```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
df = pd.read_csv("heart.csv")
df
```

	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	'	Non-Typical	145	233	1	0	150	0	2.3
1	37	'	Nonanginal	130	250	0	1	187	0	3.5
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4
3	56	'	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	'	Non-Typical	110	264	0	1	132	0	1.2
300	68	'	Typical	144	193	1	1	141	0	3.4
301	57	'	Typical	130	131	0	1	115	1	1.2
302	57	0	Asymptomatic	130	236	0	0	174	0	0.0

```
#Top 10 Data
df.head(10)
```

	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	63	1	Non-Typical	145	233	'	0	150	0	2.3	
1	37	1	Nonanginal	130	250	0	'	187	0	3.5	
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4	
3	56	1	Asymptomatic	120	236	0	'	178	0	0.8	
4	57	0	Typical	120	354	0	'	163	'	0.6	
5	57	1	Typical	140	192	0	'	148	0	0.4	
6	56	0	Asymptomatic	140	294	0	0	153	0	1.3	
7	44	1	Asymptomatic	120	263	0	'	173	0	0.0	
8	52	1	Nonanginal	172	199	'	'	162	0	0.5	
9	57	1	Nonanginal	150	168	0	'	174	0	1.6	

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

	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	'	Nonanginal	152	212	0	0	150	0	0.8
294	44	'	Typical	120	169	0	1	144	1	2.8
295	63	'	Typical	140	187	0	0	144	1	4.0
296	63	0	Typical	124	197	0	1	136	1	0.0
297	59	'	Typical	164	176	1	0	90	0	1.0
298	57	0	Typical	140	241	0	1	123	1	0.2
299	45	'	Non-Typical	110	264	0	1	132	0	1.2
300	68	'	Typical	144	193	1	1	141	0	3.4
301	57	'	Typical	130	131	0	1	115	1	1.2
302	57	0	Asymptomatic	130	236	0	0	174	0	0.0

```
#Shape
df.shape
```

```
#No. of Rows = 303
#No. of Column = 12
```

```

```

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

```
#Checking Missing Values
df.isna()
```

	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

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

```

```

```
#Count of number of missing(Nan) values in each column

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

```
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
```

```
#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]
```

```
#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
```

```
#Statistical summary of the 'Age' column:

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

```
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
```

```
#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
```

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

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

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

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

```
# 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]
```

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

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

	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

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

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

	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

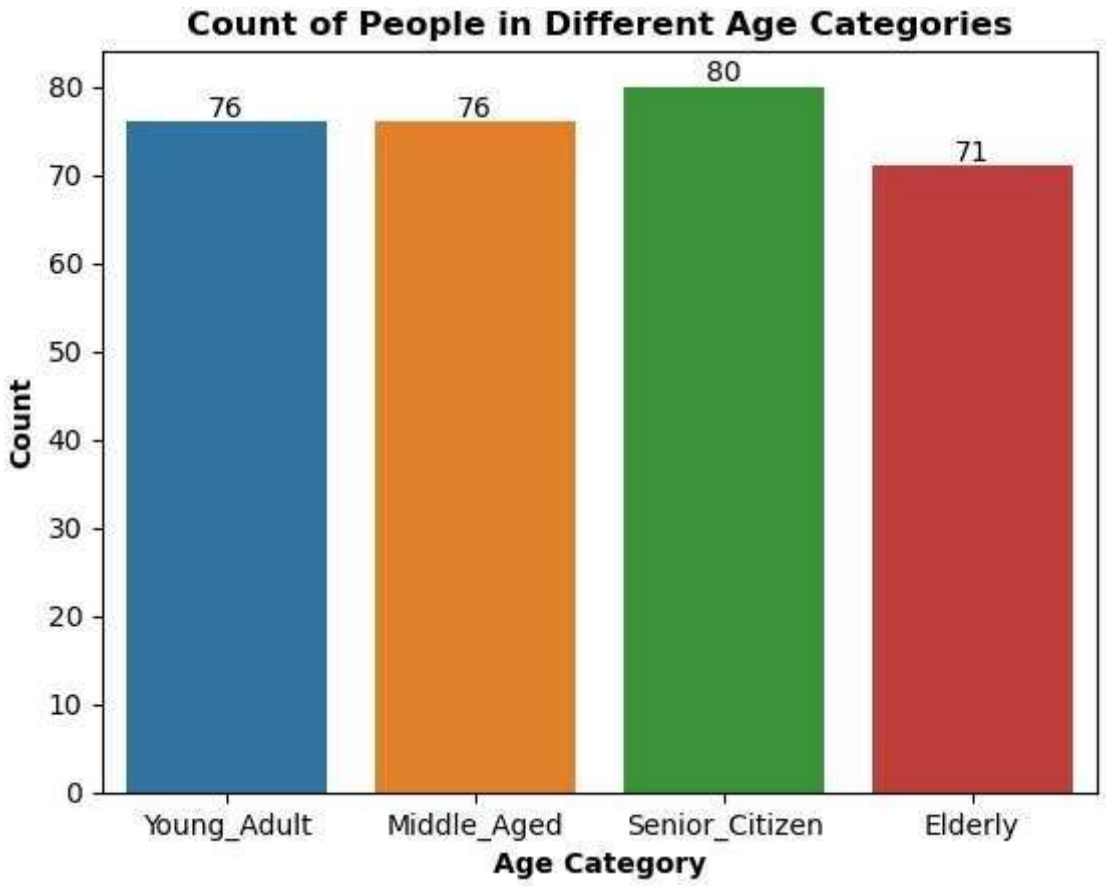
```
# Display the table with 'Age' and  'Age_Category'  Bottom 10 values

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()
```



