# Topic: COVID-19 Data Analysis and Visualization

# Step 1: Understand the Data

In [15]:

```
import pandas as pd
import matplotlib.pyplot as plt
```

In [16]:

```
# Load the dataset
data = pd.read_csv("C:\\Users\\adity\\Downloads\\COVID-19 DataSet\\worldometer_data.csv")
```

In [17]:

```
data
```

Out[17]:

| | Country/Region | Continent | Population | TotalCases | NewCases | TotalDeaths | NewDeaths | Total |
|---|---|---|---|---|---|---|---|---|
| **0** | USA | North America | 3.311981e+08 | 5032179 | NaN | 162804.0 | NaN | |
| **1** | Brazil | South America | 2.127107e+08 | 2917562 | NaN | 98644.0 | NaN | |
| **2** | India | Asia | 1.381345e+09 | 2025409 | NaN | 41638.0 | NaN | |
| **3** | Russia | Europe | 1.459409e+08 | 871894 | NaN | 14606.0 | NaN | |
| **4** | South Africa | Africa | 5.938157e+07 | 538184 | NaN | 9604.0 | NaN | |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **204** | Montserrat | North America | 4.992000e+03 | 13 | NaN | 1.0 | NaN | |
| **205** | Caribbean Netherlands | North America | 2.624700e+04 | 13 | NaN | NaN | NaN | |
| **206** | Falkland Islands | South America | 3.489000e+03 | 13 | NaN | NaN | NaN | |
| **207** | Vatican City | Europe | 8.010000e+02 | 12 | NaN | NaN | NaN | |
| **208** | Western Sahara | Africa | 5.986820e+05 | 10 | NaN | 1.0 | NaN | |

209 rows × 16 columns

In [18]:

```
# Display first few rows
print(data.head())
```

```
  Country/Region      Continent    Population  TotalCases  NewCases  \
0            USA  North America  3.311981e+08     5032179       NaN   
1         Brazil  South America  2.127107e+08     2917562       NaN   
2          India           Asia  1.381345e+09     2025409       NaN   
3         Russia         Europe  1.459409e+08      871894       NaN   
4   South Africa         Africa  5.938157e+07      538184       NaN   

   TotalDeaths  NewDeaths  TotalRecovered  NewRecovered  ActiveCases  \
0     162804.0        NaN       2576668.0           NaN    2292707.0   
1      98644.0        NaN       2047660.0           NaN     771258.0   
2      41638.0        NaN       1377384.0           NaN     606387.0   
3      14606.0        NaN        676357.0           NaN     180931.0   
4       9604.0        NaN        387316.0           NaN     141264.0   

   Serious,Critical  Tot Cases/1M pop  Deaths/1M pop  TotalTests  \
0           18296.0           15194.0          492.0  63139605.0   
1            8318.0           13716.0          464.0  13206188.0   
2            8944.0            1466.0           30.0  22149351.0   
3            2300.0            5974.0          100.0  29716907.0   
4             539.0            9063.0          162.0   3149807.0   

   Tests/1M pop       WHO Region  
0      190640.0         Americas  
1       62085.0         Americas  
2       16035.0  South-EastAsia  
3      203623.0           Europe  
4       53044.0           Africa  
```

## Step 2: Data Cleaning

In [19]:

```
# Filling missing values with 0 for simplicity
data.fillna(0, inplace=True)

# Ensure numeric columns are properly formatted
data['TotalCases'] = data['TotalCases'].astype(int)
data['TotalDeaths'] = data['TotalDeaths'].astype(int)
data['TotalRecovered'] = data['TotalRecovered'].astype(int)
data['ActiveCases'] = data['ActiveCases'].astype(int)
```

Convert date columns to datetime format:

## Step 2: Analyze Key Metrics

In [20]:

```
# Add calculated columns
data['Recovery Rate (%)'] = (data['TotalRecovered'] / data['TotalCases']) * 100
data['Fatality Rate (%)'] = (data['TotalDeaths'] / data['TotalCases']) * 100

# Display top 5 rows with new metrics
print(data[['Country/Region', 'TotalCases', 'Recovery Rate (%)', 'Fatality Rate (%)']].head())
```

