Exploratory Data Analysis (EDA) of Patient Health Indicators in Drug Safety and Pharmacovigilance

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1 About Me

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2 Project:Exploratory Data Analysis (EDA) of Patient Health Indicators in Drug Safety and Pharmacovigilance

[1]:

```
import pandas as pd
```

[2]:

```
raw_data = pd.read_csv("Drug safety and pharmacovigilance.csv")
df = raw_data.copy()
df.head(5)
```

[2]:

```
   Age Sex      BP Cholesterol  Na_to_K   Drug
0   23   F    HIGH        HIGH   25.355  DrugY
1   47   M     LOW        HIGH   13.093  drugC
2   47   M     LOW        HIGH   10.114  drugC
3   28   F  NORMAL        HIGH    7.798  drugX
4   61   F     LOW        HIGH   18.043  DrugY
```

3 Basic Info

[3]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 6 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Age          200 non-null    int64
 1   Sex          200 non-null    object
 2   BP           200 non-null    object
 3   Cholesterol  200 non-null    object
 4   Na_to_K      200 non-null    float64
 5   Drug         200 non-null    object
dtypes: float64(1), int64(1), object(4)
memory usage: 9.5+ KB
```

[4]:
```
df.shape
```

[4]:
```
(200, 6)
```

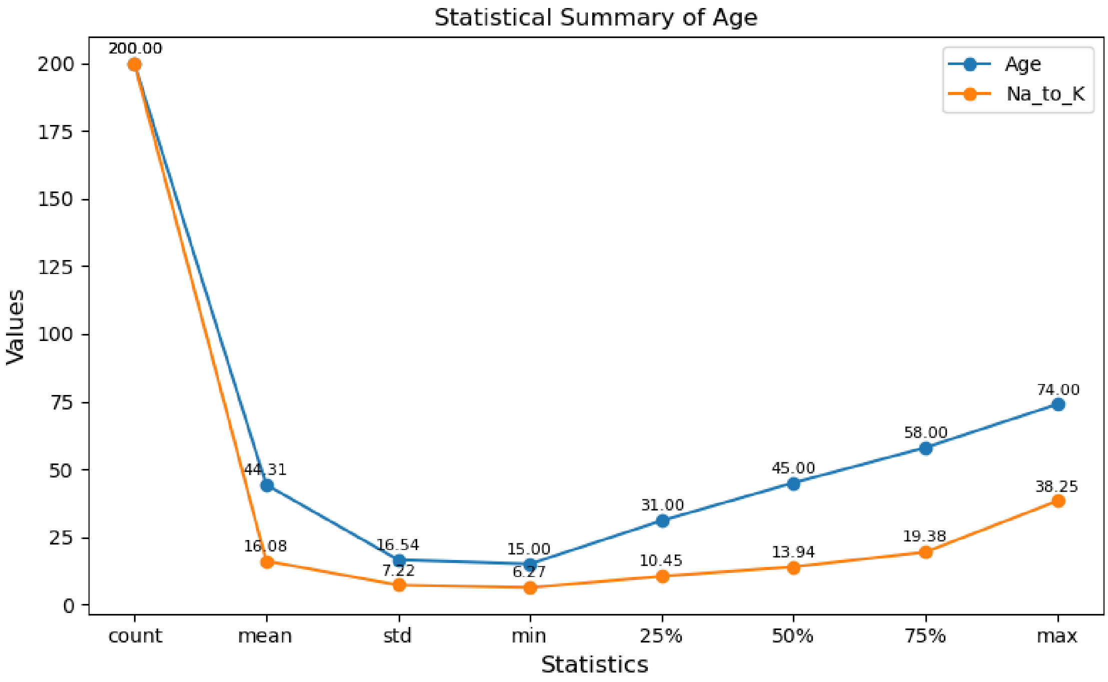
3.0.1 Summary Statistics

For Numerical Columns

[5]:
```
#Summary Statistics for Numerical Columns
df.describe().T
```

[5]:
```
         count       mean        std     min      25%      50%    75%     max
Age      200.0  44.315000  16.544315  15.000  31.0000  45.0000  58.00  74.000
Na_to_K  200.0  16.084485   7.223956   6.269  10.4455  13.9365  19.38  38.247
```

[39]:
```
import matplotlib.pyplot as plt

# Plot the line chart
ax = df.describe().plot(kind='line', marker='o', figsize=(8, 5),␣
 ↪title='Statistical Summary of Age')

# Add exact data values on each point
for line in ax.get_lines():
    for x, y in zip(line.get_xdata(), line.get_ydata()):
        ax.annotate(f'{y:.2f}', (x, y), textcoords="offset points", xytext=(0,␣
 ↪5), ha='center', fontsize=8)

