

# Epidemic Explorer: Unraveling COVID-19 Statistics

```
# Importing the Important Libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
from plotly.subplots import make_subplots
from datetime import datetime

# Loading the dataset and viewing the first 10 rows of the data
covid_df=pd.read_csv("covid_19_india.csv")
covid_df.head(10)
```

	Sno	Date	Time	State/UnionTerritory
0	1.0	2020-01-30	6:00 PM	Kerala
1	2.0	2020-01-31	6:00 PM	Kerala
2	3.0	2020-02-01	6:00 PM	Kerala
3	4.0	2020-02-02	6:00 PM	Kerala
4	5.0	2020-02-03	6:00 PM	Kerala
5	6.0	2020-02-04	6:00 PM	Kerala
6	7.0	2020-02-05	6:00 PM	Kerala
7	8.0	2020-02-06	6:00 PM	Kerala
8	9.0	2020-02-07	6:00 PM	Kerala
9	10.0	2020-02-08	6:00 PM	Kerala

	ConfirmedForeignNational	Cured	Deaths	Confirmed
0	0	0.0	0.0	1.0
1	0	0.0	0.0	1.0
2	0	0.0	0.0	2.0
3	0	0.0	0.0	3.0
4	0	0.0	0.0	3.0
5	0	0.0	0.0	3.0
6	0	0.0	0.0	3.0

7	0	0.0	0.0	3.0
8	0	0.0	0.0	3.0
9	0	0.0	0.0	3.0

```
covid_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 15114 entries, 0 to 15113
```

```
Data columns (total 9 columns):
```

#	Column	Non-Null Count	Dtype
0	Sno	15086 non-null	float64
1	Date	15086 non-null	object
2	Time	15086 non-null	object
3	State/UnionTerritory	15086 non-null	object
4	ConfirmedIndianNational	15086 non-null	object
5	ConfirmedForeignNational	15086 non-null	object
6	Cured	15086 non-null	float64
7	Deaths	15086 non-null	float64
8	Confirmed	15086 non-null	float64

```
dtypes: float64(4), object(5)
```

```
memory usage: 1.0+ MB
```

```
# Having the Descriptive statical overview of the data
```

```
covid_df.describe()
```

	Sno	Cured	Deaths	Confirmed
count	15086.000000	1.508600e+04	15086.000000	1.508600e+04
mean	7543.500000	1.747937e+05	2721.084449	1.942820e+05
std	4355.097416	3.648330e+05	7182.672358	4.095184e+05
min	1.000000	0.000000e+00	0.000000	0.000000e+00
25%	3772.250000	1.685000e+03	12.000000	2.935500e+03
50%	7543.500000	1.964700e+04	364.000000	2.608150e+04
75%	11314.750000	2.087552e+05	2170.000000	2.216012e+05
max	15086.000000	4.927480e+06	83777.000000	5.433506e+06

```
# Import the second dataset that is related to the vaccination and  
viewing the first 10 rows of the data
```

```
vaccine_df=pd.read_csv("covid_vaccine_statewise.csv")
```

```
vaccine_df.head(10)
```

	Updated On	State	Total Doses Administered	Sessions	Sites	\
0	16/01/2021	India	48276.0	3455.0	2957.0	
1	17/01/2021	India	58604.0	8532.0	4954.0	
2	18/01/2021	India	99449.0	13611.0	6583.0	
3	19/01/2021	India	195525.0	17855.0	7951.0	
4	20/01/2021	India	251280.0	25472.0	10504.0	
5	21/01/2021	India	365965.0	32226.0	12600.0	
6	22/01/2021	India	549381.0	36988.0	14115.0	
7	23/01/2021	India	759008.0	43076.0	15605.0	
8	24/01/2021	India	835058.0	49851.0	18111.0	

9	25/01/2021	India	1277104.0	55151.0	19682.0
---	------------	-------	-----------	---------	---------

	First Dose Administered	Second Dose Administered	\
0	48276.0		0.0
1	58604.0		0.0
2	99449.0		0.0
3	195525.0		0.0
4	251280.0		0.0
5	365965.0		0.0
6	549381.0		0.0
7	759008.0		0.0
8	835058.0		0.0
9	1277104.0		0.0

	Male (Doses Administered)	Female (Doses Administered)	\
0	NaN		NaN
1	NaN		NaN
2	NaN		NaN
3	NaN		NaN
4	NaN		NaN
5	NaN		NaN
6	NaN		NaN
7	NaN		NaN
8	NaN		NaN
9	NaN		NaN

	Transgender (Doses Administered)	...	18-44 Years (Doses Administered)	\
0		NaN	...	
1		NaN	...	
2		NaN	...	
3		NaN	...	
4		NaN	...	
5		NaN	...	
6		NaN	...	
7		NaN	...	
8		NaN	...	
9		NaN	...	

	45-60 Years (Doses Administered)	60+ Years (Doses Administered)	\
--	----------------------------------	--------------------------------	---

0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN
18-44 Years(Individuals Vaccinated) 45-60 Years(Individuals Vaccinated) \		
0	NaN	
NaN		
1	NaN	
NaN		
2	NaN	
NaN		
3	NaN	
NaN		
4	NaN	
NaN		
5	NaN	
NaN		
6	NaN	
NaN		
7	NaN	
NaN		
8	NaN	
NaN		
9	NaN	
NaN		
60+ Years(Individuals Vaccinated) Male(Individuals Vaccinated) \		
0	NaN	23757.0
1	NaN	27348.0
2	NaN	41361.0
3	NaN	81901.0
4	NaN	98111.0
5	NaN	132784.0
6	NaN	193899.0
7	NaN	267856.0
8	NaN	296283.0
9	NaN	444137.0
Female(Individuals Vaccinated) Transgender(Individuals Vaccinated)		
\		
0	24517.0	2.0

1	31252.0	4.0
2	58083.0	5.0
3	113613.0	11.0
4	153145.0	24.0
5	233143.0	38.0
6	355402.0	80.0
7	491049.0	103.0
8	538647.0	128.0
9	832766.0	201.0

#### Total Individuals Vaccinated

0	48276.0
1	58604.0
2	99449.0
3	195525.0
4	251280.0
5	365965.0
6	549381.0
7	759008.0
8	835058.0
9	1277104.0