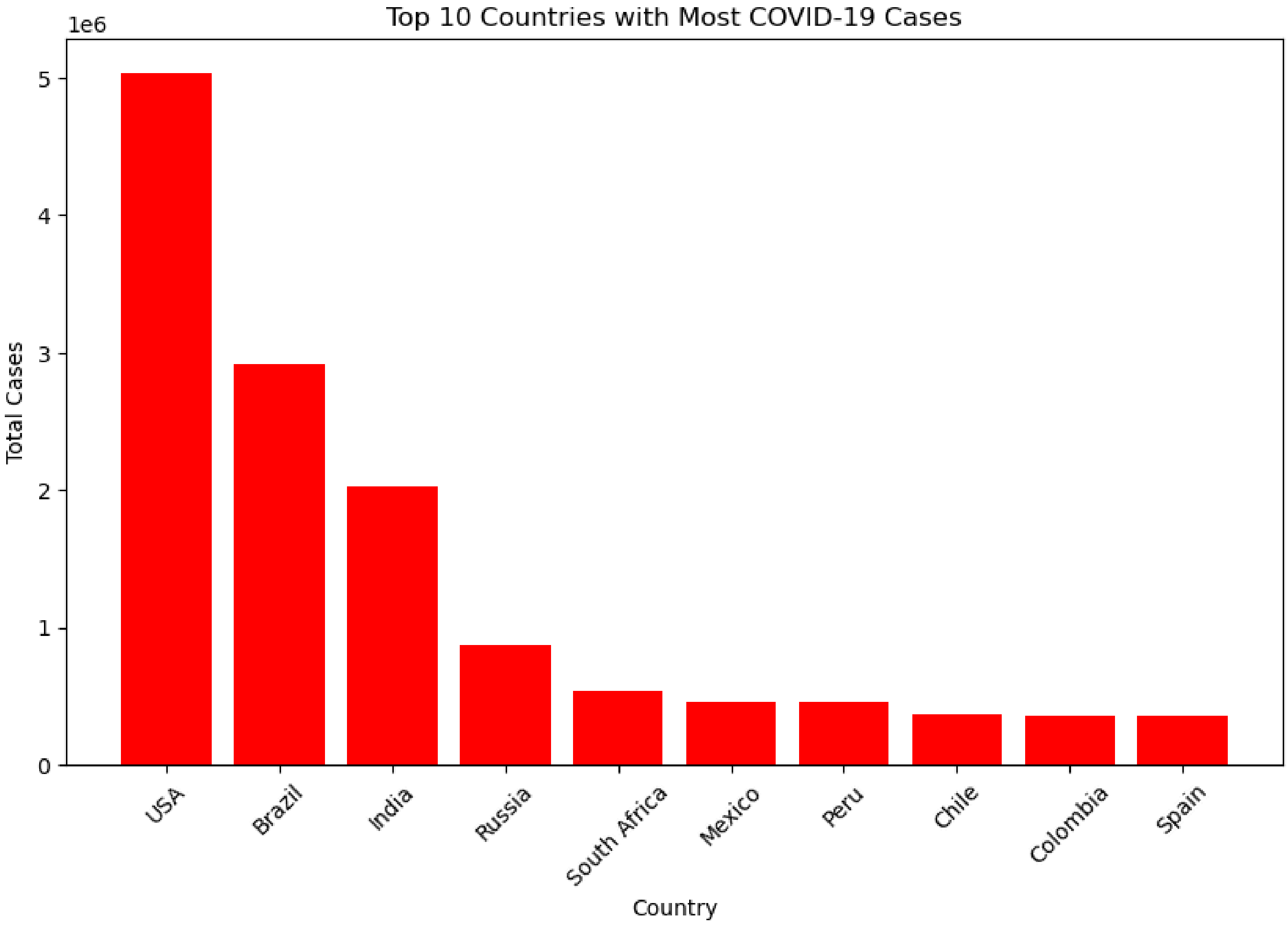
```
  Country/Region  TotalCases  Recovery Rate (%)  Fatality Rate (%)
0            USA     5032179          51.203822           3.235259
1         Brazil     2917562          70.183941           3.381042
2          India     2025409          68.005228           2.055782
3         Russia      871894          77.573306           1.675204
4   South Africa      538184          71.967208           1.784520
```

## Step 3: Visualize Data

1. Top 10 Countries with Most Cases

In [21]:

