In [14]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
```

In [15]:
```
df = pd.read_csv("C:/Users/91962/Documents/country_vaccinations.csv")
```

In [16]:
```
print(df.head())
```

```
       country iso_code        date  total_vaccinations  people_vaccinated  \
0  Afghanistan      AFG  2021-02-22                 0.0                 0.0
1  Afghanistan      AFG  2021-02-23                 NaN                 NaN
2  Afghanistan      AFG  2021-02-24                 NaN                 NaN
3  Afghanistan      AFG  2021-02-25                 NaN                 NaN
4  Afghanistan      AFG  2021-02-26                 NaN                 NaN

   people_fully_vaccinated  daily_vaccinations_raw  daily_vaccinations  \
0                      NaN                     NaN                 NaN
1                      NaN                     NaN              1367.0
2                      NaN                     NaN              1367.0
3                      NaN                     NaN              1367.0
4                      NaN                     NaN              1367.0

   total_vaccinations_per_hundred  people_vaccinated_per_hundred  \
0                             0.0                            0.0
1                             NaN                            NaN
2                             NaN                            NaN
3                             NaN                            NaN
4                             NaN                            NaN

   people_fully_vaccinated_per_hundred  daily_vaccinations_per_million  \
0                                  NaN                             NaN
1                                  NaN                            34.0
2                                  NaN                            34.0
3                                  NaN                            34.0
4                                  NaN                            34.0

                                        vaccines  \
0  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
1  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
2  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
3  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...
4  Johnson&Johnson, Oxford/AstraZeneca, Pfizer/Bi...

                source_name            source_website
0  World Health Organization  https://covid19.who.int/
1  World Health Organization  https://covid19.who.int/
2  World Health Organization  https://covid19.who.int/
3  World Health Organization  https://covid19.who.int/
4  World Health Organization  https://covid19.who.int/
```

In [17]:
```
print("Missing values:\n", df.isnull().sum())
```

```
Missing values:
 country                                0
iso_code                                0
date                                    0
total_vaccinations                  42905
people_vaccinated                   45218
people_fully_vaccinated             47710
daily_vaccinations_raw              51150
daily_vaccinations                    299
total_vaccinations_per_hundred      42905
people_vaccinated_per_hundred       45218
people_fully_vaccinated_per_hundred 47710
daily_vaccinations_per_million        299
vaccines                                0
source_name                             0
source_website                          0
dtype: int64
```

In [18]:
```
print("Summary Statistics:\n", df.describe())
```

```
Summary Statistics:
       total_vaccinations  people_vaccinated  people_fully_vaccinated  \
count        4.360700e+04       4.129400e+04             3.880200e+04
mean         4.592964e+07       1.770508e+07             1.413830e+07
std          2.246004e+08       7.078731e+07             5.713920e+07
min          0.000000e+00       0.000000e+00             1.000000e+00
25%          5.264100e+05       3.494642e+05             2.439622e+05
50%          3.590096e+06       2.187310e+06             1.722140e+06
75%          1.701230e+07       9.152520e+06             7.559870e+06
max          3.263129e+09       1.275541e+09             1.240777e+09

       daily_vaccinations_raw  daily_vaccinations  \
count            3.536200e+04        8.621300e+04
mean             2.705996e+05        1.313055e+05
std              1.212427e+06        7.682388e+05
min              0.000000e+00        0.000000e+00
25%              4.668000e+03        9.000000e+02
50%              2.530900e+04        7.343000e+03
75%              1.234925e+05        4.409800e+04
max              2.474100e+07        2.242429e+07

       total_vaccinations_per_hundred  people_vaccinated_per_hundred  \
count                    43607.000000                   41294.000000
mean                        80.188543                      40.927317
std                         67.913577                      29.290759
min                          0.000000                       0.000000
25%                         16.050000                      11.370000
50%                         67.520000                      41.435000
75%                        132.735000                      67.910000
max                        345.370000                     124.760000

       people_fully_vaccinated_per_hundred  daily_vaccinations_per_million
count                         38802.000000                    86213.000000
mean                             35.523243                     3257.049157
std                              28.376252                     3934.312440
min                               0.000000                        0.000000
25%                               7.020000                      636.000000
50%                              31.750000                     2050.000000
75%                              62.080000                     4682.000000
max                             122.370000                   117497.000000
```

In [19]:
```
print("Data Types:\n", df.dtypes)
```