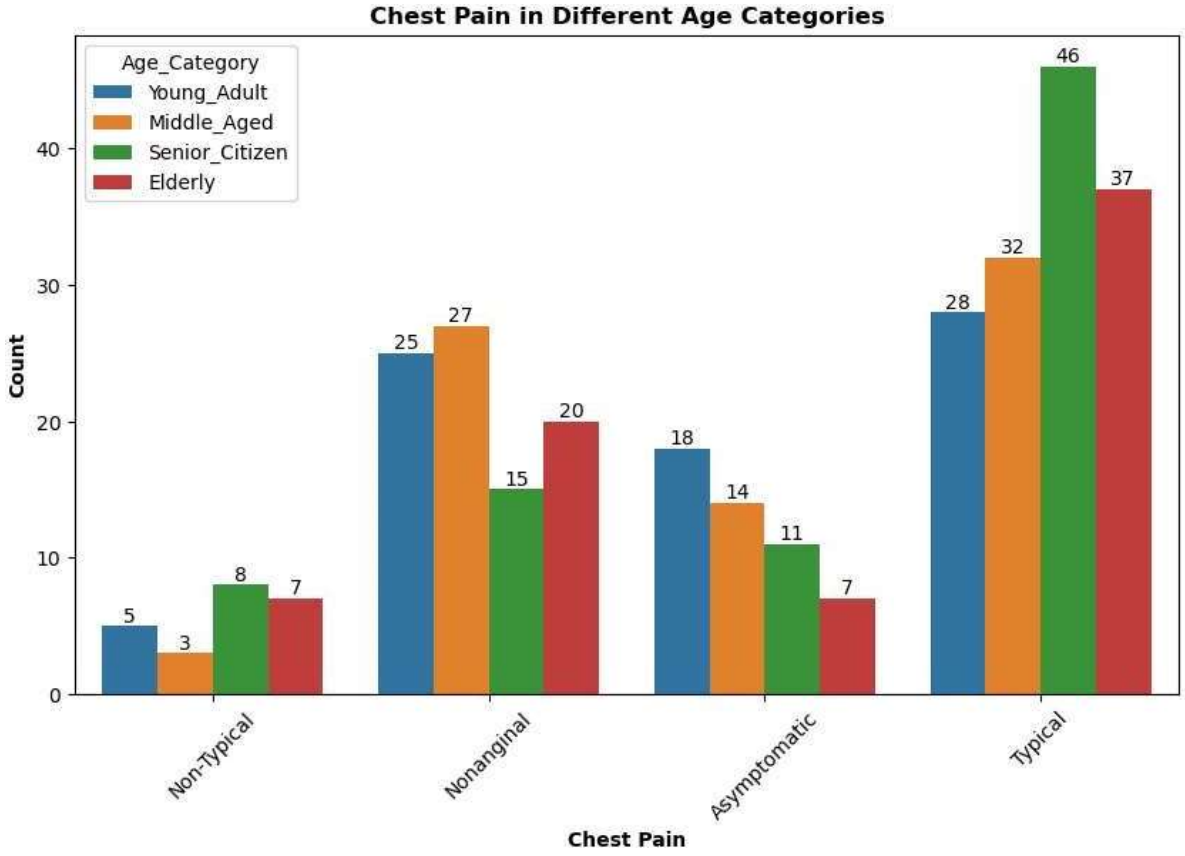

```
#Adding a new column 'Sex_Category' based on the values in the 'Sex' column

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

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

```
#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
```

```
df.head()
```

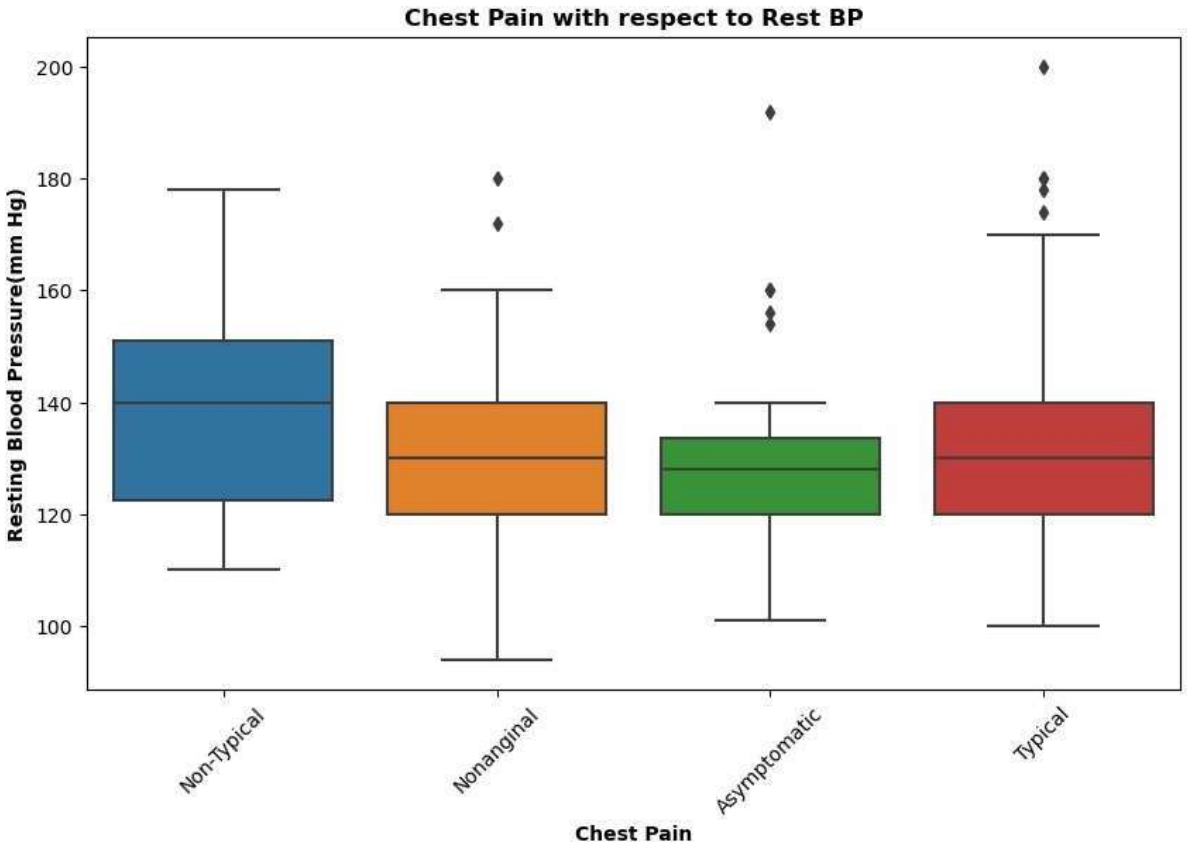
	Age	Sex	ChestPain	Resting Blood Pressure (mm Hg)	Cholestrol (mg/dl)	Fasting Blood Sugar > 120 mg/dl	Rest ECG	Maximum Heart Rate	Exercise Induced Angina	Previous Peak	Sl
0	63	1	Non-Typical	145	233	'	0	150	0	2.3	
1	37	1	Nonanginal	130	250	0	'	187	0	3.5	
2	41	0	Asymptomatic	130	204	0	0	172	0	1.4	
3	56	1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

