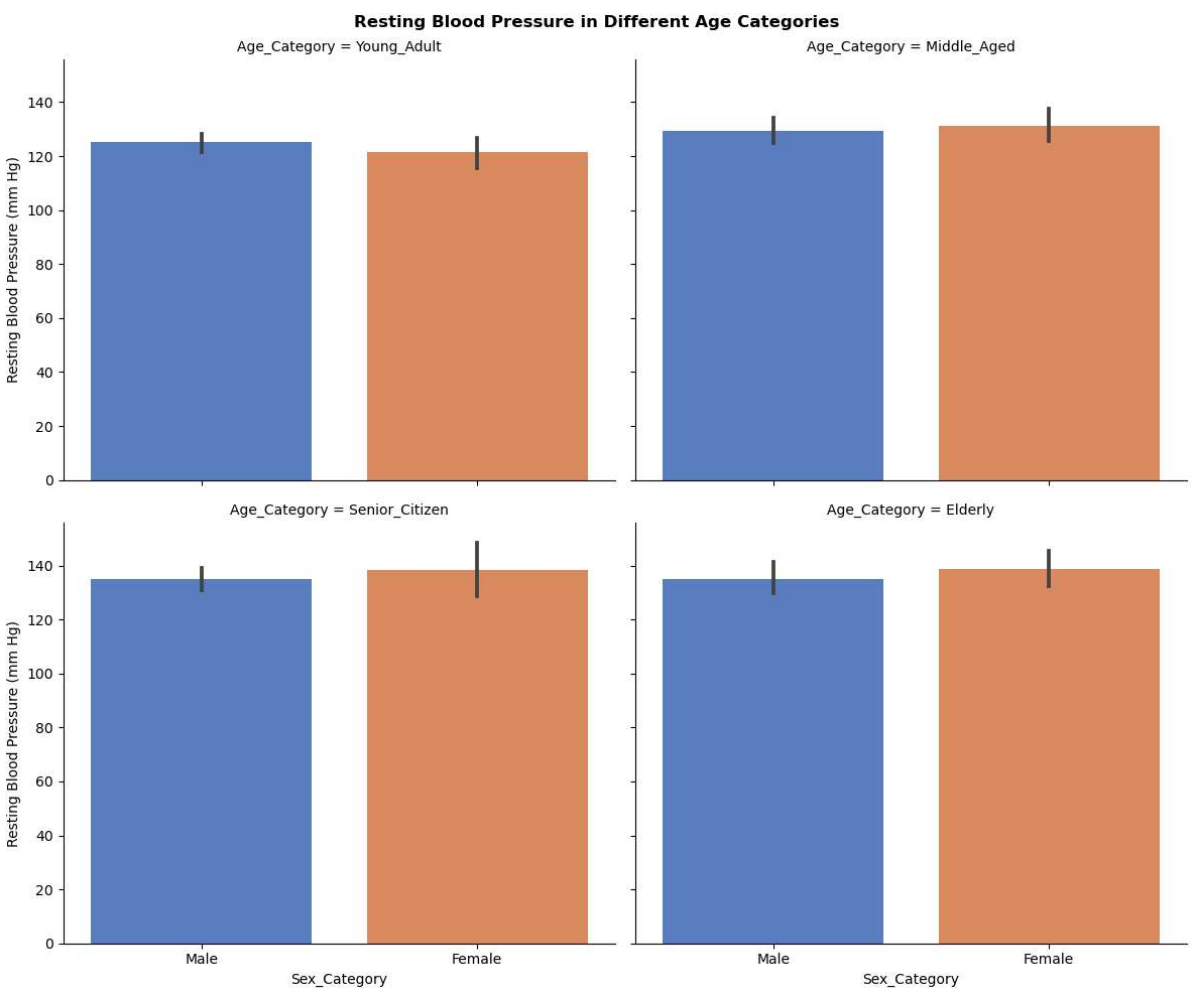
```
#Creating visualization of Rest BP wrt Sex Category for different Age Category

fig = sns.catplot(x='Sex_Category', y='Resting Blood Pressure (mm Hg)', data=df, co

plt.suptitle('Resting Blood Pressure in Different Age Categories', fontweight='bold

plt.tight_layout()

plt.show()
```



In [ ]:

In [209…

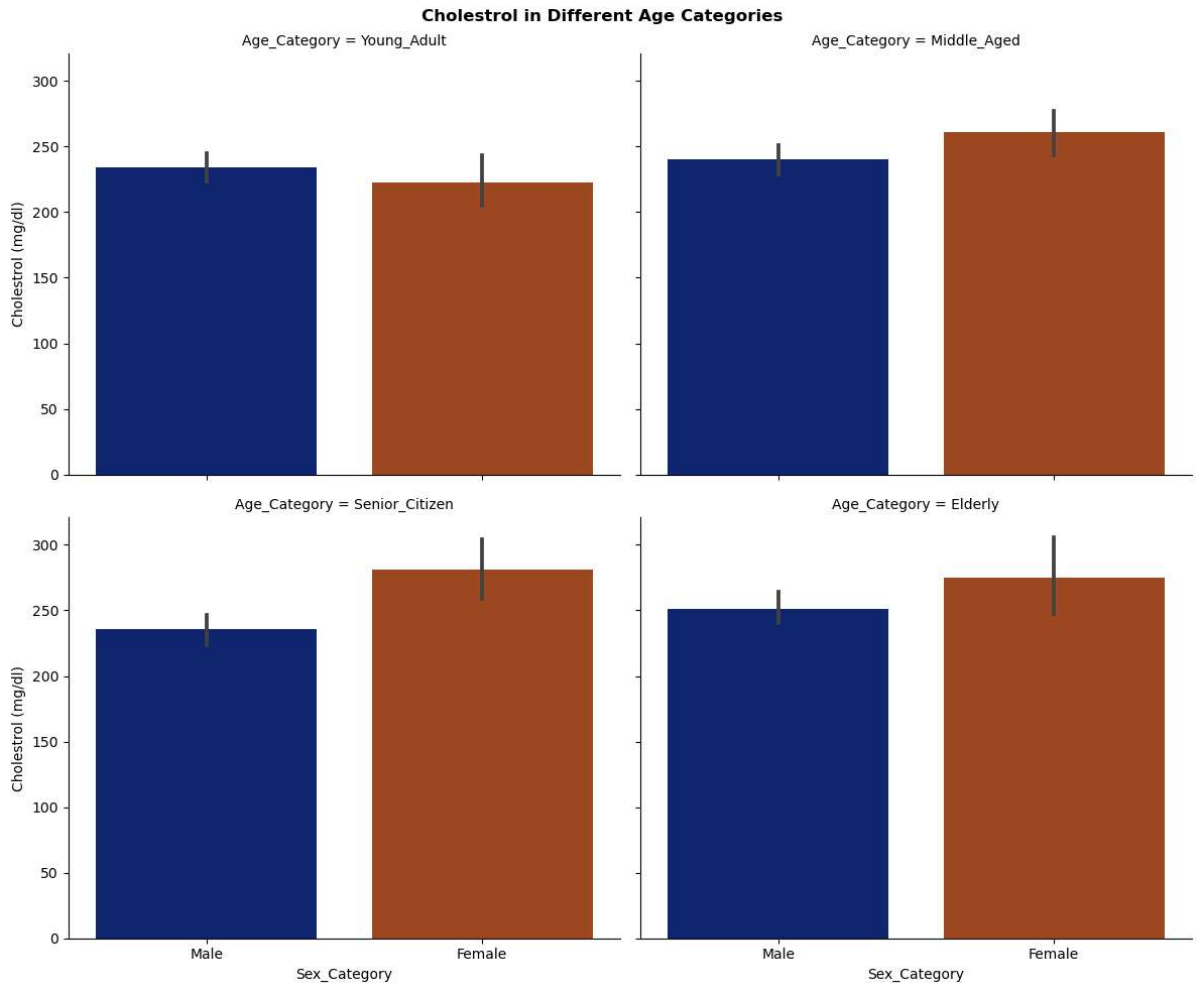
```
#Creating visualization of Cholestrol  wrt Sex Category for different Age Category

fig = sns.catplot(x='Sex_Category', y='Cholestrol (mg/dl)', data=df, col='Age_Categ

plt.suptitle('Cholestrol in Different Age Categories', fontweight='bold')

plt.tight_layout()

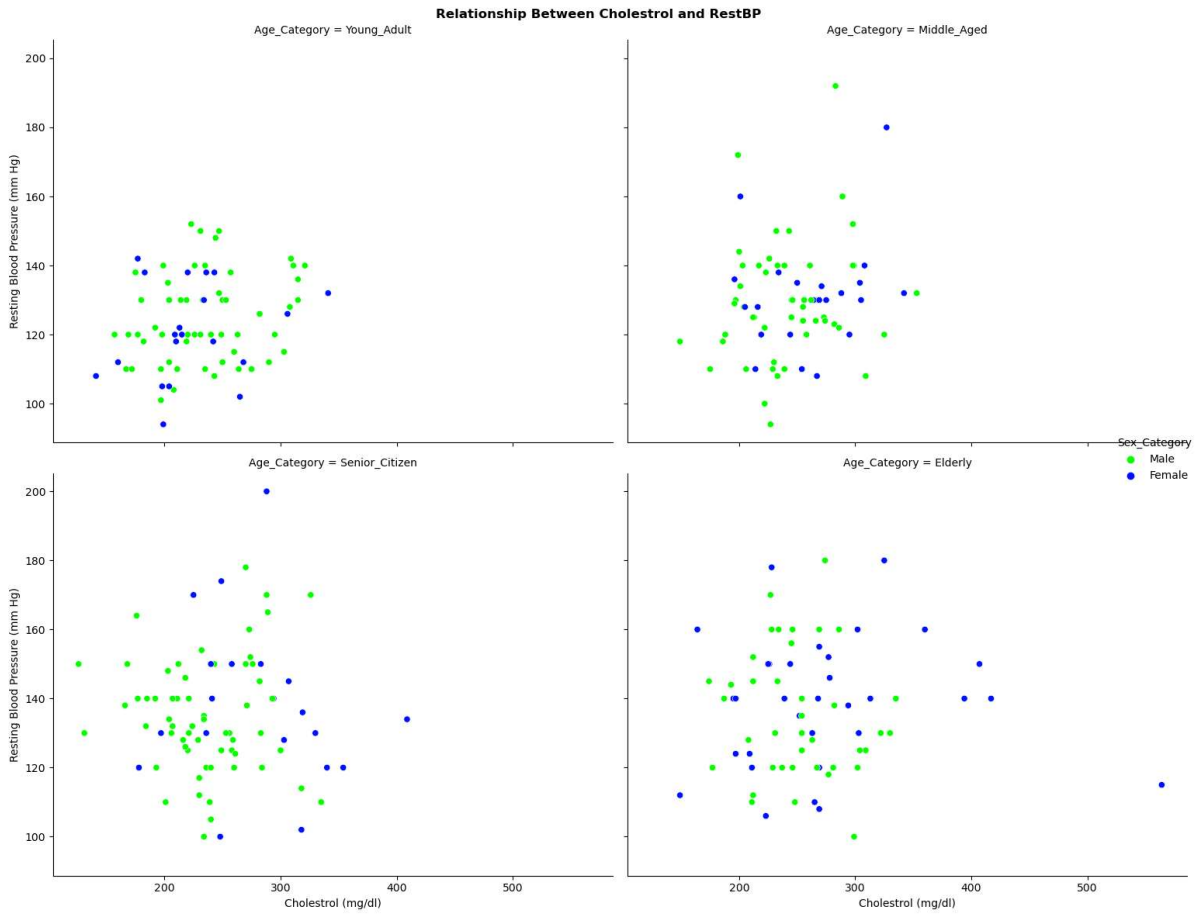
plt.show()
```



In [ ]:

In [223…

```
#Creating Visualization for Relationship Between Cholestrol and RestBP
sns.relplot(x='Cholestrol (mg/dl)', y='Resting Blood Pressure (mm Hg)', data=df, ki
plt.suptitle('Relationship Between Cholestrol and RestBP', fontweight='bold')
plt.tight_layout()
plt.show()
```



In [ ]:

In [ ]:
```
Conclusion from above visualizations:

1. Predominantly, both male and female individuals reported experiencing typical ch
   while a smaller proportion described non-typical symptoms.

2. On average, females exhibit a slightly higher heart rate than males.

3. The blood pressure of females shows a higher increase with each passing year com

4. Over the years, female cholesterol levels show a higher increase compared to mal
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