```
Data Types:
 country                                object
iso_code                               object
date                                   object
total_vaccinations                    float64
people_vaccinated                     float64
people_fully_vaccinated               float64
daily_vaccinations_raw                float64
daily_vaccinations                    float64
total_vaccinations_per_hundred        float64
people_vaccinated_per_hundred         float64
people_fully_vaccinated_per_hundred   float64
daily_vaccinations_per_million        float64
vaccines                               object
source_name                            object
source_website                         object
dtype: object
```

In [20]:
```
df["date"]= pd.to_datetime(df.date)
```

In [21]:
```
df["Total_vaccinations(count)"]= df.groupby("country").total_vaccinations.tail(1)
```

In [22]:
```
df.groupby("country")["Total_vaccinations(count)"].mean().sort_values(ascending= False).head(20)
```

Out[22]:
```
country
China             3.263129e+09
India             1.834501e+09
United States     5.601818e+08
Brazil            4.135596e+08
Indonesia         3.771089e+08
Japan             2.543456e+08
Bangladesh        2.436427e+08
Pakistan          2.193686e+08
Vietnam           2.031444e+08
Mexico            1.919079e+08
Germany           1.719400e+08
Russia            1.636012e+08
Philippines       1.487991e+08
Turkey            1.468819e+08
Iran              1.467926e+08
France            1.416662e+08
United Kingdom    1.409683e+08
Italy             1.358709e+08
Thailand          1.288824e+08
South Korea       1.206045e+08
Name: Total_vaccinations(count), dtype: float64
```

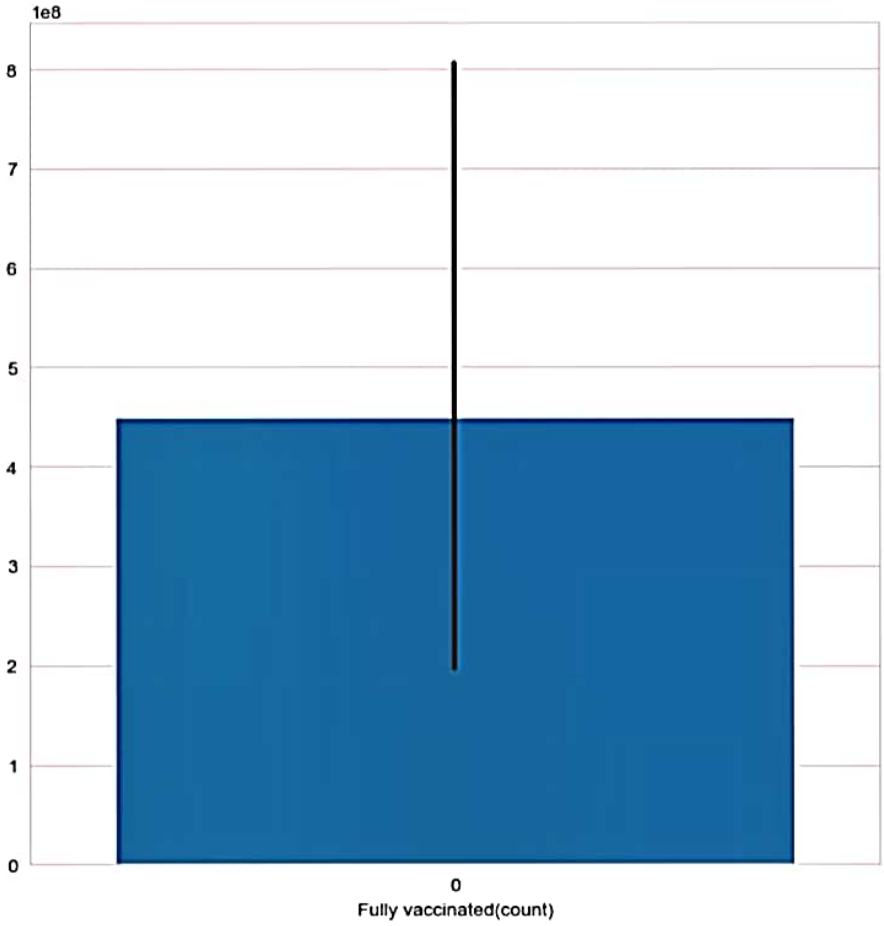
In [26]:
```
df["Full_vaccinations(count)"]= df.groupby("country").people_fully_vaccinated.tail(1)