```
#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()
```

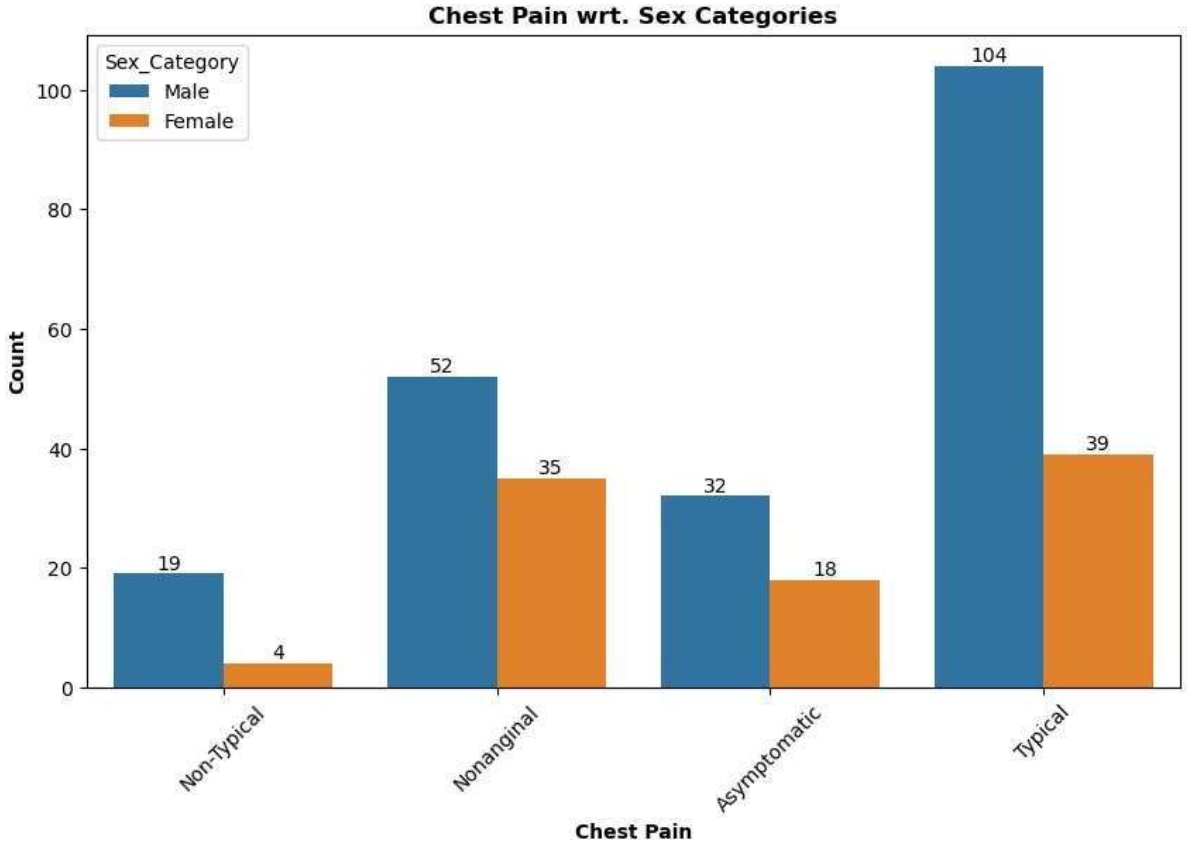



```
#Creating a visualization on ChestPain Column with respect to Resting Blood Pressur

# 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')
```

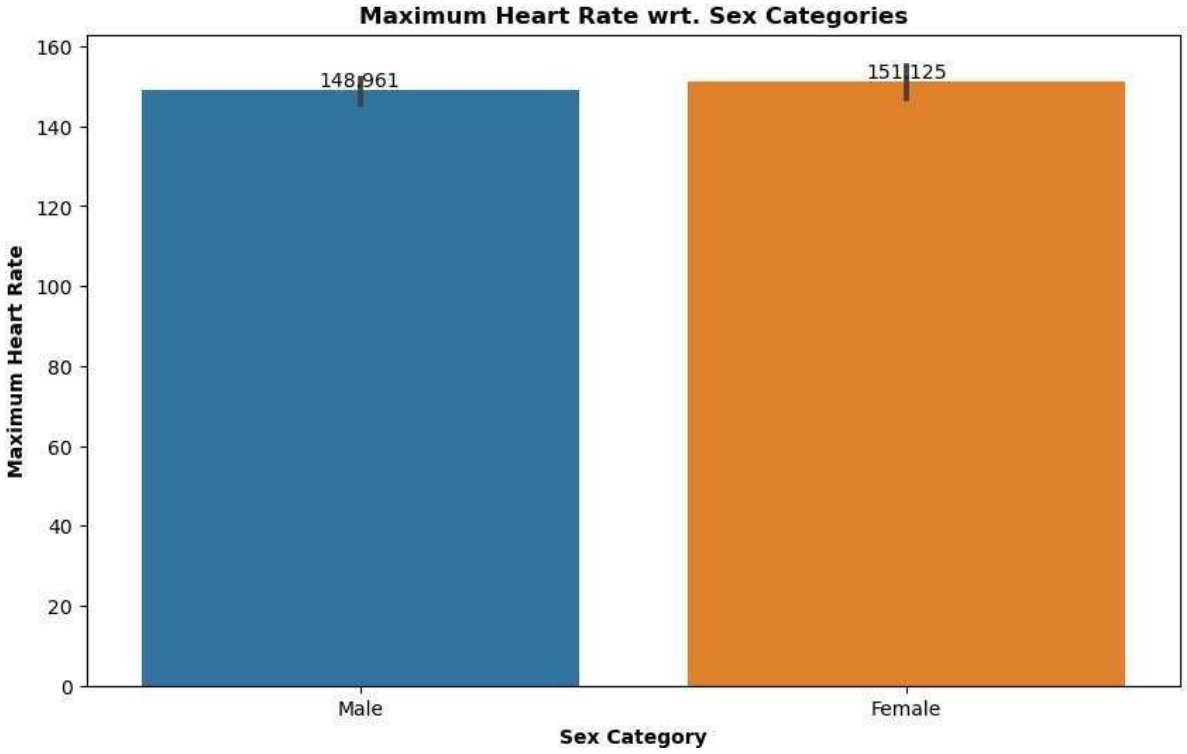
```
plt.title('Chest Pain with respect to Rest BP', fontweight = 'bold')