# Customize labels
plt.xlabel('Statistics', fontsize=12)
plt.ylabel('Values', fontsize=12)

# Display the chart
#plt.grid(True, linestyle='--', alpha=0.6)
plt.tight_layout()
plt.show()
```



For Catagorical Columns

[40]:

```
#Summary Statistics for Categorical Columns
df.describe(include='object').T
```

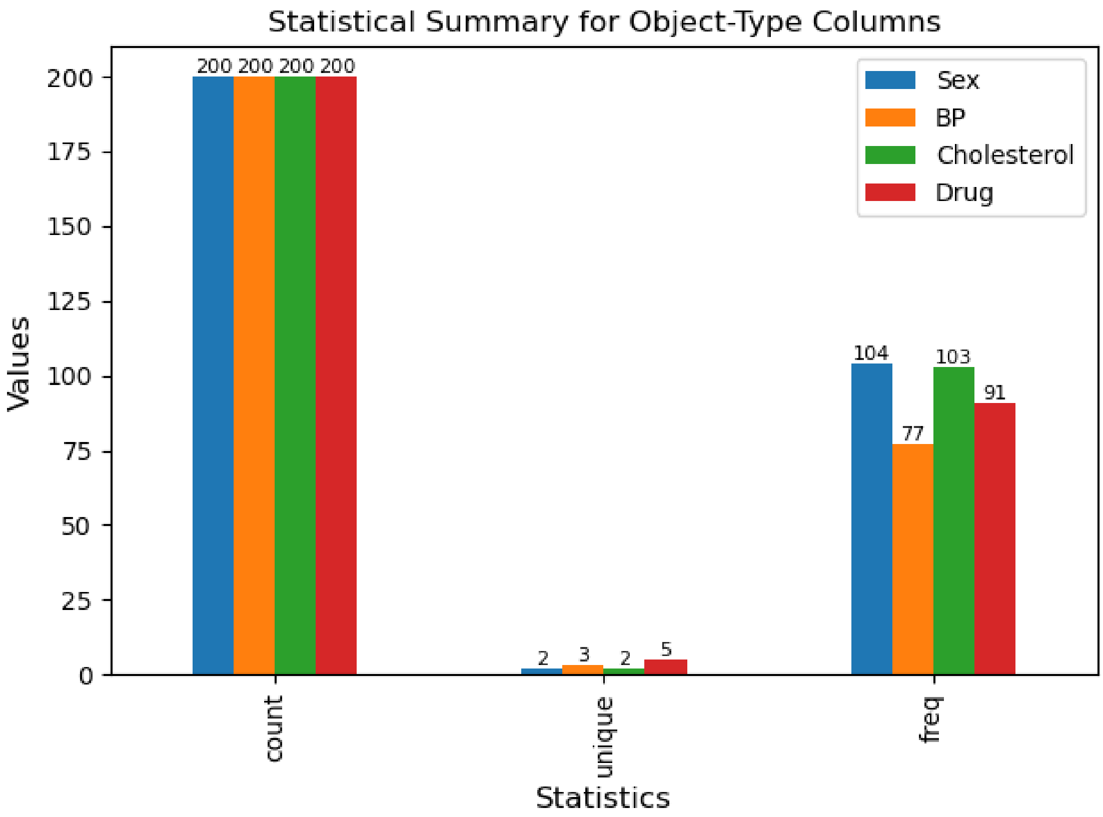
[40]:

```
            count unique    top freq
Sex           200      2      M  104
BP            200      3   HIGH   77
Cholesterol   200      2   HIGH  103
Drug          200      5  DrugY   91
```

[77]:

```
import matplotlib.pyplot as plt

# Extract descriptive statistics for object-type columns
summary = df.describe(include='object').T[['count', 'unique', 'freq']].T

# Plot the bar chart
ax = summary.plot(kind='bar', title='Statistical Summary for Object-Type␣
 ↪Columns')

# Add data labels on each bar
for p in ax.patches:  # Iterate through each bar
    ax.annotate(f'{p.get_height():.0f}',  # Get the height of each bar
                (p.get_x() + p.get_width() / 2, p.get_height()),  # Position␣
 ↪the label at the center of the bar
```

```
                ha='center', va='bottom', fontsize=8)

# Customize the chart
plt.xlabel('Statistics', fontsize=12)
plt.ylabel('Values', fontsize=12)
#plt.grid(axis='y', linestyle='--', alpha=0.6)
plt.tight_layout()