df.groupby("country")["Full_vaccinations(count)"].mean().sort_values(ascending= False).head(20)
```

Out[26]:
```
country
India             828229455.0
United States     217498967.0
Brazil            160272858.0
Indonesia         158830466.0
Bangladesh        107712737.0
Pakistan          101881176.0
Japan             100633737.0
Mexico             79711762.0
Vietnam            77754108.0
Russia             72841232.0
Philippines        65804988.0
Germany            63142649.0
Iran               56810058.0
Turkey             52968985.0
France             52438706.0
Thailand           50159803.0
United Kingdom     49404026.0
Italy              47817555.0
South Korea        44482876.0
England            41501690.0
Name: Full_vaccinations(count), dtype: float64
```

In [30]:
```
x=df.vaccines.unique()
y= list(x)
for i in y: print(i)
```

```
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing
Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V
Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik V
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech
Oxford/AstraZeneca
Oxford/AstraZeneca, Pfizer/BioNTech
Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V
CanSino, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
Moderna, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik V
Pfizer/BioNTech
Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik Light, Sputnik
V
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing
Sinopharm/Beijing, Sputnik V
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
Moderna, Pfizer/BioNTech
Covaxin, Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac
Johnson&Johnson, Oxford/AstraZeneca
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing
Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing
Sinopharm/Beijing
Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac
Covaxin, Oxford/AstraZeneca
CanSino, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac
CanSino, Sinopharm/Beijing, Sinopharm/Wuhan, Sinovac, ZF2001
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac
Covaxin, Oxford/AstraZeneca, Sinopharm/Beijing
Moderna, Oxford/AstraZeneca, Sinopharm/Beijing, Sputnik V
Abdala, Soberana Plus, Soberana02
Johnson&Johnson, Moderna, Pfizer/BioNTech
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V
Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
Covaxin, Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac
Johnson&Johnson, Pfizer/BioNTech
Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
Oxford/AstraZeneca, Sputnik V
Moderna
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V
Oxford/AstraZeneca, Sinopharm/Beijing
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
Johnson&Johnson, Moderna