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




```
#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()
```




```
#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()
```

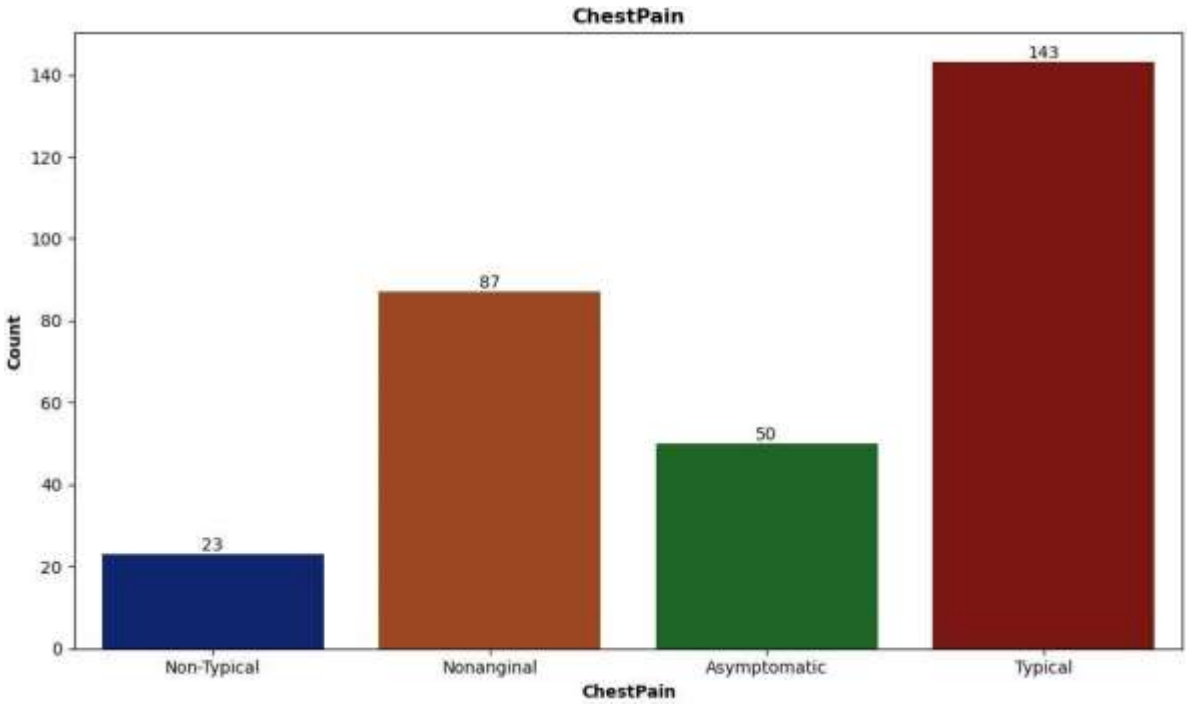


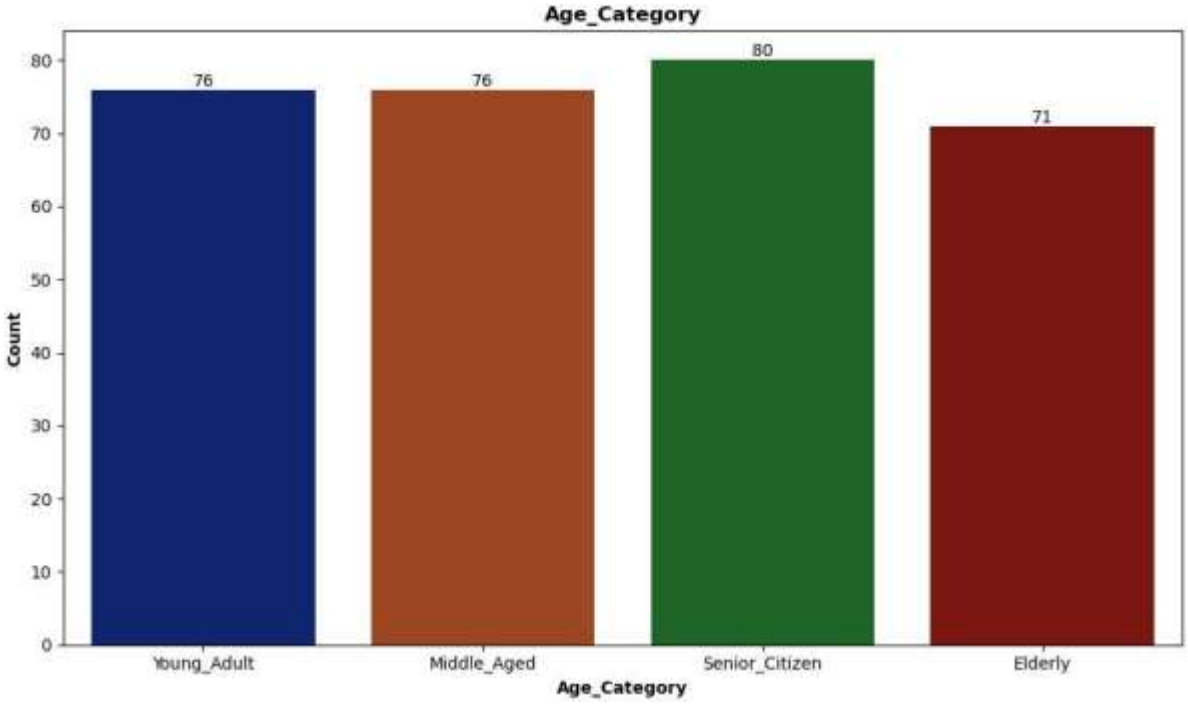

```
#Summary statistics for non-numeric columns