[10 rows x 24 columns]

vaccine\_df.info()

<class 'pandas.core.frame.DataFrame'>

RangeIndex: 7845 entries, 0 to 7844

Data columns (total 24 columns):

#	Column	Non-Null Count	Dtype
---	-----	-----	-----
0	Updated On	7845 non-null	object
1	State	7845 non-null	object
2	Total Doses Administered	7621 non-null	float64
3	Sessions	7621 non-null	float64
4	Sites	7621 non-null	float64
5	First Dose Administered	7621 non-null	float64
6	Second Dose Administered	7621 non-null	float64
7	Male (Doses Administered)	7461 non-null	float64
8	Female (Doses Administered)	7461 non-null	float64
9	Transgender (Doses Administered)	7461 non-null	float64
10	Covaxin (Doses Administered)	7621 non-null	float64

```

11 CoviShield (Doses Administered)      7621 non-null    float64
12 Sputnik V (Doses Administered)      2995 non-null    float64
13 AEFI                                5438 non-null    float64
14 18-44 Years (Doses Administered)     1702 non-null    float64
15 45-60 Years (Doses Administered)     1702 non-null    float64
16 60+ Years (Doses Administered)       1702 non-null    float64
17 18-44 Years(Individuals Vaccinated)  3733 non-null    float64
18 45-60 Years(Individuals Vaccinated)  3734 non-null    float64
19 60+ Years(Individuals Vaccinated)    3734 non-null    float64
20 Male(Individuals Vaccinated)         160 non-null     float64
21 Female(Individuals Vaccinated)       160 non-null     float64
22 Transgender(Individuals Vaccinated)  160 non-null     float64
23 Total Individuals Vaccinated          5919 non-null    float64

```

dtypes: float64(22), object(2)

memory usage: 1.4+ MB

*# Descriptive Statical overview of the dataset*

vaccine\_df.describe()

	Total Doses Administered	Sessions	Sites	\
count	7.621000e+03	7.621000e+03	7621.000000	
mean	9.188171e+06	4.792358e+05	2282.872064	
std	3.746180e+07	1.911511e+06	7275.973730	
min	7.000000e+00	0.000000e+00	0.000000	
25%	1.356570e+05	6.004000e+03	69.000000	
50%	8.182020e+05	4.547000e+04	597.000000	
75%	6.625243e+06	3.428690e+05	1708.000000	
max	5.132284e+08	3.501031e+07	73933.000000	

	First Dose Administered	Second Dose Administered	\
count	7.621000e+03	7.621000e+03	
mean	7.414415e+06	1.773755e+06	
std	2.995209e+07	7.570382e+06	
min	7.000000e+00	0.000000e+00	
25%	1.166320e+05	1.283100e+04	
50%	6.614590e+05	1.388180e+05	
75%	5.387805e+06	1.166434e+06	
max	4.001504e+08	1.130780e+08	

	Male (Doses Administered)	Female (Doses Administered)	\
count	7.461000e+03	7.461000e+03	
mean	3.620156e+06	3.168416e+06	
std	1.737938e+07	1.515310e+07	
min	0.000000e+00	2.000000e+00	
25%	5.655500e+04	5.210700e+04	
50%	3.897850e+05	3.342380e+05	
75%	2.735777e+06	2.561513e+06	
max	2.701636e+08	2.395186e+08	

Transgender (Doses Administered)	Covaxin (Doses Administered)
----------------------------------	------------------------------

\		
count	7461.000000	7.621000e+03
mean	1162.978019	1.044669e+06
std	5931.353995	4.452259e+06
min	0.000000	0.000000e+00
25%	8.000000	0.000000e+00
50%	113.000000	1.185100e+04
75%	800.000000	7.579300e+05
max	98275.000000	6.236742e+07

CoviShield (Doses Administered)	...	18-44 Years (Doses Administered)	\
count	7.621000e+03	...	
1.702000e+03			
mean	8.126553e+06	...	
8.773958e+06			
std	3.298414e+07	...	
2.660829e+07			
min	7.000000e+00	...	
2.662400e+04			
25%	1.331340e+05	...	
4.344842e+05			
50%	7.567360e+05	...	
3.095970e+06			
75%	6.007817e+06	...	
7.366241e+06			
max	4.468251e+08	...	
2.243304e+08			

45-60 Years (Doses Administered)	60+ Years (Doses Administered)	\
count	1.702000e+03	
1.702000e+03		
mean	7.442161e+06	
5.641605e+06		
std	2.225999e+07	
1.681650e+07		
min	1.681500e+04	
9.994000e+03		
25%	2.326275e+05	
1.285605e+05		
50%	2.695938e+06	

1.805696e+06	
75%	6.969726e+06
5.294763e+06	
max	1.667575e+08
1.186927e+08	

18-44 Years(Individuals Vaccinated) \	
count	3.733000e+03
mean	1.395895e+06
std	5.501454e+06
min	1.059000e+03
25%	5.655400e+04
50%	2.947270e+05
75%	9.105160e+05
max	9.224315e+07

45-60 Years(Individuals Vaccinated) \		60+ Years(Individuals Vaccinated) \	
count	3.734000e+03		
3.734000e+03			
mean	2.916515e+06		
2.627444e+06			
std	9.567607e+06		
8.192225e+06			
min	1.136000e+03		
5.580000e+02			
25%	9.248225e+04		
5.615975e+04			
50%	8.330395e+05		
7.887425e+05			
75%	2.499280e+06		
2.337874e+06			
max	9.096888e+07		
6.731098e+07			

Male(Individuals Vaccinated)		Female(Individuals Vaccinated) \	
count	1.600000e+02		1.600000e+02
mean	4.461687e+07		3.951018e+07
std	3.950749e+07		3.417684e+07
min	2.375700e+04		2.451700e+04
25%	5.739350e+06		5.023407e+06
50%	3.716590e+07		3.365402e+07
75%	7.441663e+07		6.685368e+07
max	1.349420e+08		1.156684e+08