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



3.0.2 Duplicate and Missing Value check

[23]:
```
df.duplicated().any()
```

[23]:
```
False
```

[93]:
```
df.isnull().any()
```

```
[93]: Age            False
      Sex            False
      BP             False
      Cholesterol    False
      Na_to_K        False
      Drug           False
      dtype: bool
```

```
[80]: df.columns
```

```
[80]: Index(['Age', 'Sex', 'BP', 'Cholesterol', 'Na_to_K', 'Drug'], dtype='object')
```

```
[83]: df.head()
```

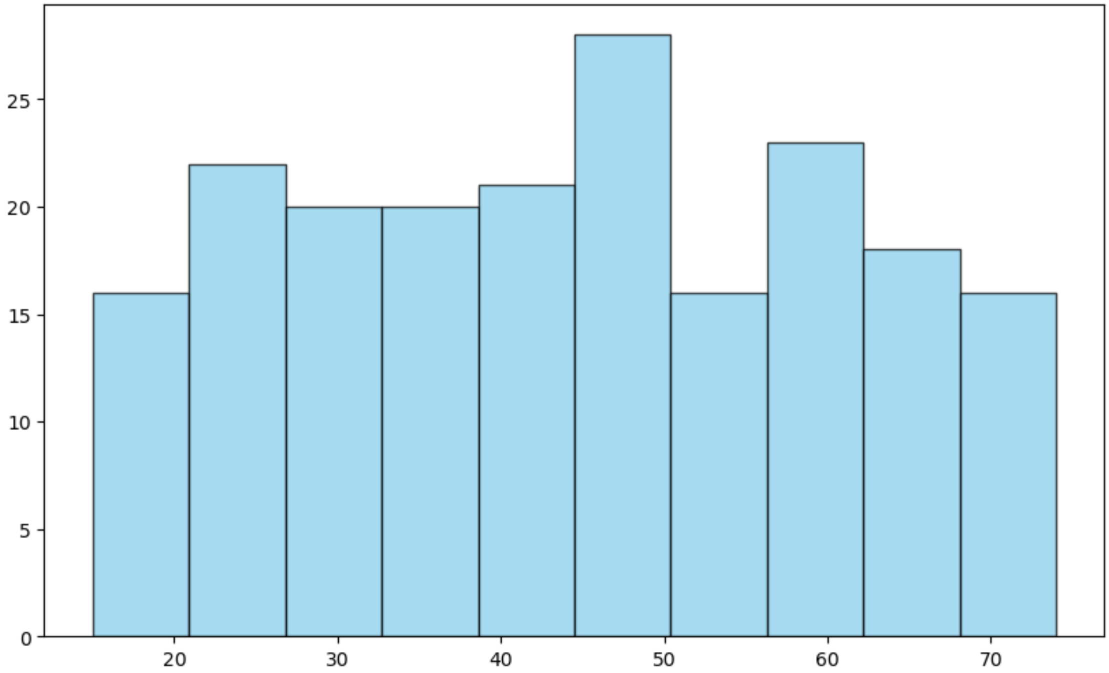
```
[83]:    Age Sex      BP Cholesterol  Na_to_K   Drug
      0   23   F    HIGH        HIGH   25.355  DrugY
      1   47   M     LOW        HIGH   13.093  drugC
      2   47   M     LOW        HIGH   10.114  drugC
      3   28   F  NORMAL        HIGH    7.798  drugX
      4   61   F     LOW        HIGH   18.043  DrugY
```

```
[101]: df['Drug'].value_counts(),df['Cholesterol'].value_counts(),df['BP'].
        ↪value_counts()
```

```
[101]: (Drug
        DrugY    91
        drugX    54
        drugA    23
        drugC    16
        drugB    16
        Name: count, dtype: int64,
        Cholesterol
        HIGH      103
        NORMAL     97
        Name: count, dtype: int64,
        BP
        HIGH      77
        LOW       64
        NORMAL    59
        Name: count, dtype: int64)
```