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

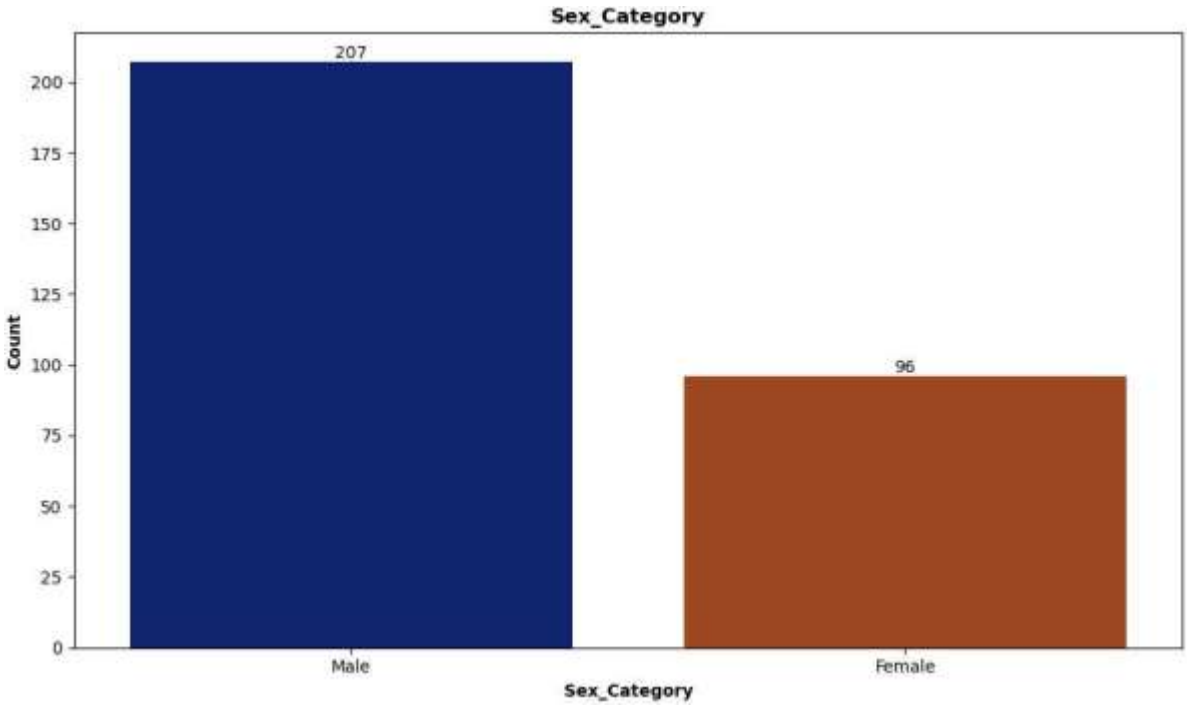
	ChestPain	Age Category	Sex Category	ExAng Category
count	303	303	303	303
unique	4	4	2	2
top	Typical	Senior_Citizen	Male	No
freq	143	80	207	204

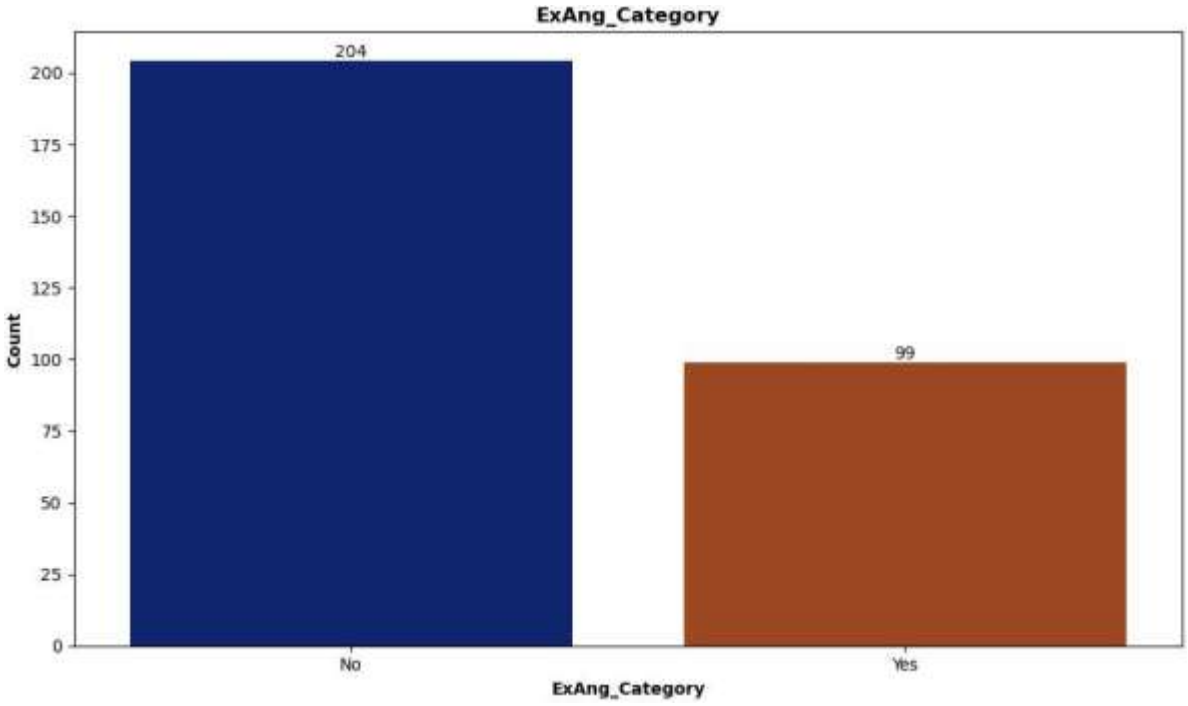
```
#Visualizations of above data