Transgender(Individuals Vaccinated)		Total Individuals Vaccinated	
count	160.000000		
5.919000e+03			
mean	12370.543750		



```

4.547842e+06
std                                12485.026753
1.834182e+07
min                                2.000000
7.000000e+00
25%                                1278.750000
7.427550e+04
50%                                8007.500000
4.022880e+05
75%                                19851.000000
3.501562e+06
max                                46462.000000
2.506569e+08

[8 rows x 22 columns]

```

## Covid Data

```

# From the first dataset (covid_df) we will be removing few of the
# columns as they are unnecessary for the dataset
covid_df.drop(["Sno", "Time", "ConfirmedIndianNational", "ConfirmedForeignNational"], inplace=True, axis=1)

```

```
covid_df.head()
```

	Date	State/UnionTerritory	Cured	Deaths	Confirmed
0	2020-01-30	Kerala	0.0	0.0	1.0
1	2020-01-31	Kerala	0.0	0.0	1.0
2	2020-02-01	Kerala	0.0	0.0	2.0
3	2020-02-02	Kerala	0.0	0.0	3.0
4	2020-02-03	Kerala	0.0	0.0	3.0

```

# Changing the format of the Date Column
covid_df['Date']=pd.to_datetime(covid_df['Date'], format='%Y-%m-%d')
# The date column has been converted from object to datetime also the
# format got changed

```

```
covid_df.head()
```

	Date	State/UnionTerritory	Cured	Deaths	Confirmed
0	2020-01-30	Kerala	0.0	0.0	1.0
1	2020-01-31	Kerala	0.0	0.0	1.0
2	2020-02-01	Kerala	0.0	0.0	2.0
3	2020-02-02	Kerala	0.0	0.0	3.0
4	2020-02-03	Kerala	0.0	0.0	3.0

```

# Total Active cases
covid_df['Active_Cases']=covid_df['Confirmed']-(covid_df['Cured']
+covid_df['Deaths'])

```

```
covid_df.head(35)
```

	Date	State/UnionTerritory	Cured	Deaths	Confirmed
Active_Cases					
0	2020-01-30	Kerala	0.0	0.0	1.0
1.0					
1	2020-01-31	Kerala	0.0	0.0	1.0
1.0					
2	2020-02-01	Kerala	0.0	0.0	2.0
2.0					
3	2020-02-02	Kerala	0.0	0.0	3.0
3.0					
4	2020-02-03	Kerala	0.0	0.0	3.0
3.0					
5	2020-02-04	Kerala	0.0	0.0	3.0
3.0					
6	2020-02-05	Kerala	0.0	0.0	3.0
3.0					
7	2020-02-06	Kerala	0.0	0.0	3.0
3.0					
8	2020-02-07	Kerala	0.0	0.0	3.0
3.0					
9	2020-02-08	Kerala	0.0	0.0	3.0
3.0					
10	2020-02-09	Kerala	0.0	0.0	3.0
3.0					
11	2020-02-10	Kerala	0.0	0.0	3.0
3.0					
12	2020-02-11	Kerala	0.0	0.0	3.0
3.0					
13	2020-02-12	Kerala	0.0	0.0	3.0
3.0					
14	2020-02-13	Kerala	0.0	0.0	3.0
3.0					
15	2020-02-14	Kerala	0.0	0.0	3.0
3.0					
16	2020-02-15	Kerala	0.0	0.0	3.0
3.0					
17	2020-02-16	Kerala	0.0	0.0	3.0
3.0					
18	2020-02-17	Kerala	0.0	0.0	3.0
3.0					
19	2020-02-18	Kerala	0.0	0.0	3.0
3.0					
20	2020-02-19	Kerala	0.0	0.0	3.0
3.0					
21	2020-02-20	Kerala	0.0	0.0	3.0
3.0					
22	2020-02-21	Kerala	0.0	0.0	3.0
3.0					
23	2020-02-22	Kerala	0.0	0.0	3.0
3.0					

24	2020-02-23	Kerala	0.0	0.0	3.0
3.0					
25	2020-02-24	Kerala	0.0	0.0	3.0
3.0					
26	2020-02-25	Kerala	0.0	0.0	3.0
3.0					
27	2020-02-26	Kerala	0.0	0.0	3.0
3.0					
28	2020-02-27	Kerala	0.0	0.0	3.0
3.0					
29	2020-02-28	Kerala	0.0	0.0	3.0
3.0					
30	2020-02-29	Kerala	0.0	0.0	3.0
3.0					
31	2020-03-01	Kerala	0.0	0.0	3.0
3.0					
32	2020-03-02	Telengana	0.0	0.0	1.0
1.0					
33	2020-03-02	Kerala	0.0	0.0	3.0
3.0					
34	2020-03-02	Delhi	0.0	0.0	1.0
1.0					

*# Creating a Pivot Table of the Active Cases(Statewise)*

```
statewise=pd.pivot_table(covid_df,values=["Confirmed","Deaths","Cured"],index='State/UnionTerritory',aggfunc=max)
```

statewise

	Confirmed	Cured
Deaths		
State/UnionTerritory		
Andaman and Nicobar Islands	6674.0	6359.0
92.0		
Andhra Pradesh	1475372.0	1254291.0
9580.0		
Arunachal Pradesh	22462.0	19977.0
88.0		
Assam	340858.0	290774.0
2344.0		
Bihar	664115.0	595377.0
4039.0		
Cases being reassigned to states	9265.0	0.0
0.0		
Chandigarh	56513.0	48831.0
647.0		
Chhattisgarh	925531.0	823113.0
12036.0		
Dadra and Nagar Haveli and Daman and Diu	9652.0	8944.0

4.0		
Daman & Diu	2.0	0.0
0.0		
Delhi	1402873.0	1329899.0
22111.0		
Goa	138776.0	112633.0
2197.0		
Gujarat	766201.0	660489.0
9269.0		
Haryana	709689.0	626852.0
6923.0		
Himachal Pradesh	166678.0	129330.0
2460.0		
Jammu and Kashmir	251919.0	197701.0
3293.0		
Jharkhand	320934.0	284805.0
4601.0		
Karnataka	2272374.0	1674487.0
22838.0		
Kerala	2200706.0	1846105.0
6612.0		
Ladakh	16784.0	15031.0
170.0		
Lakshadweep	5212.0	3915.0
15.0		
Madhya Pradesh	742718.0	652612.0
7139.0		
Maharashtra	5433506.0	4927480.0
83777.0		
Manipur	40683.0	33466.0
612.0		
Meghalaya	24872.0	19185.0
355.0		
Mizoram	9252.0	7094.0
29.0		
Nagaland	18714.0	14079.0
228.0		
Odisha	633302.0	536595.0
2357.0		
Puducherry	87749.0	69060.0
1212.0		
Punjab	511652.0	427058.0
12317.0		
Rajasthan	879664.0	713129.0
7080.0		
Sikkim	11689.0	8427.0
212.0		
Tamil Nadu	1664350.0	1403052.0
18369.0		