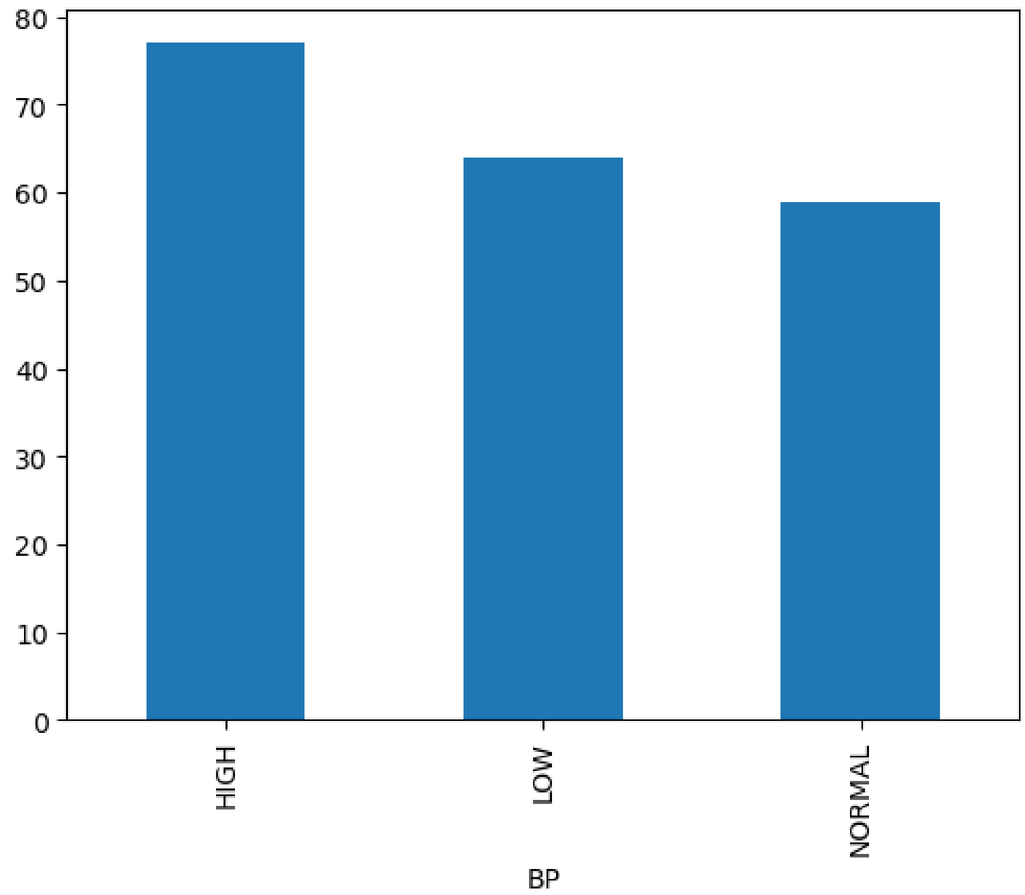
```
[140]: df['Age'].hist( bins=10,             # Number of bins (intervals)
                       figsize=(10, 6),    # Size of the figure
                       color='skyblue',    # Fill color
                      edgecolor='black', # Outline color for bars
                       alpha=0.75,         # Transparency of the bars
                       grid=False)
```

```
[140]: <Axes: >
```



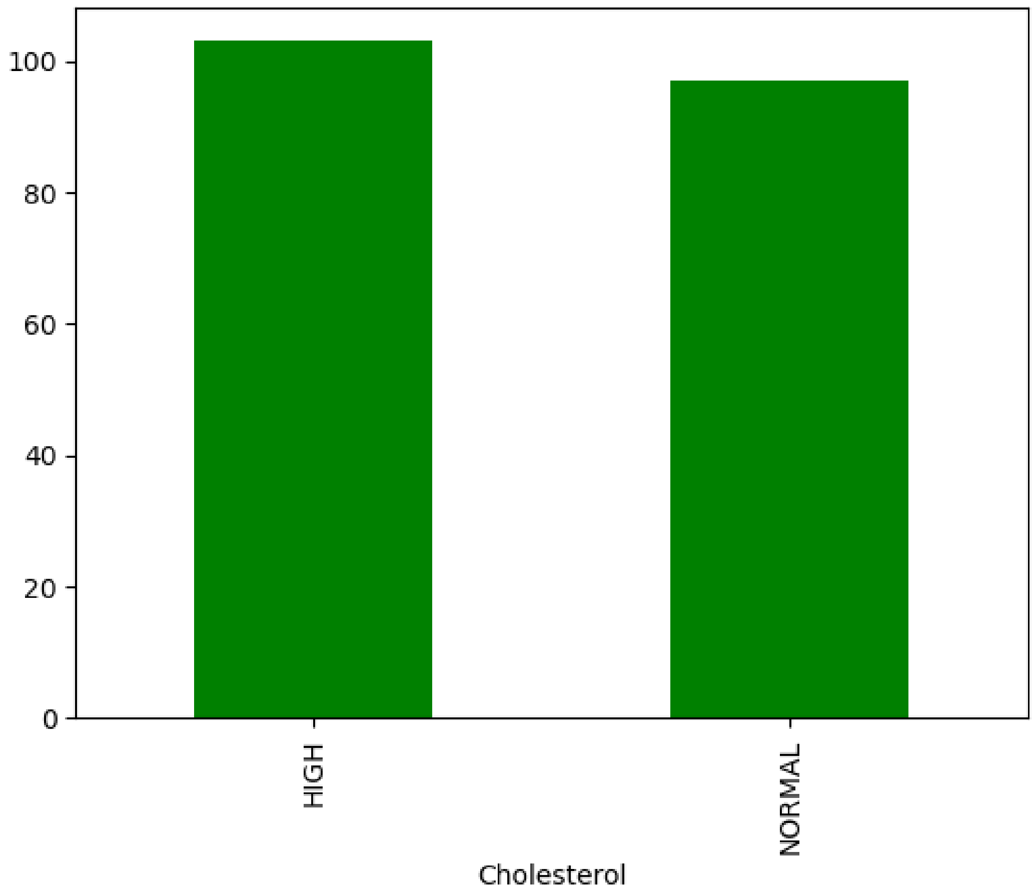
```
[113]: df['BP'].value_counts().plot(kind = 'bar')
```

```
[113]: <Axes: xlabel='BP'>
```