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()
```



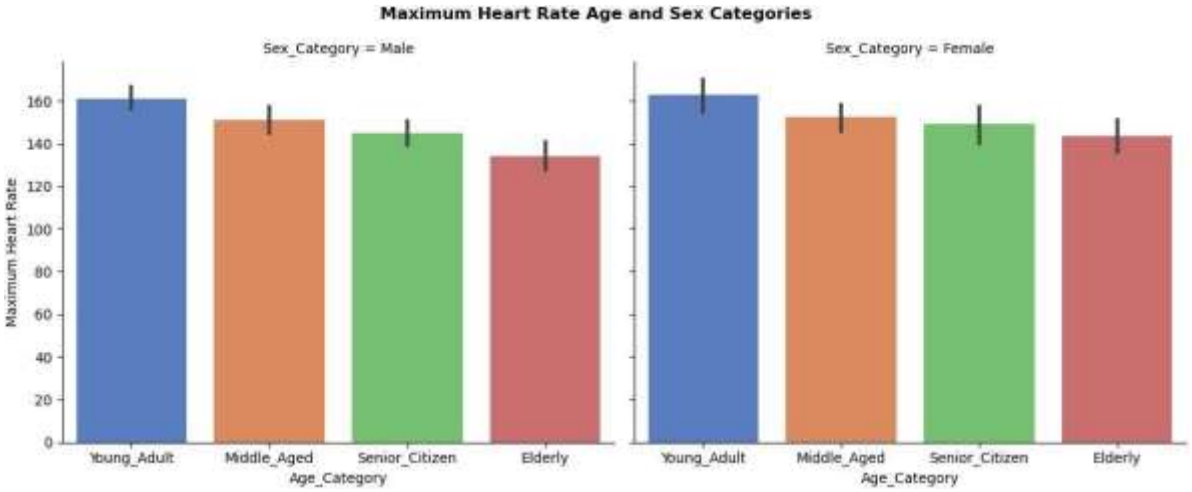






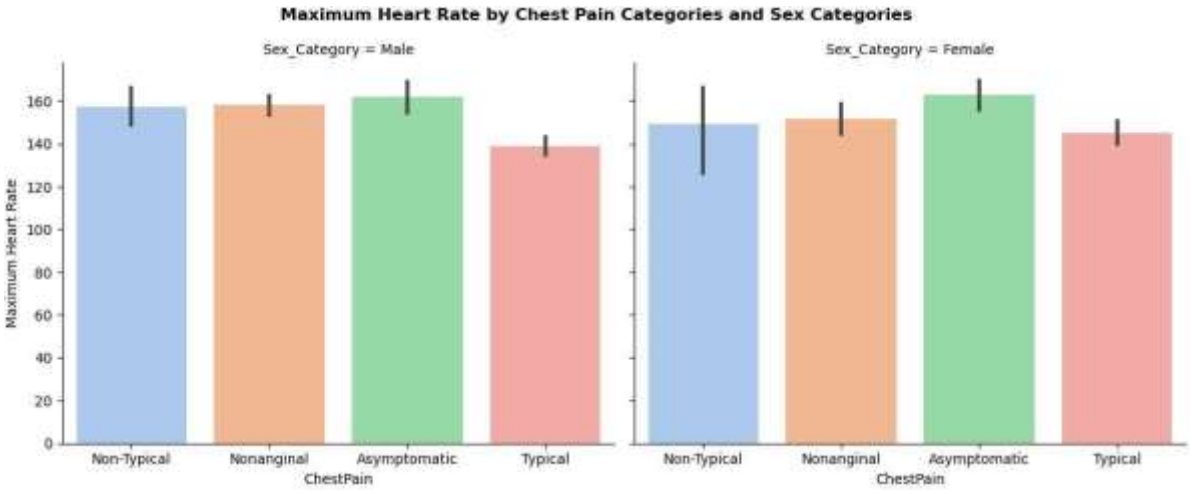

```
#Creating visualization of Maximum Heart Rate wrt Age Category for different Sex Ca
plt.figure(figsize = (10,10))
fig = sns.catplot(x='Age_Category', y='Maximum Heart Rate', data=df, col='Sex_Categ

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

plt.tight_layout()

plt.show()
```

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

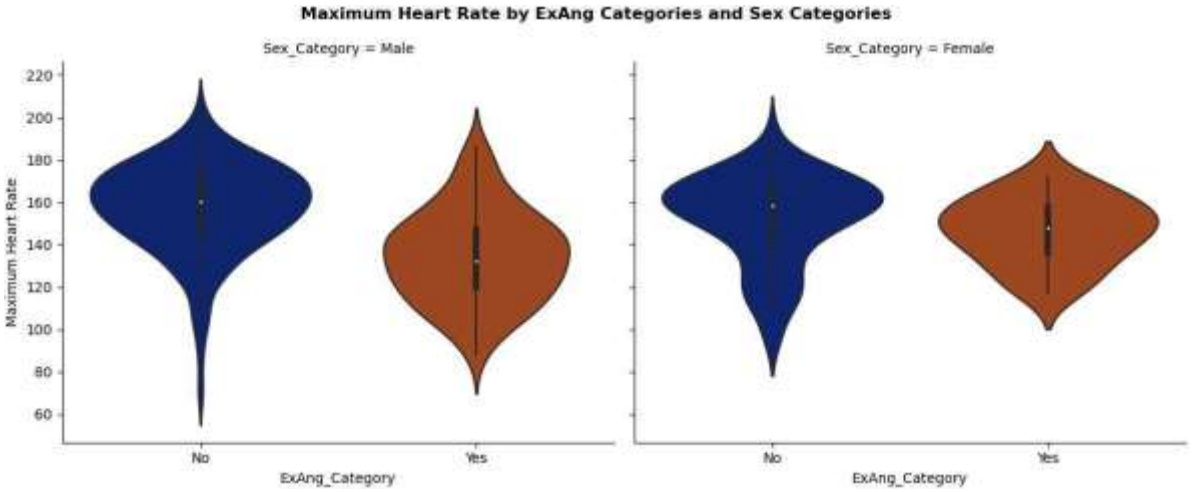



```
#Creating visualization of Maximum Heart Rate wrt Chest pain for different Sex Cate

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()
```

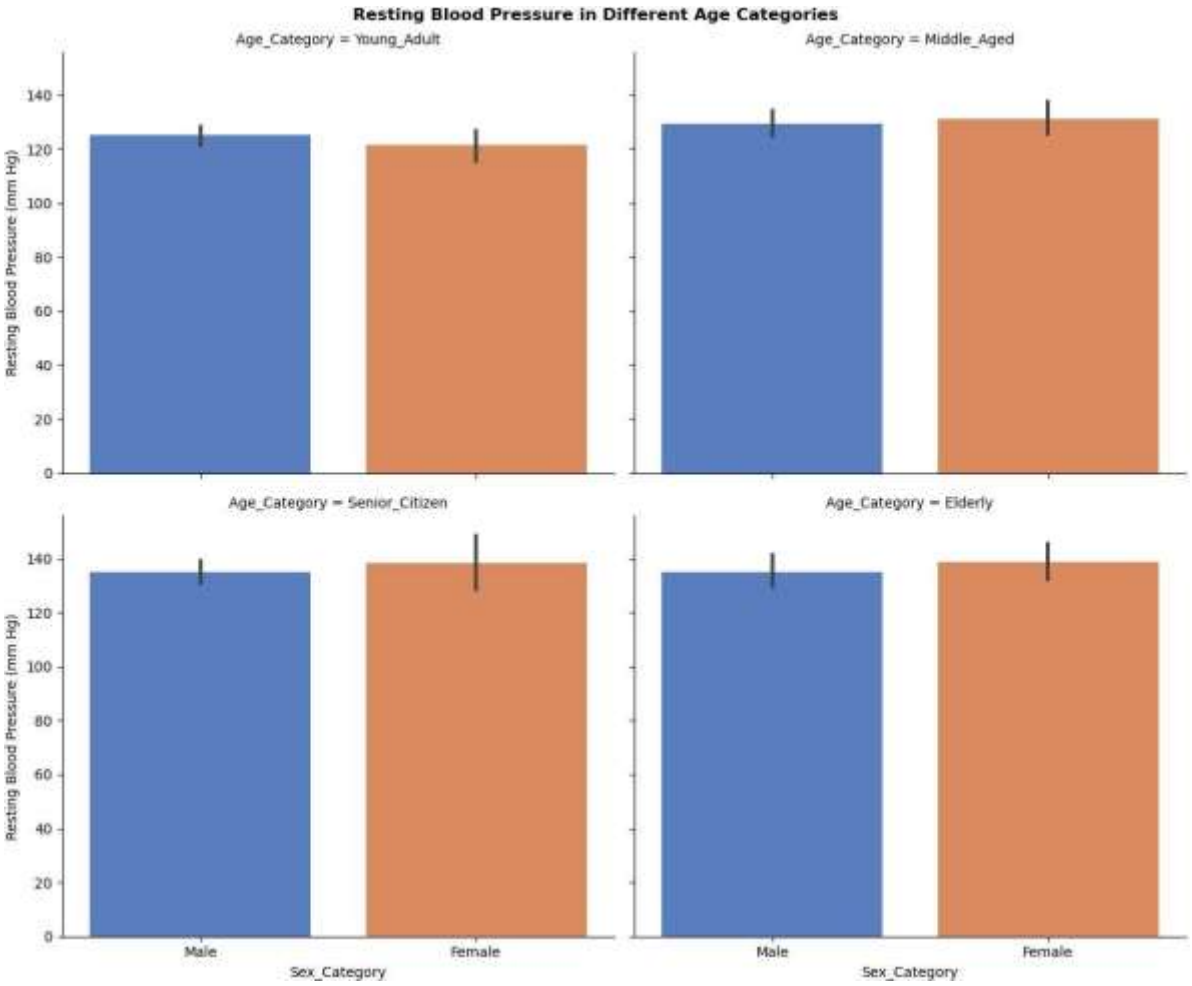
```
<Figure size 1000x1000 with 0 Axes>
```



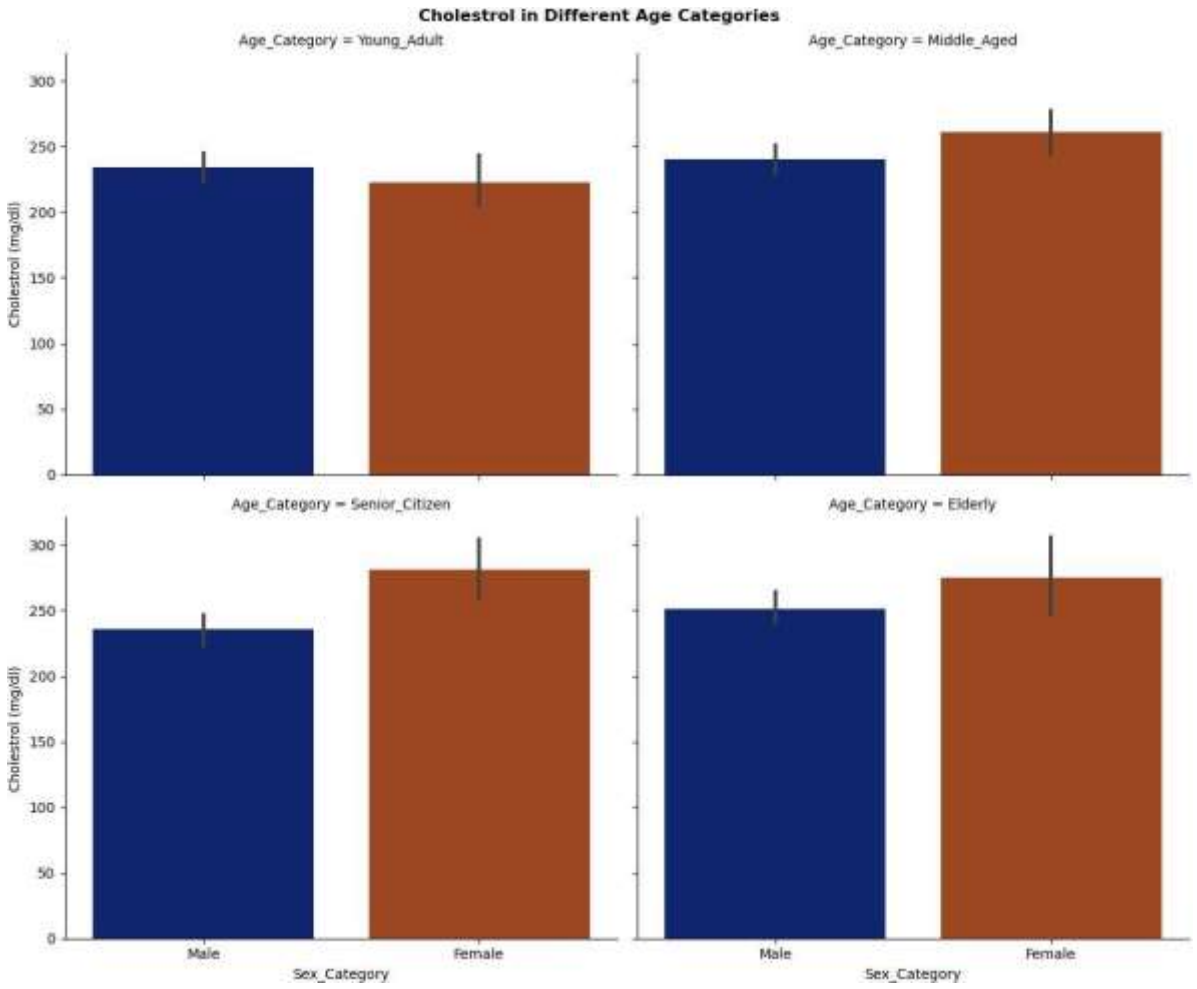