Telangana	536766.0	485644.0
3012.0		
Telangana	443360.0	362160.0
2312.0		
Tripura	42776.0	36402.0
450.0		
Unassigned	77.0	0.0
0.0		
Uttar Pradesh	1637663.0	1483249.0
18072.0		
Uttarakhand	295790.0	214426.0
5132.0		
West Bengal	1171861.0	1026492.0
13576.0		

*# Recovery Rate*

```
statewise['Recovery
Rate']=statewise['Cured']*100/statewise['Confirmed']
```

*# Mortality Rate (Death Rate)*

```
statewise['Mortality
Rate']=statewise['Deaths']*100/statewise['Confirmed']
```

*# Sorting the Data on the basis of the Confirmed cases in the Descending Order*

```
statewise=statewise.sort_values(by='Confirmed',ascending=False)
```

*# Showing the Pivot table in the better way*

```
statewise.style.background_gradient(cmap='cubehelix')
```

```
<pandas.io.formats.style.Styler at 0x203f0c2f9d0>
```

## Key Findings

1. Maharastra is the having the maximum number of the cases numbered as 5433506 followed by Karnataka and Kerla and the least in Daman and Diu.
2. Mortality rate is heighest in the state Punjab having almost 2.40 followed by sikkim and Uttrakhand as 1.81 and 1.73
3. Recovery rate is heighest for Andaman and Nicobar Islands and Delhi ranging around 95 and 94 respectively

*# Top 10 active cases states*

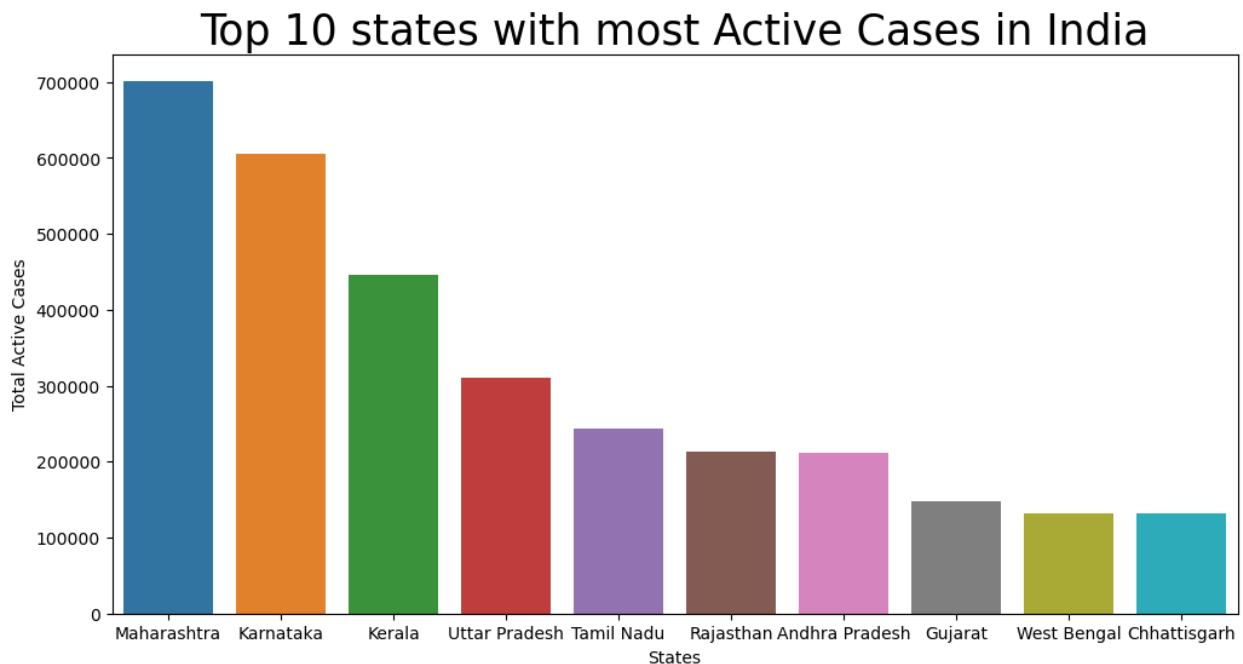
```
top_10_active_cases=covid_df.groupby(by='State/UnionTerritory').max()
[['Active_Cases','Date']].sort_values(by=['Active_Cases'],
```

```
ascending=False).reset_index()
```

*# Plotting the Bar Plot*

```
fig=plt.figure(figsize=(12,6)) # For the sie of the Bar Plot
```