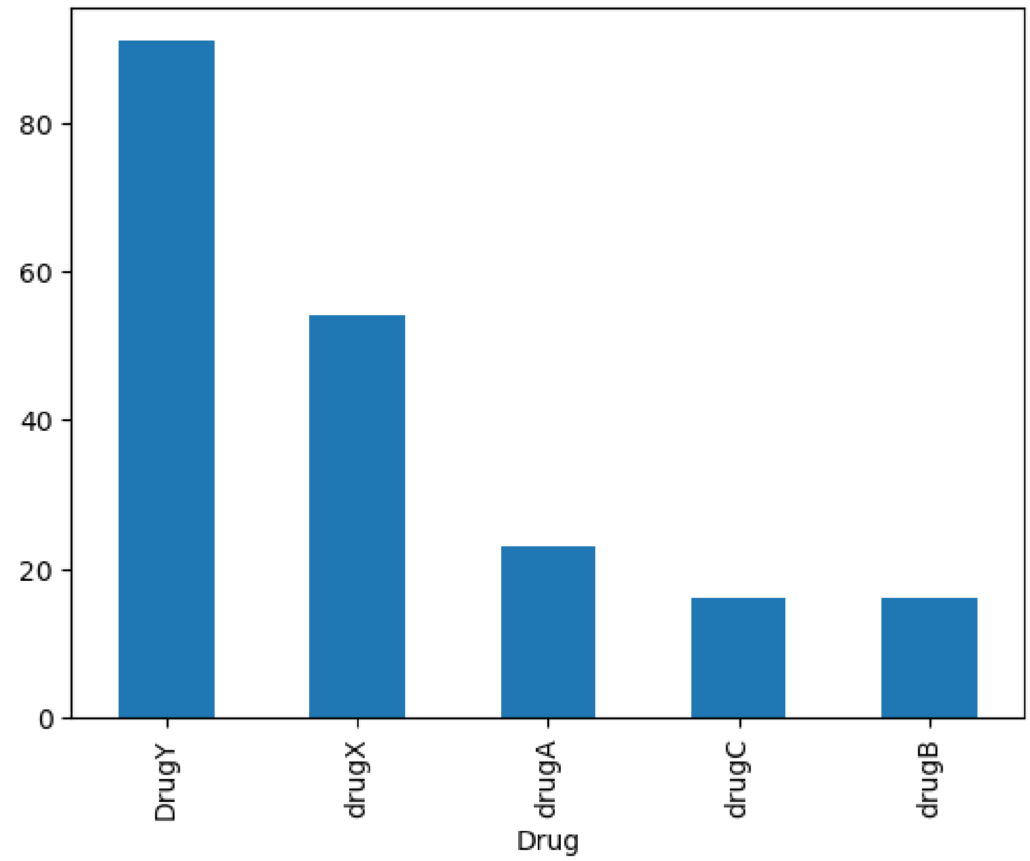
```
[133]: df['Cholesterol'].value_counts().plot(kind = 'bar',color = 'green')
```

```
[133]: <Axes: xlabel='Cholesterol'>
```



```
[137]: df['Drug'].value_counts().plot(kind = 'bar')
```

```
[137]: <Axes: xlabel='Drug'>
```