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V
Pfizer/BioNTech, Sinovac
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
Covaxin, Oxford/AstraZeneca, Sputnik V
Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
COVIran Barekat, Covaxin, FAKHRAVAC, Oxford/AstraZeneca, Razi Cov Pars, Sinopharm/Beijing, Soberana02, Sp
ikoGen, Sputnik V
Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sputnik V
QazVac, Sinopharm/Beijing, Sputnik V
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik Light, Sputnik
V
Johnson&Johnson, Moderna, Novavax, Pfizer/BioNTech
Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V
Pfizer/BioNTech, Sinopharm/Beijing
CanSino, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
CanSino, Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V
Abdala, Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Soberana02, Sputnik Light, Sputnik V
Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac
CanSino, Covaxin, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik Light,
Sputnik V
Covaxin, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V
EpiVacCorona, Sputnik V
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac, Sputnik V
Pfizer/BioNTech, Sputnik V
Oxford/AstraZeneca, Sinopharm/Beijing, Sputnik V
Moderna, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech, Sputnik V
Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing, Sinovac
Johnson&Johnson, Oxford/AstraZeneca, Sinopharm/Beijing, Sinovac, Sputnik Light, Sputnik V
Medigen, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V
Johnson&Johnson, Pfizer/BioNTech, Sinopharm/Beijing
```

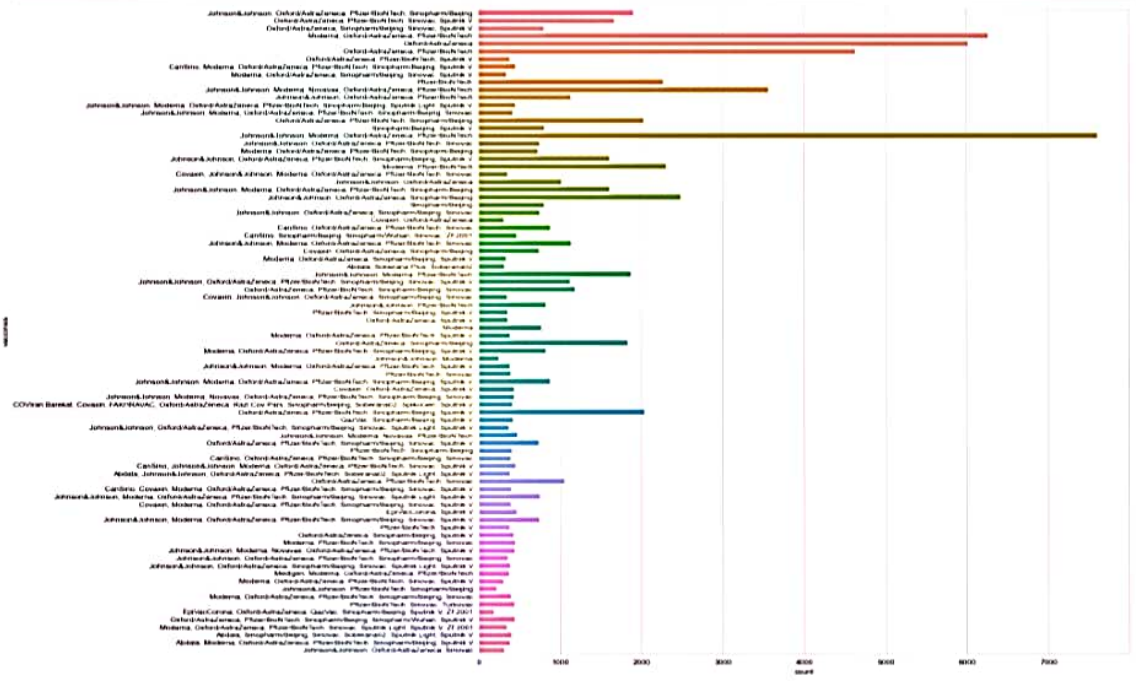
In [28]:
```
sns.set_style("whitegrid")
plt.figure(figsize= (8,8))
ax= sns.barplot(x.values)
ax.set_xlabel("Fully vaccinated(count)")
plt.show()
```



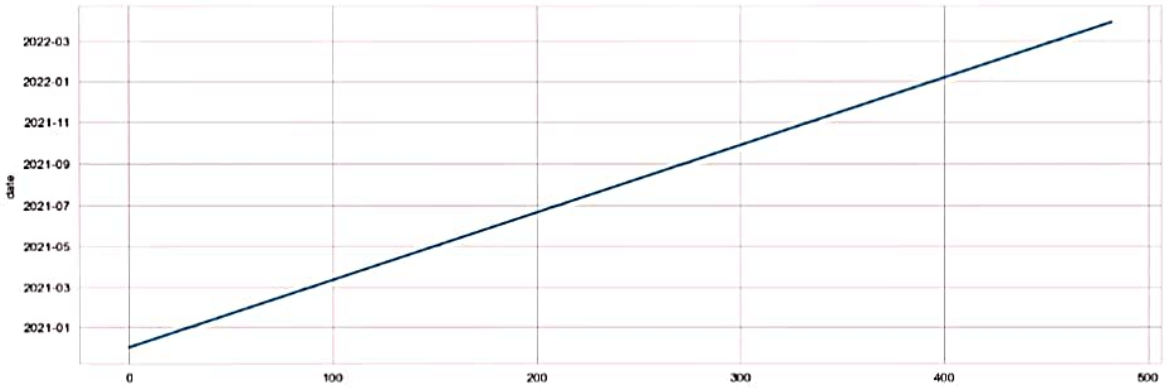
In [31]:
```
df.vaccines.value_counts()
```

Out[31]:
```
Johnson&Johnson, Moderna, Oxford/AstraZeneca, Pfizer/BioNTech                 7608
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech                                  6263
Oxford/AstraZeneca                                                            6022
Oxford/AstraZeneca, Pfizer/BioNTech                                           4629
Johnson&Johnson, Moderna, Novavax, Oxford/AstraZeneca, Pfizer/BioNTech        3564
                                                                              ...
Johnson&Johnson, Oxford/AstraZeneca, Sinovac                                   312
Moderna, Oxford/AstraZeneca, Pfizer/BioNTech, Sinovac, Sputnik V               311
Johnson&Johnson, Moderna                                                       251
Johnson&Johnson, Pfizer/BioNTech, Sinopharm/Beijing                            228