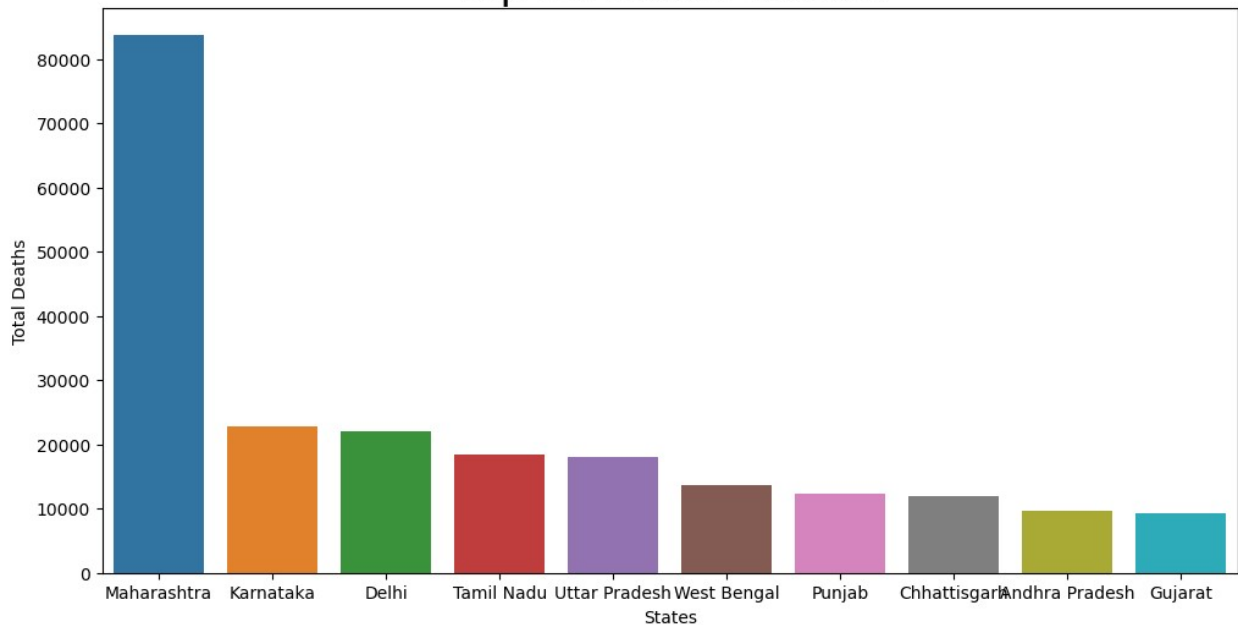
```
plt.title("Top 10 states with most Active Cases in India",size=25) #
Heading of the Bar Plot
ax=sns.barplot(data=top_10_active_cases.iloc[:10],y='Active_Cases',x='
State/UnionTerritory') # Providing Data
plt.xlabel('States')
plt.ylabel('Total Active Cases')
Text(0, 0.5, 'Total Active Cases')
```



```
# Top 10 Deaths Reported states
top_10_death_cases=covid_df.groupby(by='State/UnionTerritory').max()
[['Deaths', 'Date']].sort_values(by=['Deaths'],
ascending=False).reset_index()

# Plotting the Bar Plot for Deaths
fig=plt.figure(figsize=(12,6)) # For the size of the Bar Plot
plt.title("Top 10 Death States",size=25) # Heading of the Bar Plot
ax=sns.barplot(data=top_10_death_cases.iloc[:10],y='Deaths',x='State/
UnionTerritory') # Providing Data
plt.xlabel('States')
plt.ylabel('Total Deaths')
Text(0, 0.5, 'Total Deaths')
```

## Top 10 Death States



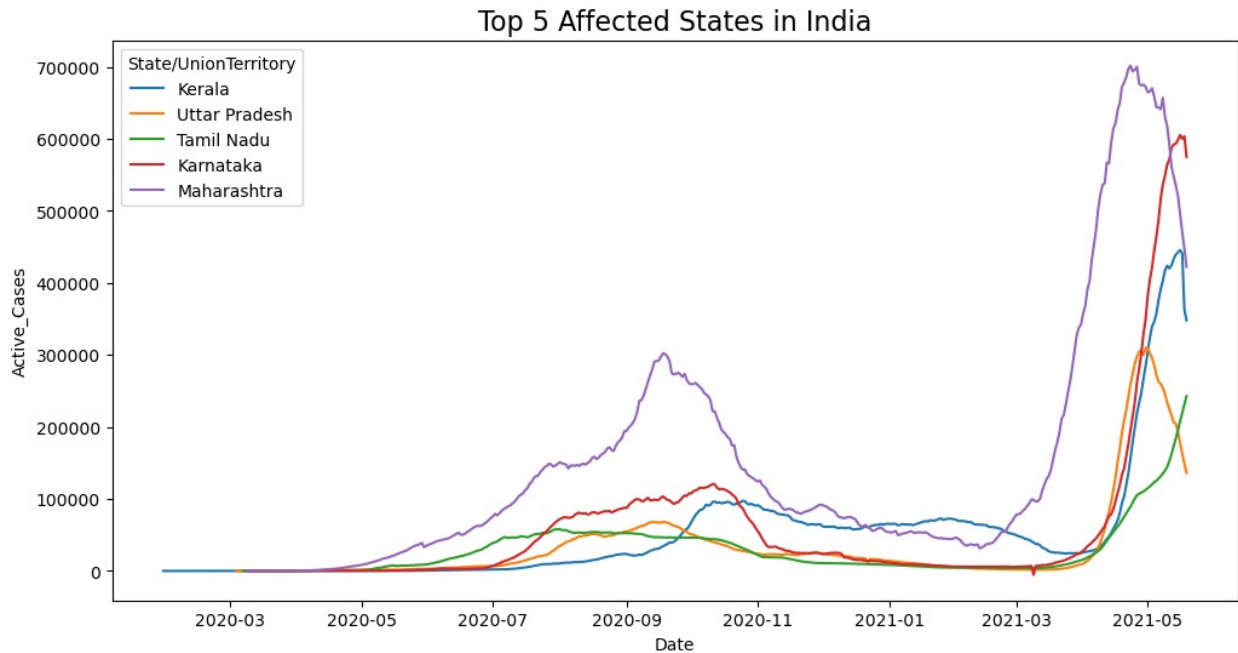
```
import matplotlib.pyplot as plt
import seaborn as sns

fig = plt.figure(figsize=(12, 6))

# Filtering the DataFrame
states_to_plot = ['Maharashtra', 'Karnataka', 'Kerala', 'Tamil Nadu',
                  'Uttar Pradesh']
filtered_df =
covid_df[covid_df['State/UnionTerritory'].isin(states_to_plot)]

# Creating the line plot
ax = sns.lineplot(data=filtered_df, x='Date', y='Active_Cases',
                  hue='State/UnionTerritory')

ax.set_title('Top 5 Affected States in India', size=16)
plt.show()
```



## Summary

1. The number of cases in these states started increasing June 2020 and came to normal at November 2021.
2. Again in April 2021 they started getting a hike and then started falling down in post May 2021