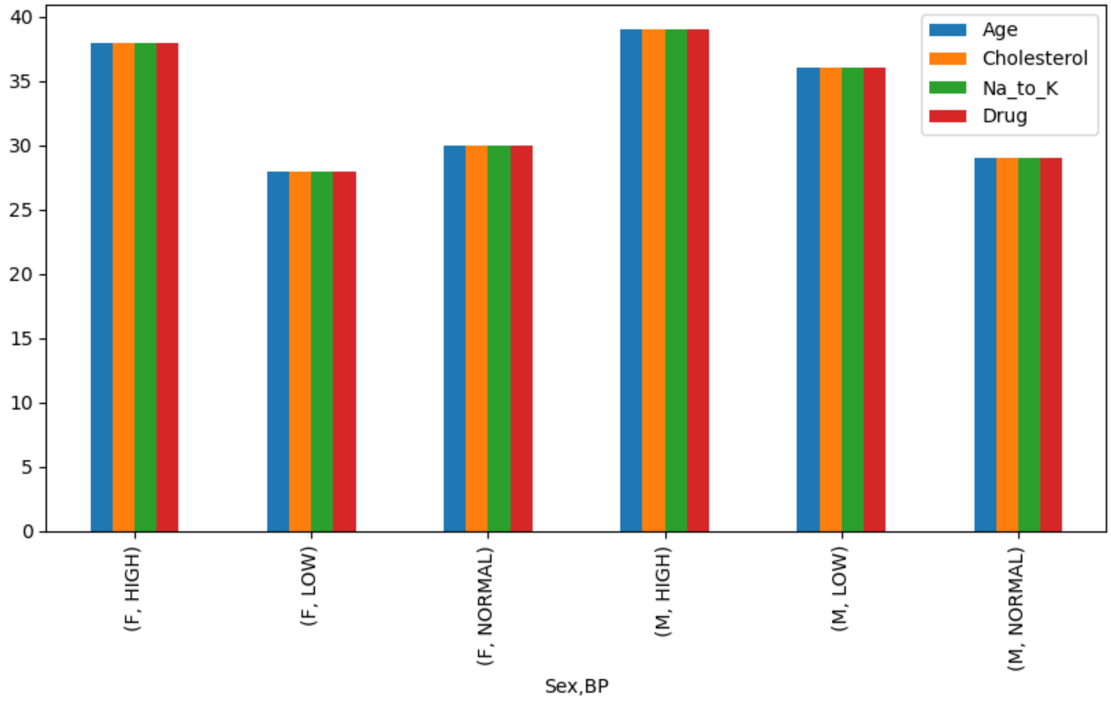


```
[154]: df.groupby(['Sex','Drug']).count()
```

```
[154]:           Age  BP  Cholesterol  Na_to_K
       Sex Drug
       F   DrugY   47  47           47       47
           drugA    9   9            9        9
           drugB    6   6            6        6
           drugC    7   7            7        7
           drugX   27  27           27       27
       M   DrugY   44  44           44       44
           drugA   14  14           14       14
           drugB   10  10           10       10
           drugC    9   9            9        9
           drugX   27  27           27       27
```

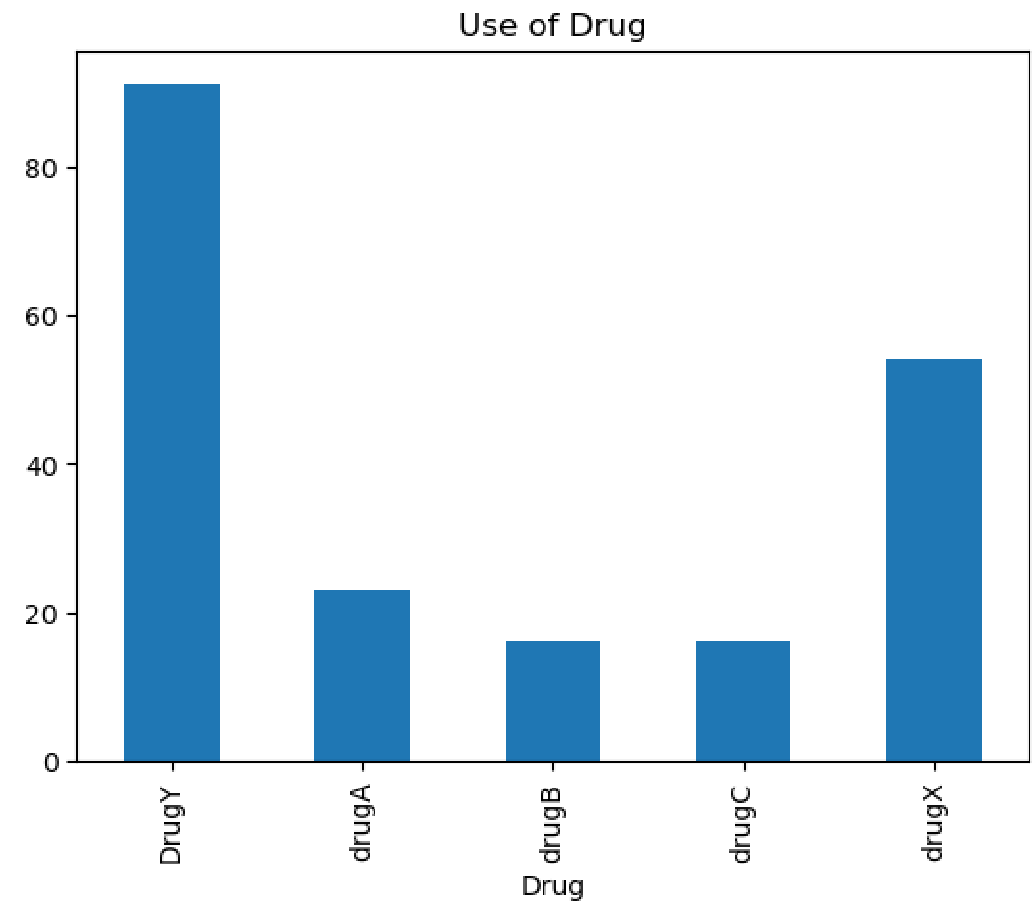
```
[163]: df.groupby(['Sex','BP']).count().plot(kind = 'bar',figsize =(10,5))
```

```
[163]: <Axes: xlabel='Sex,BP'>
```