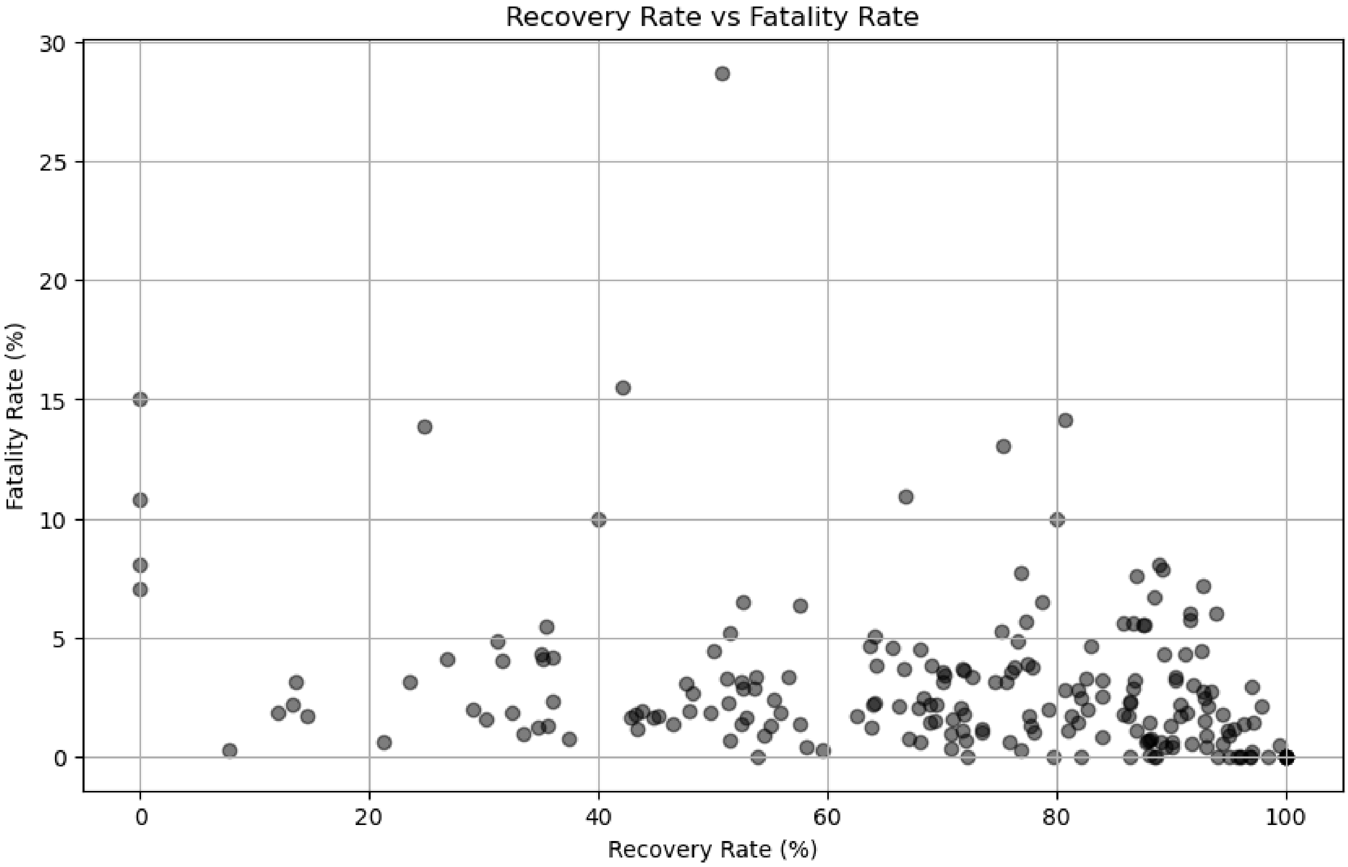
```
# Sort data by TotalCases and take top 10
top_countries = data.sort_values(by='TotalCases', ascending=False).head(10)

# Bar plot
plt.figure(figsize=(10, 6))
plt.bar(top_countries['Country/Region'], top_countries['TotalCases'], color='red')
plt.title('Top 10 Countries with Most COVID-19 Cases')
plt.xlabel('Country')
plt.ylabel('Total Cases')
plt.xticks(rotation=45)
plt.show()
```



2. Recovery Rate vs Fatality Rate

In [22]:

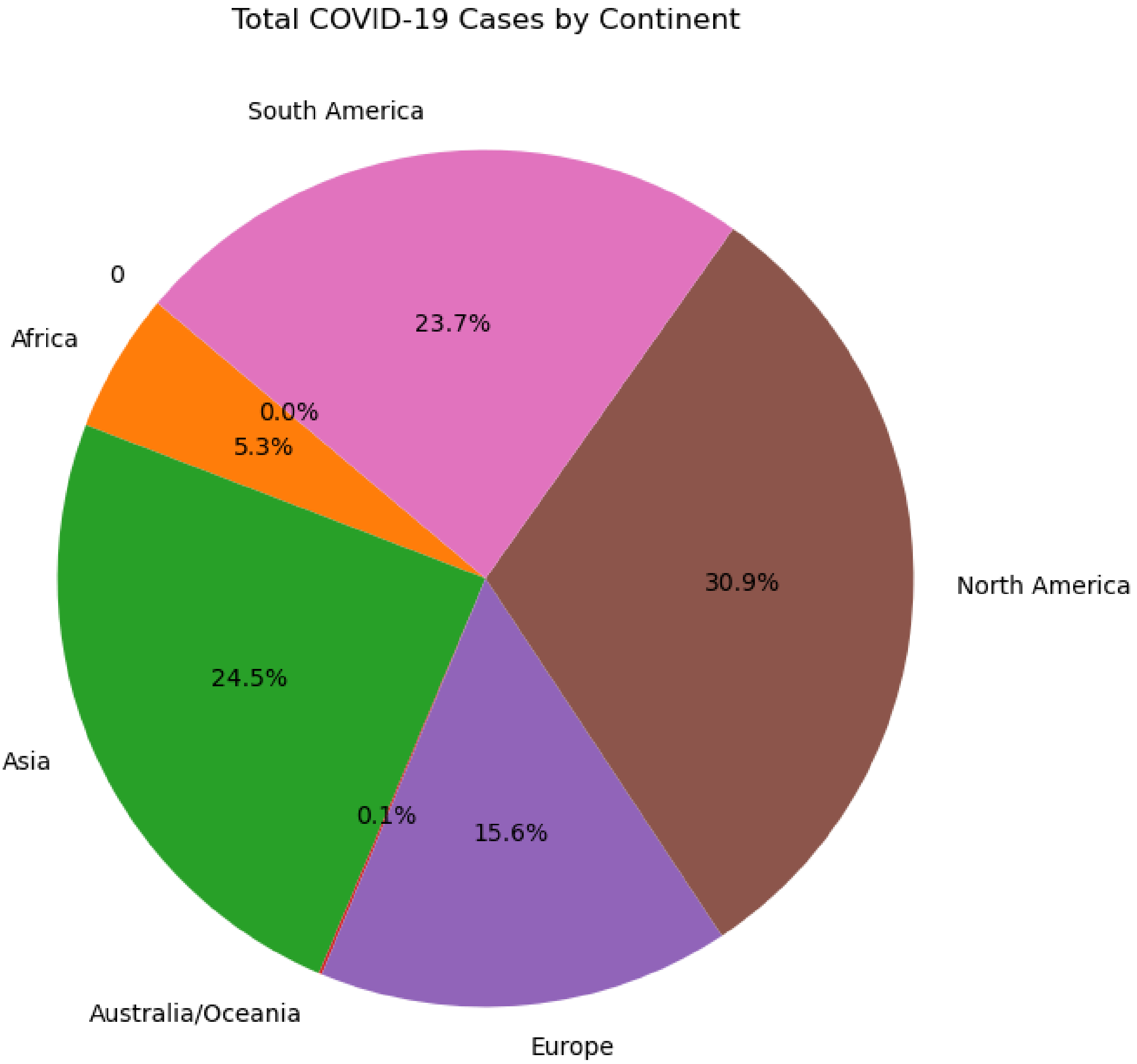
```
# Scatter plot
plt.figure(figsize=(10, 6))
plt.scatter(data['Recovery Rate (%)'], data['Fatality Rate (%)'], alpha=0.5, color='black')
plt.title('Recovery Rate vs Fatality Rate')
plt.xlabel('Recovery Rate (%)')
plt.ylabel('Fatality Rate (%)')
plt.grid()
plt.show()
```



3. Total Cases by Continent

In [23]:

```
# Group by continent
continent_data = data.groupby('Continent')['TotalCases'].sum().reset_index()

# Pie chart
plt.figure(figsize=(8, 8))
plt.pie(continent_data['TotalCases'], labels=continent_data['Continent'], autopct='%1.1f%%',
plt.title('Total COVID-19 Cases by Continent')
plt.show()
```


Total COVID-19 Cases by Continent
South America
23.7%
0
0.0%
Africa
5.3%
North America
30.9%
24.5%
Asia
0.1%
15.6%
Australia/Oceania
Europe