## Vaccine Data

```
vaccine_df.head()
```

	Updated On	State	Total Doses Administered	Sessions	Sites	\
0	16/01/2021	India	48276.0	3455.0	2957.0	
1	17/01/2021	India	58604.0	8532.0	4954.0	
2	18/01/2021	India	99449.0	13611.0	6583.0	
3	19/01/2021	India	195525.0	17855.0	7951.0	
4	20/01/2021	India	251280.0	25472.0	10504.0	

	First Dose Administered	Second Dose Administered	\
0	48276.0	0.0	
1	58604.0	0.0	
2	99449.0	0.0	
3	195525.0	0.0	
4	251280.0	0.0	

	Male (Doses Administered)	Female (Doses Administered)	\
0	NaN	NaN	
1	NaN	NaN	
2	NaN	NaN	
3	NaN	NaN	



4	NaN	NaN
Transgender (Doses Administered) ... 18-44 Years (Doses Administered) \		
0	NaN	...
NaN		
1	NaN	...
NaN		
2	NaN	...
NaN		
3	NaN	...
NaN		
4	NaN	...
NaN		
45-60 Years (Doses Administered) 60+ Years (Doses Administered) \		
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
18-44 Years(Individuals Vaccinated) 45-60 Years(Individuals Vaccinated) \		
0	NaN	
NaN		
1	NaN	
NaN		
2	NaN	
NaN		
3	NaN	
NaN		
4	NaN	
NaN		
60+ Years(Individuals Vaccinated) Male(Individuals Vaccinated) \		
0	NaN	23757.0
1	NaN	27348.0
2	NaN	41361.0
3	NaN	81901.0
4	NaN	98111.0
Female(Individuals Vaccinated) Transgender(Individuals Vaccinated) \		
0	24517.0	2.0
1	31252.0	4.0
2	58083.0	5.0

3	113613.0	11.0
4	153145.0	24.0

Total Individuals Vaccinated		
0	48276.0	
1	58604.0	
2	99449.0	
3	195525.0	
4	251280.0	

[5 rows x 24 columns]

*# Replacing the Column name from Updated On to Vaccine Date and Total Individuals Vaccinated to just "Total"*

```
vaccine_df.rename(columns={'Updated On': 'Vaccine_Date', 'Total
Individuals Vaccinated': 'Total'}, inplace=True)
vaccine_df.head(10)
```

	Vaccine_Date	State	Total Doses Administered	Sessions	Sites	\
0	16/01/2021	India	48276.0	3455.0	2957.0	
1	17/01/2021	India	58604.0	8532.0	4954.0	
2	18/01/2021	India	99449.0	13611.0	6583.0	
3	19/01/2021	India	195525.0	17855.0	7951.0	
4	20/01/2021	India	251280.0	25472.0	10504.0	
5	21/01/2021	India	365965.0	32226.0	12600.0	
6	22/01/2021	India	549381.0	36988.0	14115.0	
7	23/01/2021	India	759008.0	43076.0	15605.0	
8	24/01/2021	India	835058.0	49851.0	18111.0	
9	25/01/2021	India	1277104.0	55151.0	19682.0	

	First Dose Administered	Second Dose Administered	\
0	48276.0	0.0	
1	58604.0	0.0	
2	99449.0	0.0	
3	195525.0	0.0	
4	251280.0	0.0	
5	365965.0	0.0	
6	549381.0	0.0	
7	759008.0	0.0	
8	835058.0	0.0	
9	1277104.0	0.0	

	Male (Doses Administered)	Female (Doses Administered)	\
0	NaN	NaN	
1	NaN	NaN	
2	NaN	NaN	
3	NaN	NaN	
4	NaN	NaN	

5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN

Transgender (Doses Administered) ... 18-44 Years (Doses Administered) \

0	NaN ...
NaN	
1	NaN ...
NaN	
2	NaN ...
NaN	
3	NaN ...
NaN	
4	NaN ...
NaN	
5	NaN ...
NaN	
6	NaN ...
NaN	
7	NaN ...
NaN	
8	NaN ...
NaN	
9	NaN ...
NaN	

45-60 Years (Doses Administered) 60+ Years (Doses Administered) \

0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN

18-44 Years(Individuals Vaccinated) 45-60 Years(Individuals Vaccinated) \

0	NaN
NaN	
1	NaN
NaN	
2	NaN
NaN	
3	NaN

NaN
4
NaN
5
NaN
6
NaN
7
NaN
8
NaN
9
NaN

	60+ Years(Individuals Vaccinated)	Male(Individuals Vaccinated)	\
0	NaN	23757.0	
1	NaN	27348.0	
2	NaN	41361.0	
3	NaN	81901.0	
4	NaN	98111.0	
5	NaN	132784.0	
6	NaN	193899.0	
7	NaN	267856.0	
8	NaN	296283.0	
9	NaN	444137.0	

	Female(Individuals Vaccinated)	Transgender(Individuals Vaccinated)	\
0	24517.0	2.0	
1	31252.0	4.0	
2	58083.0	5.0	
3	113613.0	11.0	
4	153145.0	24.0	
5	233143.0	38.0	
6	355402.0	80.0	
7	491049.0	103.0	
8	538647.0	128.0	
9	832766.0	201.0	

Total

```
0    48276.0
1    58604.0
2    99449.0
3   195525.0
4   251280.0
5   365965.0
6   549381.0
7   759008.0
8   835058.0
9  1277104.0
```

```
[10 rows x 24 columns]
```

```
vaccine_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 7845 entries, 0 to 7844
```

```
Data columns (total 24 columns):
```

#	Column	Non-Null Count	Dtype
0	Vaccine_Date	7845 non-null	object
1	State	7845 non-null	object
2	Total Doses Administered	7621 non-null	float64
3	Sessions	7621 non-null	float64
4	Sites	7621 non-null	float64
5	First Dose Administered	7621 non-null	float64
6	Second Dose Administered	7621 non-null	float64
7	Male (Doses Administered)	7461 non-null	float64
8	Female (Doses Administered)	7461 non-null	float64
9	Transgender (Doses Administered)	7461 non-null	float64
10	Covaxin (Doses Administered)	7621 non-null	float64
11	CoviShield (Doses Administered)	7621 non-null	float64
12	Sputnik V (Doses Administered)	2995 non-null	float64
13	AEFI	5438 non-null	float64
14	18-44 Years (Doses Administered)	1702 non-null	float64
15	45-60 Years (Doses Administered)	1702 non-null	float64
16	60+ Years (Doses Administered)	1702 non-null	float64
17	18-44 Years(Individuals Vaccinated)	3733 non-null	float64
18	45-60 Years(Individuals Vaccinated)	3734 non-null	float64
19	60+ Years(Individuals Vaccinated)	3734 non-null	float64
20	Male(Individuals Vaccinated)	160 non-null	float64
21	Female(Individuals Vaccinated)	160 non-null	float64
22	Transgender(Individuals Vaccinated)	160 non-null	float64
23	Total	5919 non-null	float64

```
dtypes: float64(22), object(2)
```

```
memory usage: 1.4+ MB
```

```
vaccine_df.isnull().sum()
```

Vaccine_Date	0
State	0
Total Doses Administered	224
Sessions	224
Sites	224
First Dose Administered	224
Second Dose Administered	224
Male (Doses Administered)	384
Female (Doses Administered)	384
Transgender (Doses Administered)	384
Covaxin (Doses Administered)	224
CoviShield (Doses Administered)	224
Sputnik V (Doses Administered)	4850
AEFI	2407
18-44 Years (Doses Administered)	6143
45-60 Years (Doses Administered)	6143
60+ Years (Doses Administered)	6143
18-44 Years(Individuals Vaccinated)	4112
45-60 Years(Individuals Vaccinated)	4111
60+ Years(Individuals Vaccinated)	4111
Male(Individuals Vaccinated)	7685
Female(Individuals Vaccinated)	7685
Transgender(Individuals Vaccinated)	7685
Total	1926

dtype: int64

*# Dropping the Columns*

```
vaccination=vaccine_df.drop(columns=['Sputnik V (Doses Administered)', 'AEFI', '18-44 Years (Doses Administered)', '45-60 Years (Doses Administered)', '60+ Years (Doses Administered)'],axis=1,inplace=True)
```

vaccine\_df.head()

	Vaccine_Date	State	Total Doses Administered	Sessions	Sites	\
0	16/01/2021	India	48276.0	3455.0	2957.0	
1	17/01/2021	India	58604.0	8532.0	4954.0	
2	18/01/2021	India	99449.0	13611.0	6583.0	
3	19/01/2021	India	195525.0	17855.0	7951.0	
4	20/01/2021	India	251280.0	25472.0	10504.0	

	First Dose Administered	Second Dose Administered	\
0	48276.0	0.0	
1	58604.0	0.0	
2	99449.0	0.0	
3	195525.0	0.0	
4	251280.0	0.0	

	Male (Doses Administered)	Female (Doses Administered)	\
0	NaN	NaN	

1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
Transgender (Doses Administered) Covaxin (Doses Administered) \		
0	NaN	579.0
1	NaN	635.0
2	NaN	1299.0
3	NaN	3017.0
4	NaN	3946.0
CoviShield (Doses Administered) 18-44 Years(Individuals Vaccinated) \		
0	47697.0	
NaN		
1	57969.0	
NaN		
2	98150.0	
NaN		
3	192508.0	
NaN		
4	247334.0	
NaN		
45-60 Years(Individuals Vaccinated) 60+ Years(Individuals Vaccinated) \		
0		NaN
NaN		
1		NaN
NaN		
2		NaN
NaN		
3		NaN
NaN		
4		NaN
NaN		
Male(Individuals Vaccinated) Female(Individuals Vaccinated) \		
0	23757.0	24517.0
1	27348.0	31252.0
2	41361.0	58083.0
3	81901.0	113613.0
4	98111.0	153145.0
Transgender(Individuals Vaccinated) Total		
0	2.0	48276.0
1	4.0	58604.0
2	5.0	99449.0

3	11.0	195525.0
4	24.0	251280.0

```
# Male Vs Female Vaccination
```

```
male = vaccine_df["Male(Individuals Vaccinated)"].sum()
female = vaccine_df['Female(Individuals Vaccinated)'].sum()
px.pie(values=[male,female],names=['Male','Female'],title='Male vs
Female Vaccination')
```

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                            [0.5555555555555556, "#d8576b"],
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```

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```

```

# Removing all the rows where state is shown as India
vaccine=vaccine_df[vaccine_df.State!='India']
vaccine

```

Vaccine_Administered	Date	State	Total Doses
212	16/01/2021	Andaman and Nicobar Islands	23.0
213	17/01/2021	Andaman and Nicobar Islands	23.0
214	18/01/2021	Andaman and Nicobar Islands	42.0
215	19/01/2021	Andaman and Nicobar Islands	89.0
216	20/01/2021	Andaman and Nicobar Islands	124.0
...	...	...	...
7840	11/08/2021	West Bengal	NaN
7841	12/08/2021	West Bengal	NaN
7842	13/08/2021	West Bengal	NaN
7843	14/08/2021	West Bengal	NaN
7844	15/08/2021	West Bengal	NaN
Sessions Administered	Sites	First Dose Administered	Second Dose
212	2.0	2.0	23.0
213	2.0	2.0	23.0
214	9.0	2.0	42.0
215	12.0	2.0	89.0
216	16.0	3.0	124.0
...	...	...	...
7840	NaN	NaN	NaN
7841	NaN	NaN	NaN
7842	NaN	NaN	NaN
7843	NaN	NaN	NaN
7844	NaN	NaN	NaN

	Male (Doses Administered)	Female (Doses Administered)	\
212	12.0	11.0	
213	12.0	11.0	
214	29.0	13.0	
215	53.0	36.0	
216	67.0	57.0	
...	...	...	
7840	NaN	NaN	
7841	NaN	NaN	
7842	NaN	NaN	
7843	NaN	NaN	
7844	NaN	NaN	

	Transgender (Doses Administered)	Covaxin (Doses Administered)
\		
212	0.0	0.0
213	0.0	0.0
214	0.0	0.0
215	0.0	0.0
216	0.0	0.0
...	...	...
7840	NaN	NaN
7841	NaN	NaN
7842	NaN	NaN
7843	NaN	NaN
7844	NaN	NaN