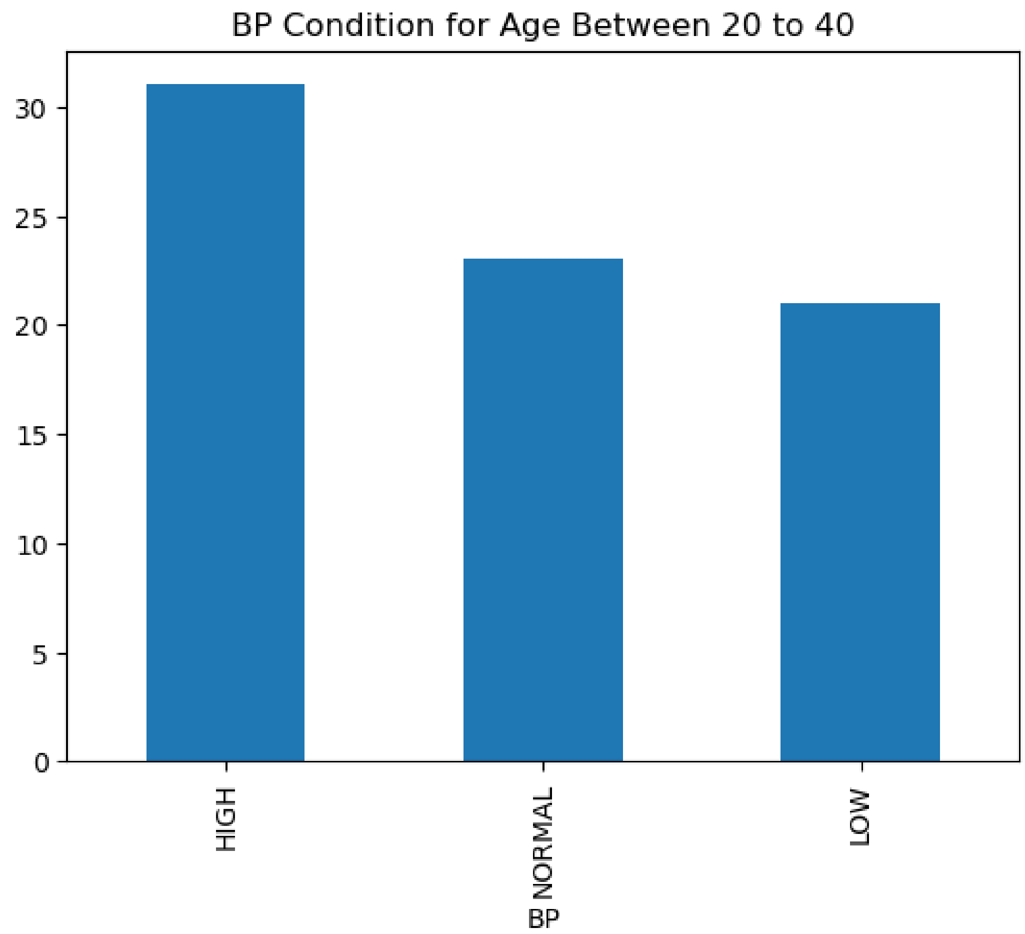
```
[176]: df.groupby('Drug')['Age'].count().plot(kind = 'bar',title ='Use of Drug')
```

```
[176]: <Axes: title={'center': 'Use of Drug'}, xlabel='Drug'>
```



```
[198]: df[(df['Age']>= 20) & (df['Age'] <= 40)]['BP'].value_counts().plot(kind =␣
        ↪'bar',title='BP Condition for Age Between 20 to 40')
```

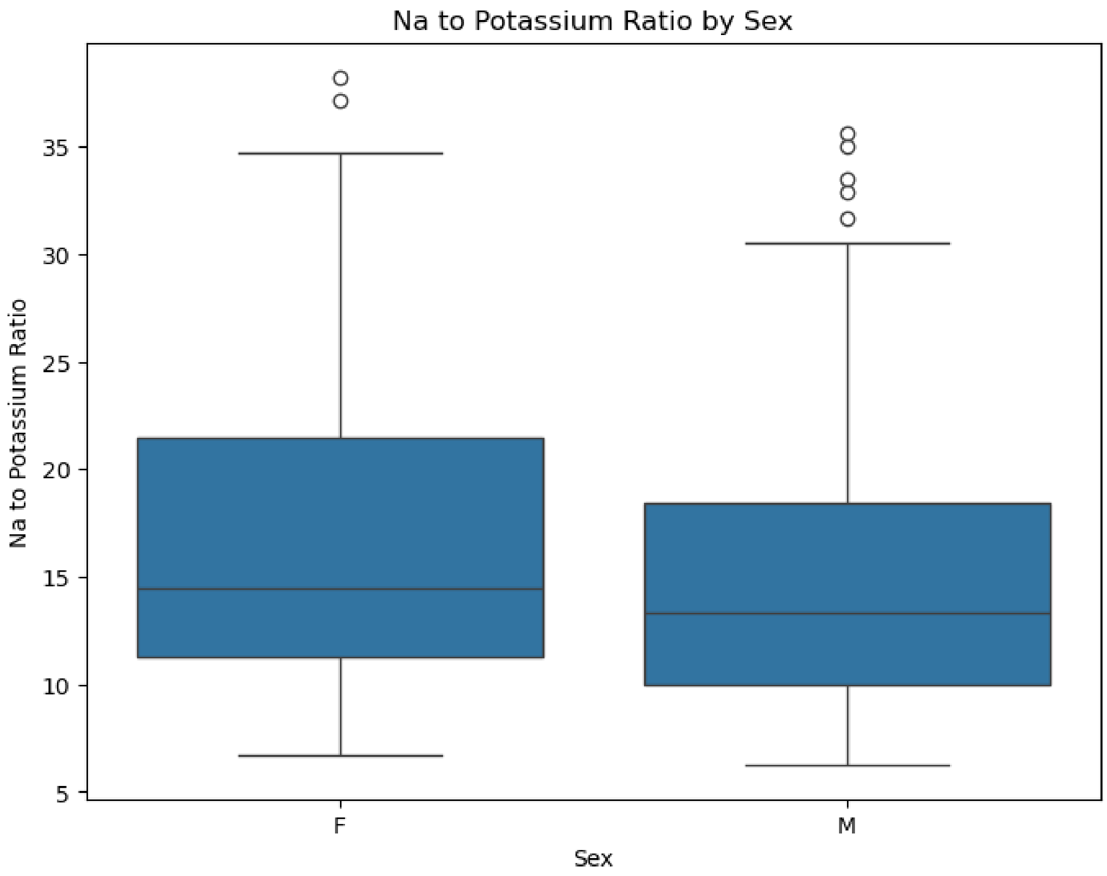
```
[198]: <Axes: title={'center': 'BP Condition for Age Between 20 to 40'}, xlabel='BP'>
```



[211]:
```
df[(df['Age']>= 20) & (df['Age'] <= 40)].groupby(['Cholesterol']).count()
```

[211]:
```
             Age  Sex  BP  Na_to_K  Drug
Cholesterol
HIGH          38   38  38       38    38
NORMAL        37   37  37       37    37
```

[212]:
```
plt.figure(figsize=(8,6))
sns.boxplot(x='Sex', y='Na_to_K', data=df)
plt.title('Na to Potassium Ratio by Sex')
plt.xlabel('Sex')
plt.ylabel('Na to Potassium Ratio')
plt.show()
```


Na to Potassium Ratio by Sex
Na to Potassium Ratio
35
30
25
20
15
10
5
F
M
Sex

```
[ ]:
```