```
#Creating visualization of Maximum Heart Rate wrt ExAng for different Sex Category

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()
```



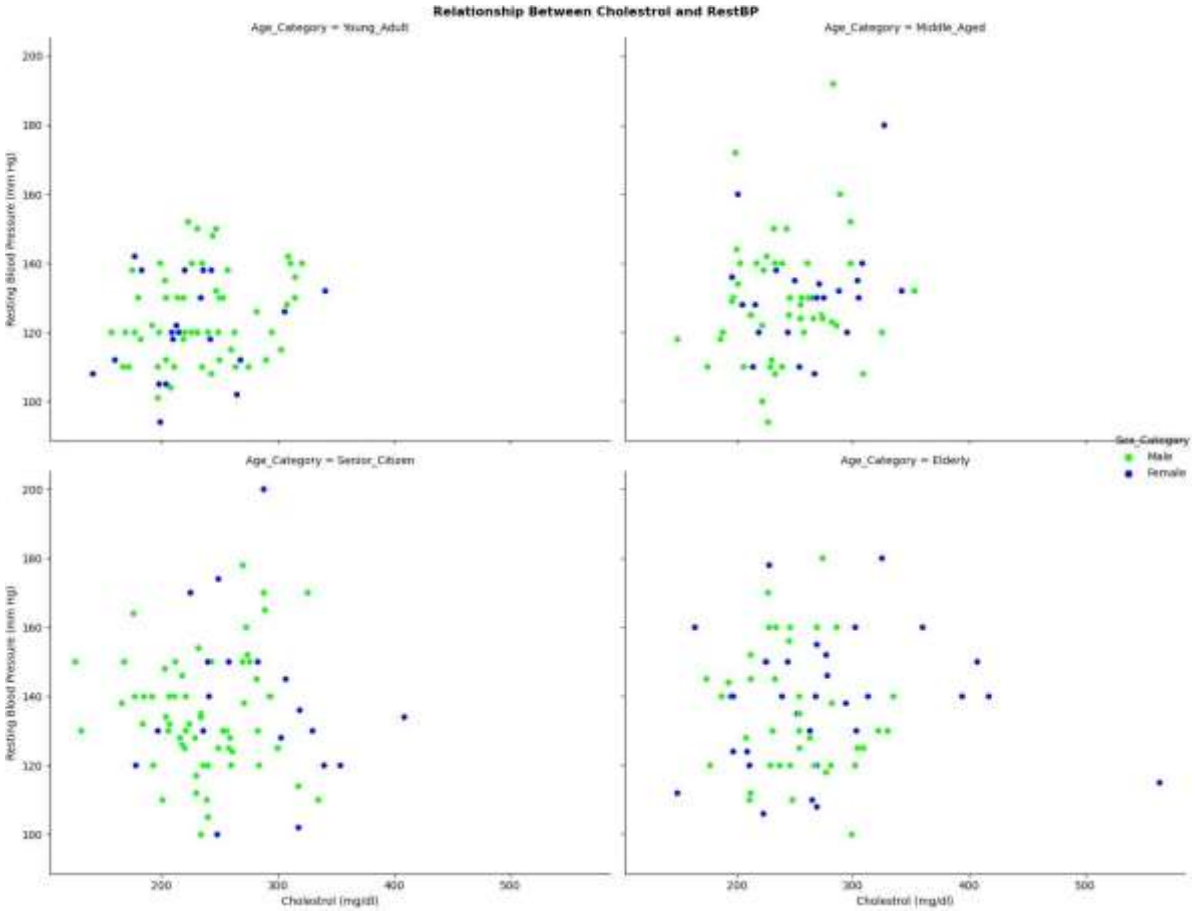

```
#Creating visualization of Rest BP wrt Sex Category for different Age Category

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()
```



```
#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()
```




```
#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()
```


Relationship Between Cholestrol and RestBP
Age_Category = Young_Adult
Age_Category = Middle_Aged
Age_Category = Senior_Citizen
Age_Category = Elderly
Resting Blood Pressure (mm Hg)
Cholestrol (mg/dl)
Gen_Category
Male
Female