	CoviShield (Doses Administered)	18-44 Years(Individuals Vaccinated)	\
212		23.0	
NaN			
213		23.0	
NaN			
214		42.0	
NaN			
215		89.0	
NaN			
216		124.0	
NaN			

...	...
...	
7840	NaN
NaN	
7841	NaN
NaN	
7842	NaN
NaN	
7843	NaN
NaN	
7844	NaN
NaN	

	45-60 Years(Individuals Vaccinated)	60+ Years(Individuals Vaccinated)
	\	

212	NaN
NaN	
213	NaN
NaN	
214	NaN
NaN	
215	NaN
NaN	
216	NaN
NaN	
...	...

...	
7840	NaN
NaN	
7841	NaN
NaN	
7842	NaN
NaN	
7843	NaN
NaN	
7844	NaN
NaN	

	Male(Individuals Vaccinated)	Female(Individuals Vaccinated)
	\	
212	NaN	NaN
213	NaN	NaN
214	NaN	NaN
215	NaN	NaN
216	NaN	NaN
...	...	...
7840	NaN	NaN
7841	NaN	NaN
7842	NaN	NaN
7843	NaN	NaN

7844	NaN	NaN
Transgender(Individuals Vaccinated) Total		
212	NaN	23.0
213	NaN	23.0
214	NaN	42.0
215	NaN	89.0
216	NaN	124.0
...	...	...
7840	NaN	NaN
7841	NaN	NaN
7842	NaN	NaN
7843	NaN	NaN
7844	NaN	NaN

[7633 rows x 19 columns]

*# Most Vaccinated State*

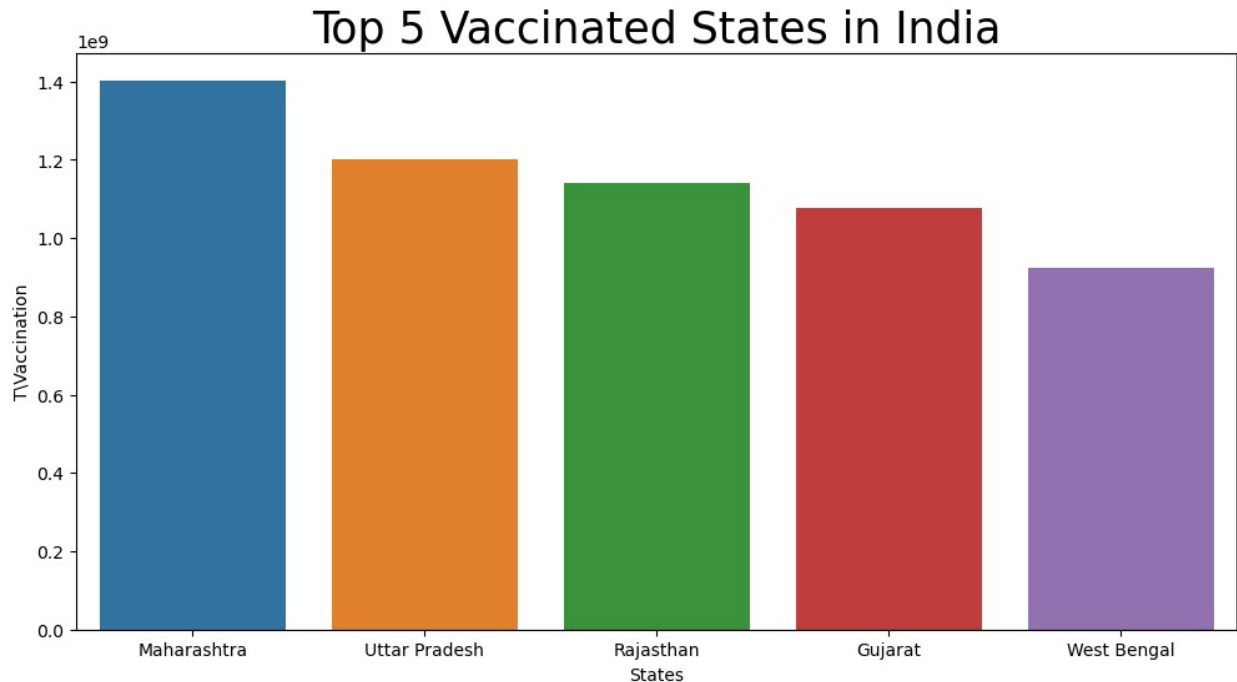
```
max_vac=vaccine.groupby('State')['Total'].sum().to_frame('Total')
max_vac=max_vac.sort_values('Total',ascending=False)[:5]
max_vac
```

	Total
State	
Maharashtra	1.403075e+09
Uttar Pradesh	1.200575e+09
Rajasthan	1.141163e+09
Gujarat	1.078261e+09
West Bengal	9.250227e+08

*# Plotting the Bar Plot*

```
fig=plt.figure(figsize=(12,6)) # For the size of the Bar Plot
plt.title("Top 5 Vaccinated States in India",size=25) # Heading of the
Bar Plot
x=sns.barplot(data=max_vac.iloc[:5],y=max_vac.Total,x=max_vac.index) #
Providing Data
plt.xlabel('States')
plt.ylabel('T\Vaccination')
```

```
Text(0, 0.5, 'T\\Vaccination')
```



*# Least Vaccinated State*

```
min_vac=vaccine.groupby('State')['Total'].sum().to_frame('Total')
min_vac=min_vac.sort_values('Total')[:5]
min_vac
```

State	Total
Lakshadweep	2124715.0
Andaman and Nicobar Islands	8102125.0
Ladakh	9466289.0
Dadra and Nagar Haveli and Daman and Diu	11358600.0
Sikkim	16136752.0

*# Plotting the Bar Plot*

```
fig=plt.figure(figsize=(12,6)) # For the size of the Bar Plot
plt.title("Least 5 Vaccinated States in India",size=25) # Heading of
the Bar Plot
x=sns.barplot(data=min_vac.iloc[:5],y=min_vac.Total,x=min_vac.index) #
Providing Data
plt.xlabel('States')
plt.ylabel('T\Vaccination')
```

```
Text(0, 0.5, 'T\\Vaccination')
```

## Least 5 Vaccinated States in India