EpiVacCorona, Oxford/AstraZeneca, QazVac, Sinopharm/Beijing, Sputnik V, ZF2001 190
Name: vaccines, Length: 84, dtype: int64
```

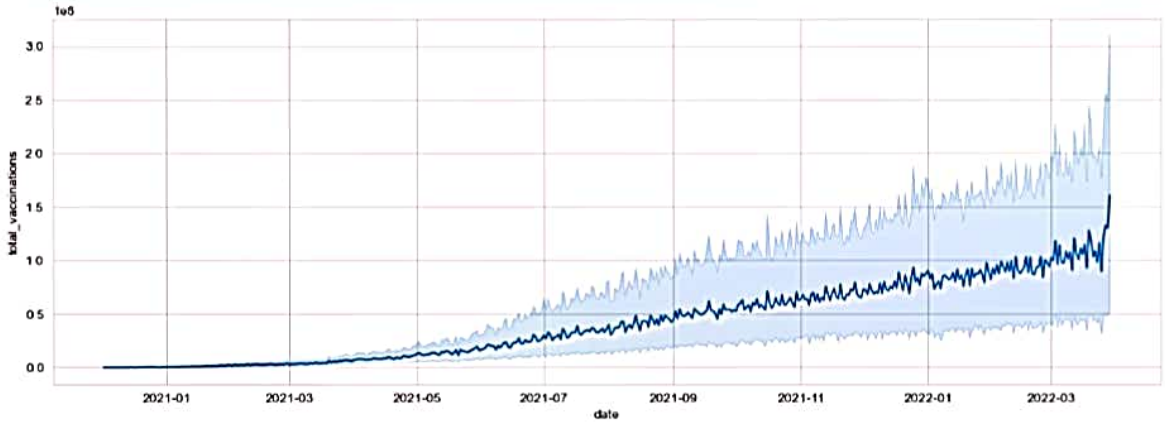
In [33]:
```
plt.figure(figsize=(15,15))
sns.countplot(y= "vaccines",data= df)
plt.show()
```



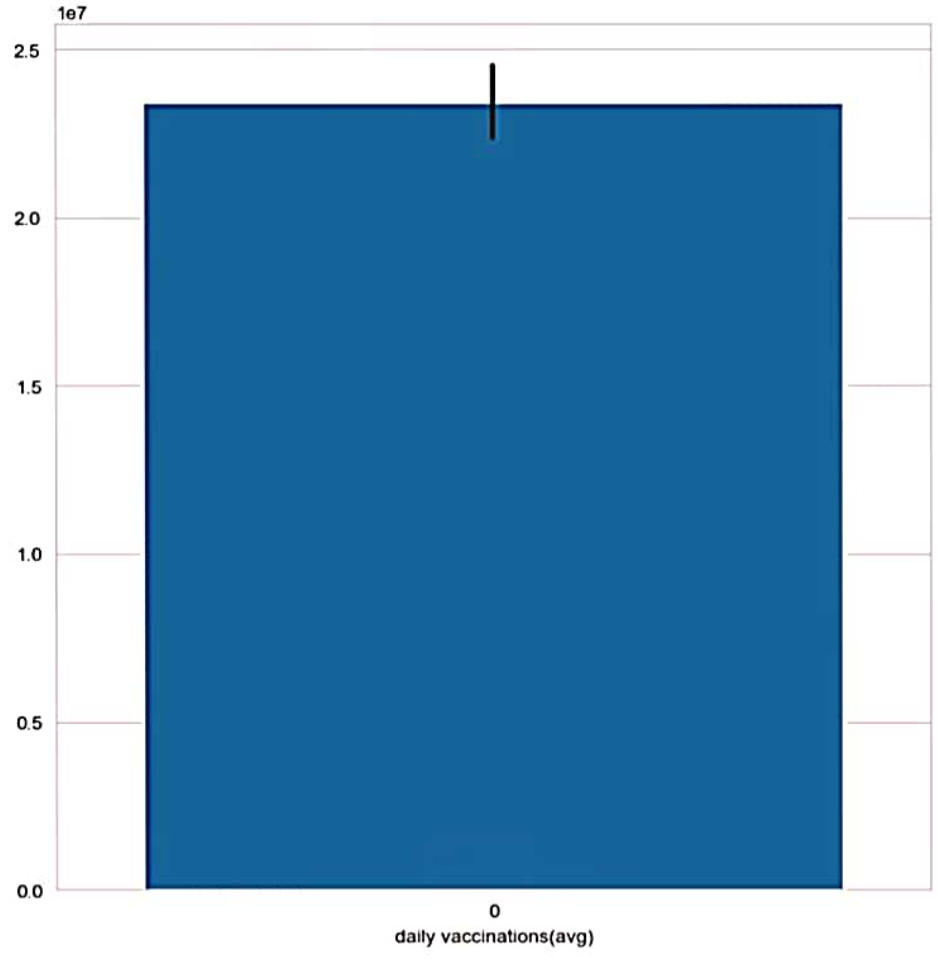
In [35]:
```
x= df.groupby("date").daily_vaccinations.sum()
plt.figure(figsize= (15,5))
sns.lineplot(x.index)
plt.show()
```



In [36]:
```
plt.figure(figsize= (15,5))
sns.lineplot(x= "date",y= "total_vaccinations",data= df)
plt.show()
```

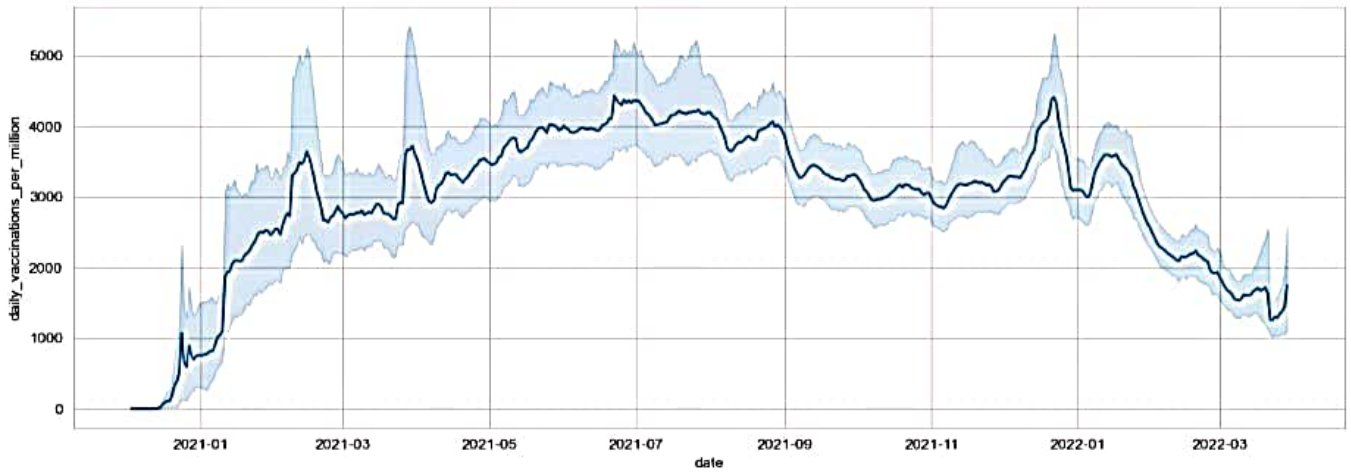


In [38]:
```
plt.figure(figsize= (8,8))
ax= sns.barplot(x.values)
ax.set_xlabel("daily vaccinations(avg)")
plt.show()
```

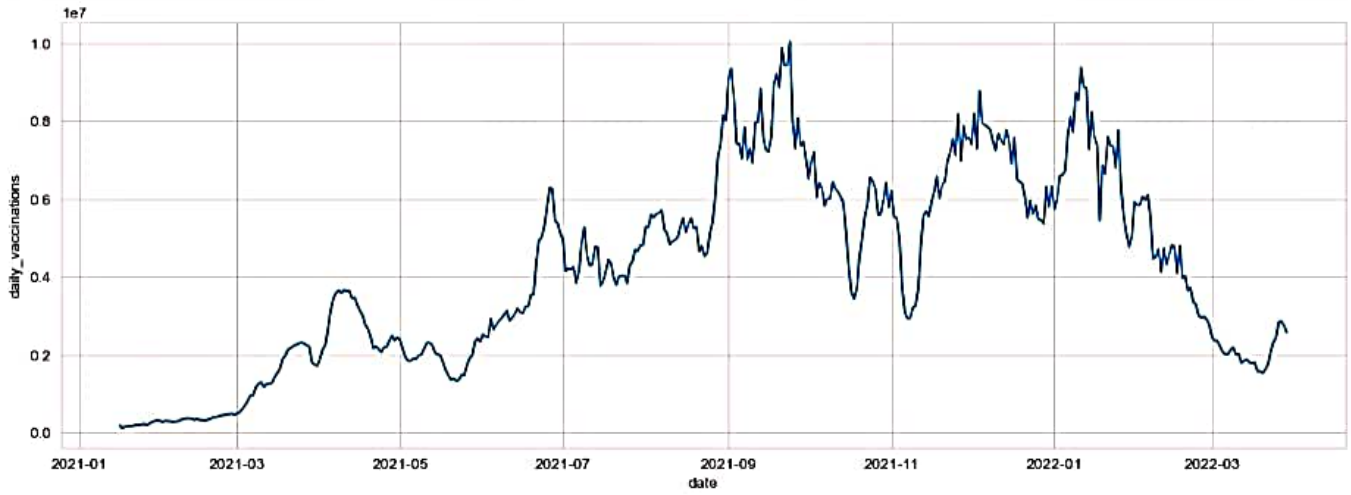


In [39]:
```
df["Total_vaccinations_per_hundred"]= df.groupby("country").total_vaccinations_per_hundred.tail(1)
```

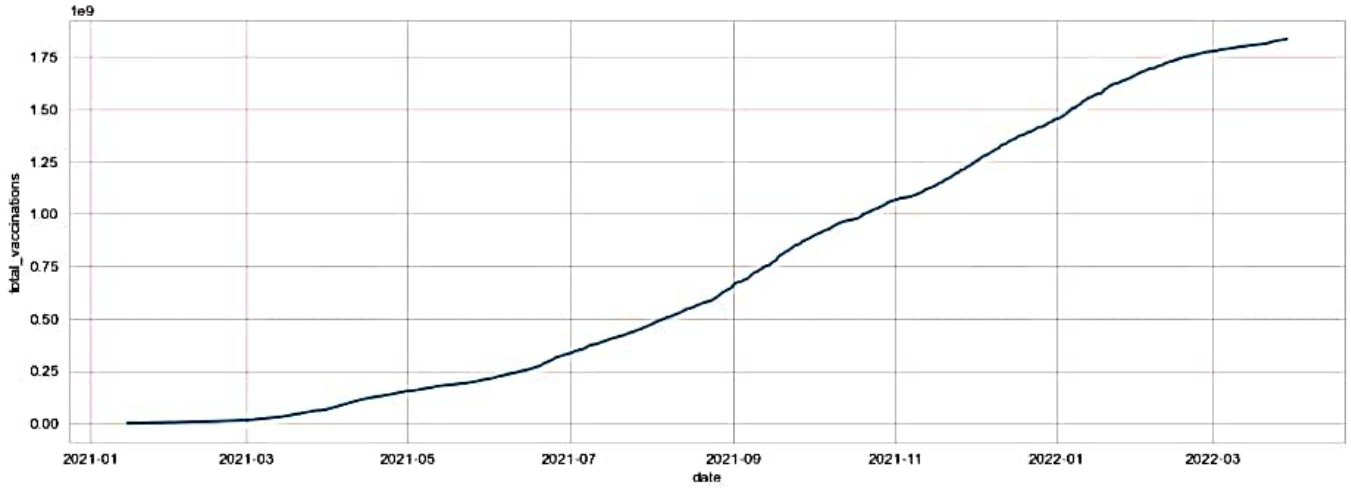
In [42]:
```
plt.figure(figsize= (15,5))
sns.lineplot(x= "date",y= "daily_vaccinations_per_million",data= df)
plt.show()
```



In [43]:
```
plt.figure(figsize= (15,5))

sns.lineplot(x= "date",y= "daily_vaccinations",data= df[df.country== "India"])
plt.show()
```



In [44]:
```
plt.figure(figsize= (15,5))
sns.lineplot(x= "date",y= "total_vaccinations",data= df[df["country"]=="India"])
plt.show()
```



In [ ]: