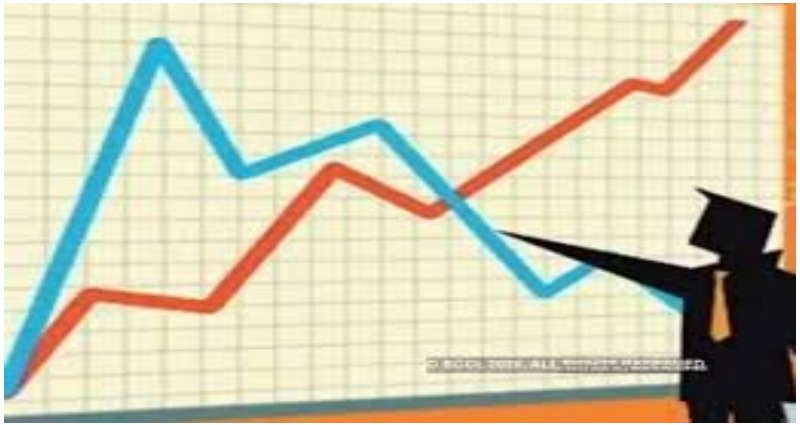
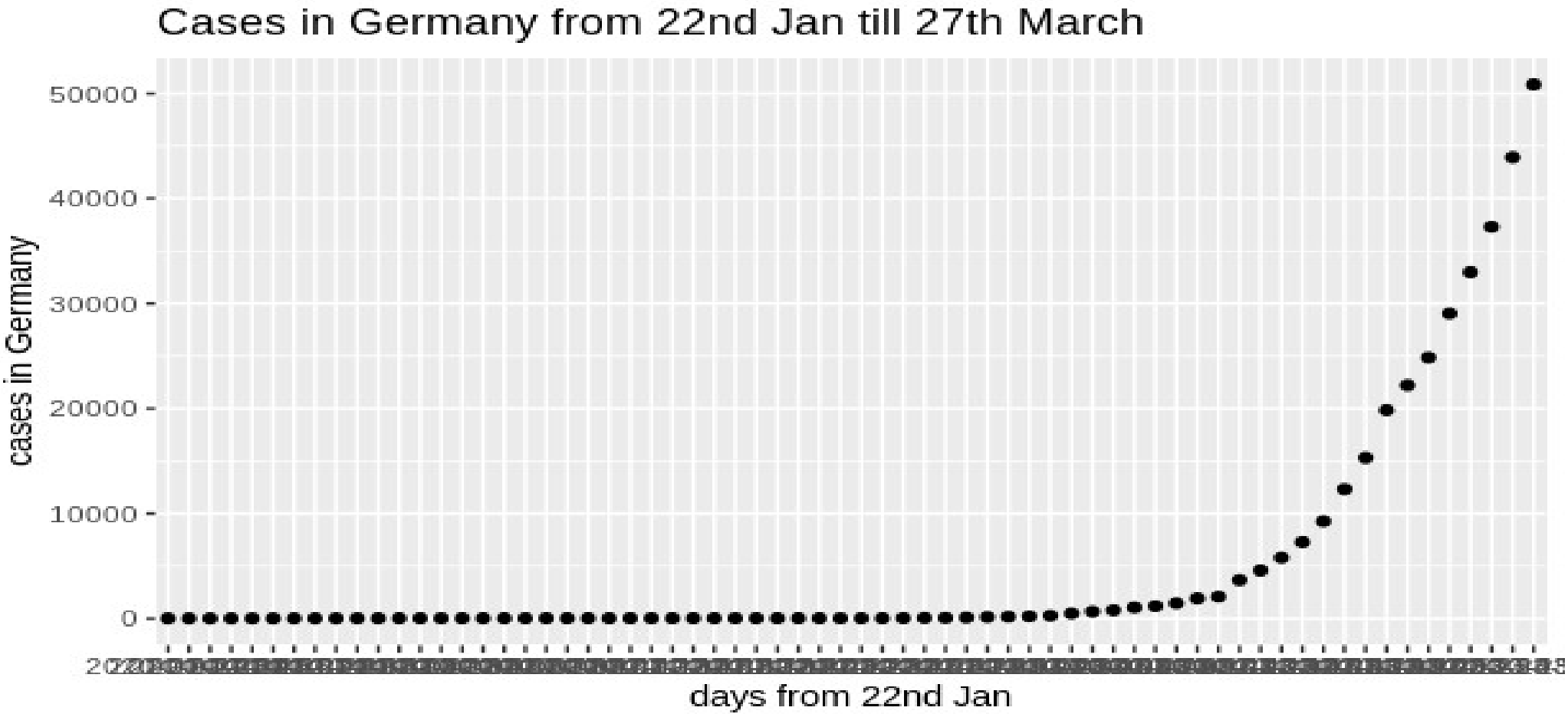
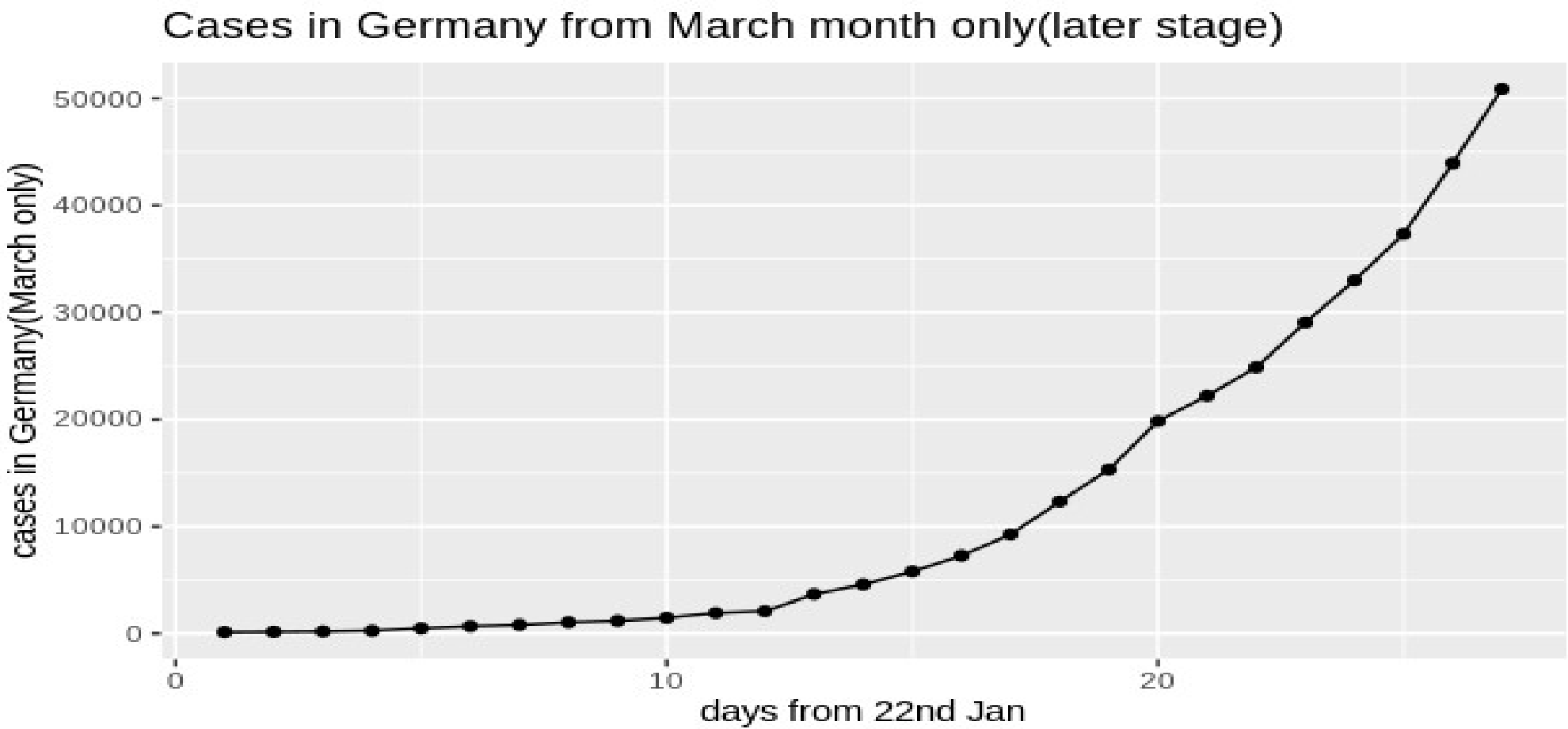
COVID-19 EXPECTED OUTCOME FOR INDIA IN COMING MONTHS OF APRIL-MAY

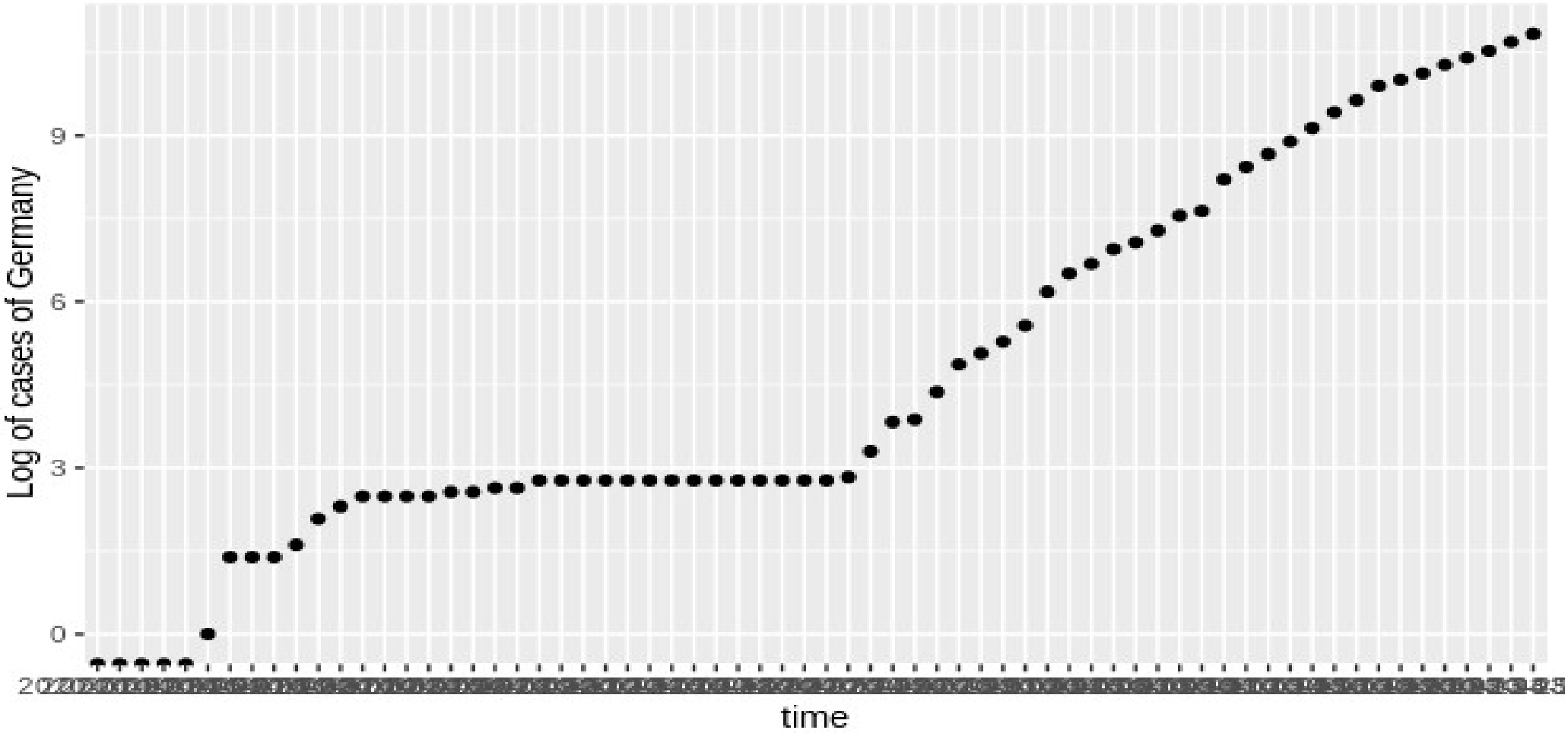


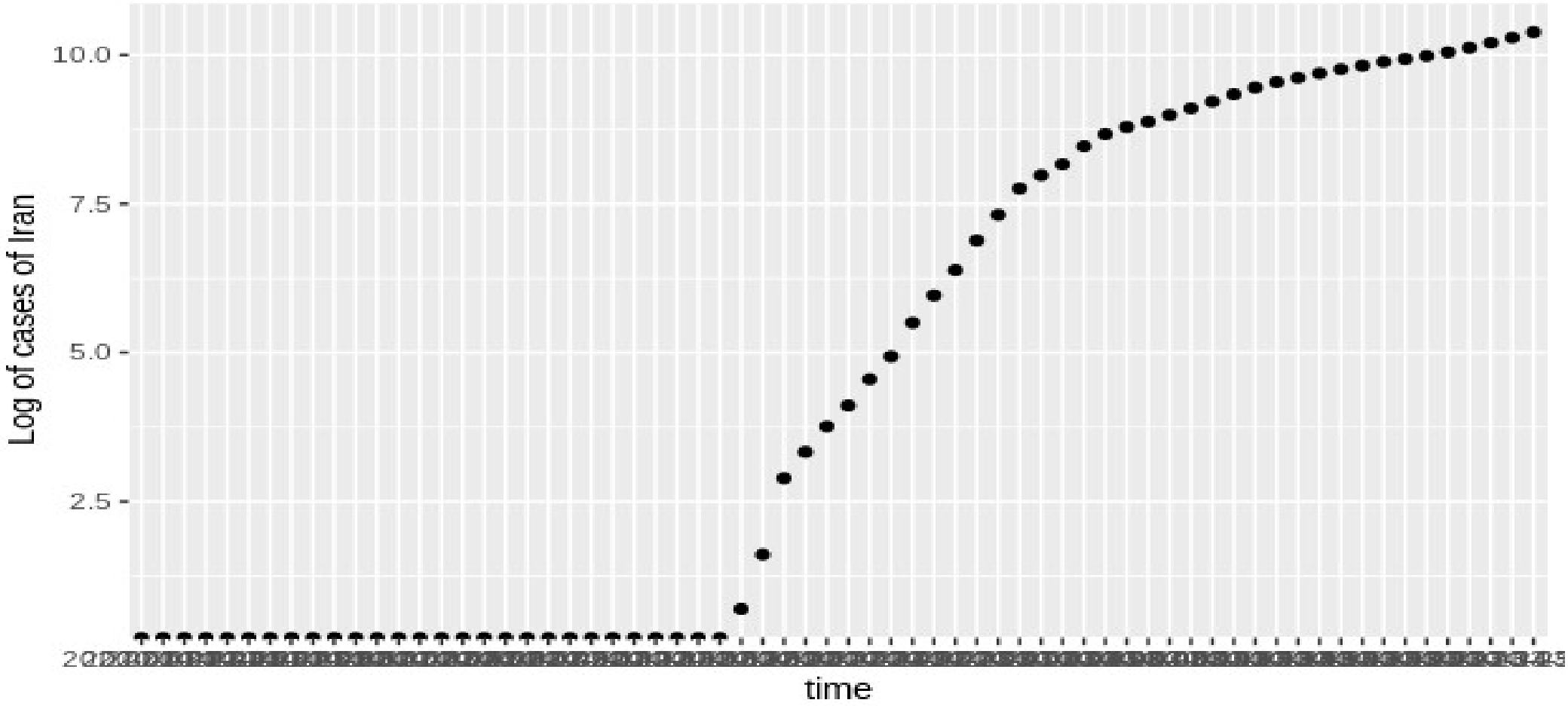
- It has been observed from the nature of spread of corona virus that rate increases with increase in number of cases in a geographical region.
- This observation is further supported by the shape of the graph of number of cases vs time of various countries which clearly resembles its exponential nature.
- Mathematically,assuming number of cases in a region to be N.Thus,dN/dt =kN.After solving we get N=Pe^kt.
- Here we take P as some initial cases which arrived to a country before any ban/limitations on international flights.
- Thus the only thing left is k which we are going to analyse based on a particular country’s measures and actions.

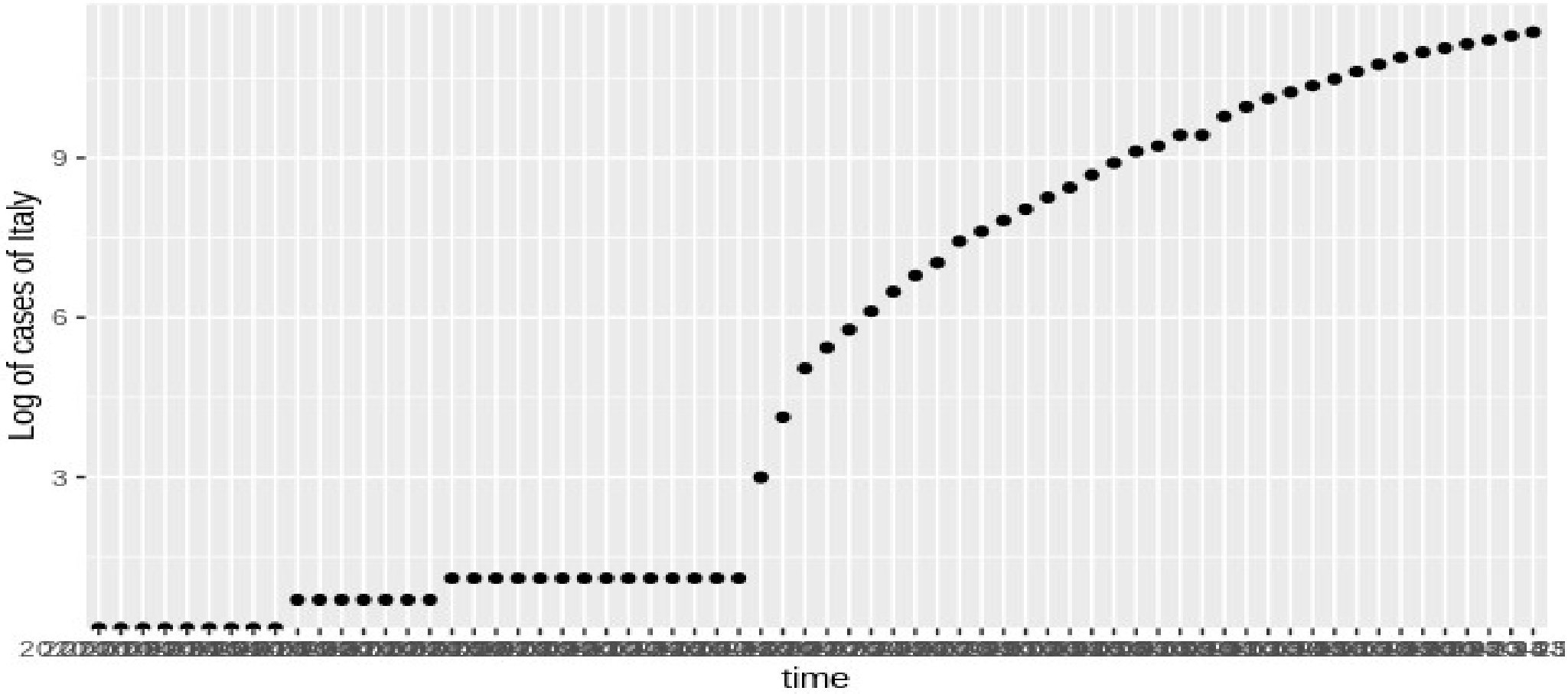

Cases in Germany from 22nd Jan till 27th March
50000
40000
30000
20000
10000
0
cases in Germany
days from 22nd Jan

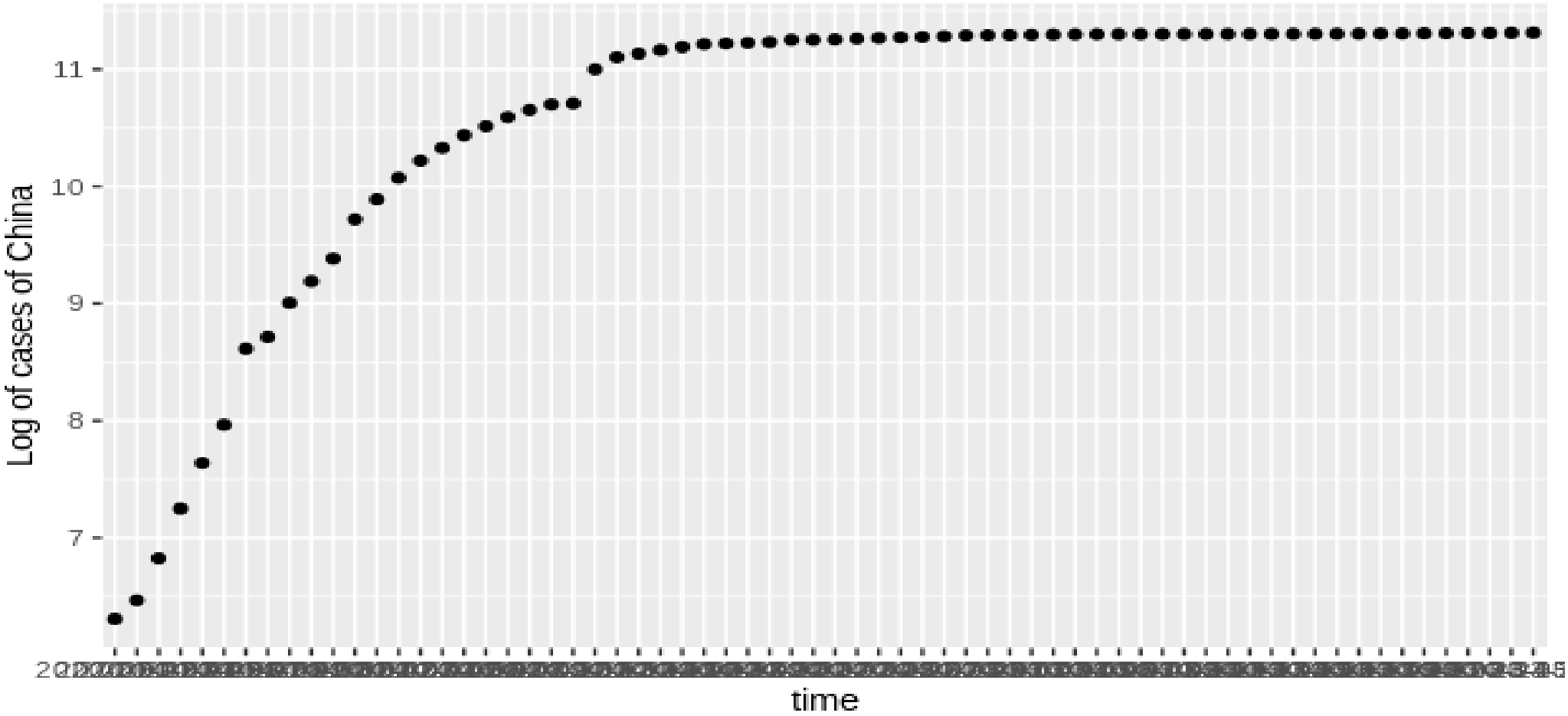

Cases in Germany from March month only(later stage)
cases in Germany(March only)
50000
40000
30000
20000
10000
0
0
10
20
days from 22nd Jan

- In order to verify our assumption of exponential growth,we compare real graph of case vs time with N=Pe^kt.
- Here we take log of y axis on original graph and plot vs time.
- Note that the graph we get can be compared with log(P)+kt vs time.
- We should not consider initial portion of time since there is no such community transmission at such time.
- Rather initially,cases appear just because of international visitors coming to a particular country with acquired covid-19.
- These initial numbers may be extremely random.
- As time passes,community transfer dominates reason of spread and not international visitors.
- Hence our assumption of dN/dt=kN(rate of transfer or increment is proportional to current cases) can be visualised just at later stage of timeline and not initial stage.


Log of cases of Germany
9
6
3
0
time


10.0
7.5
5.0
2.5
Log of cases of Iran
time


Log of cases of Italy
9
6
3
time

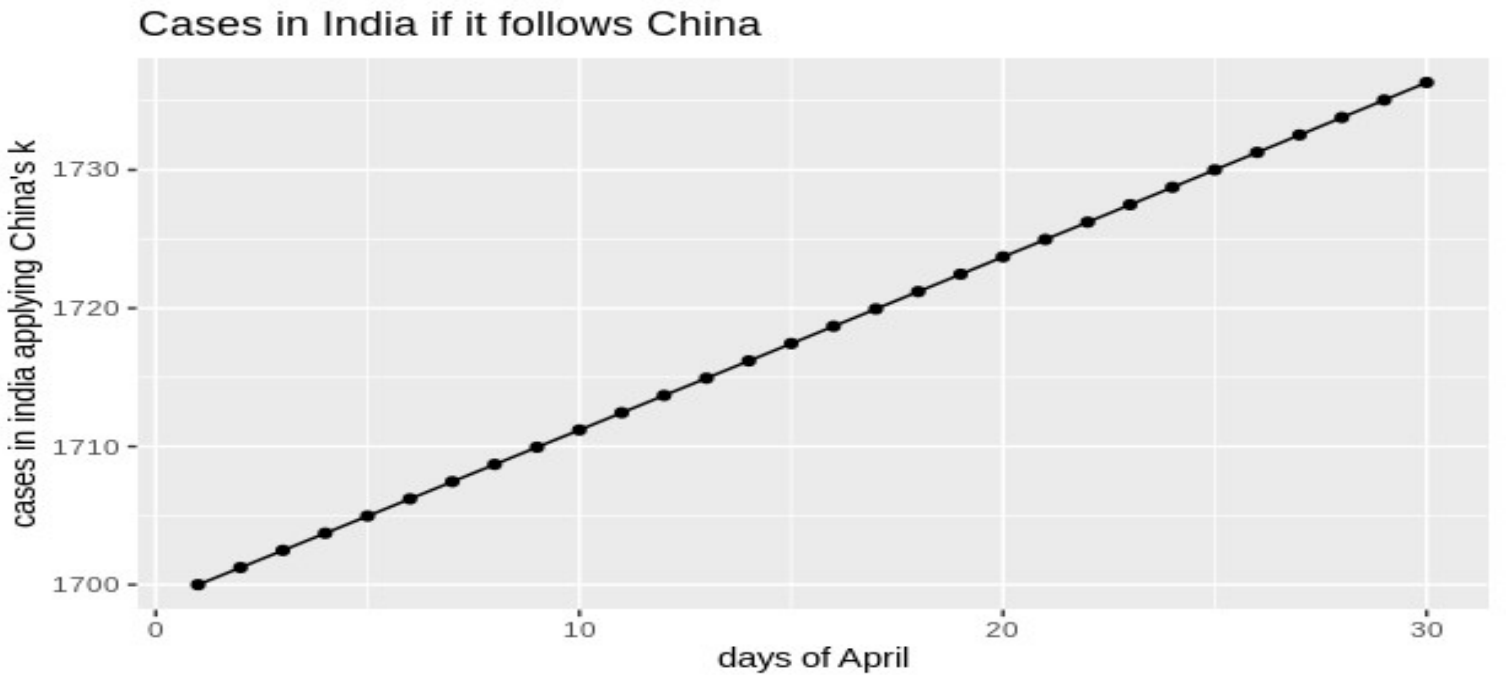

Log of cases of China
11
10
9
8
7
time

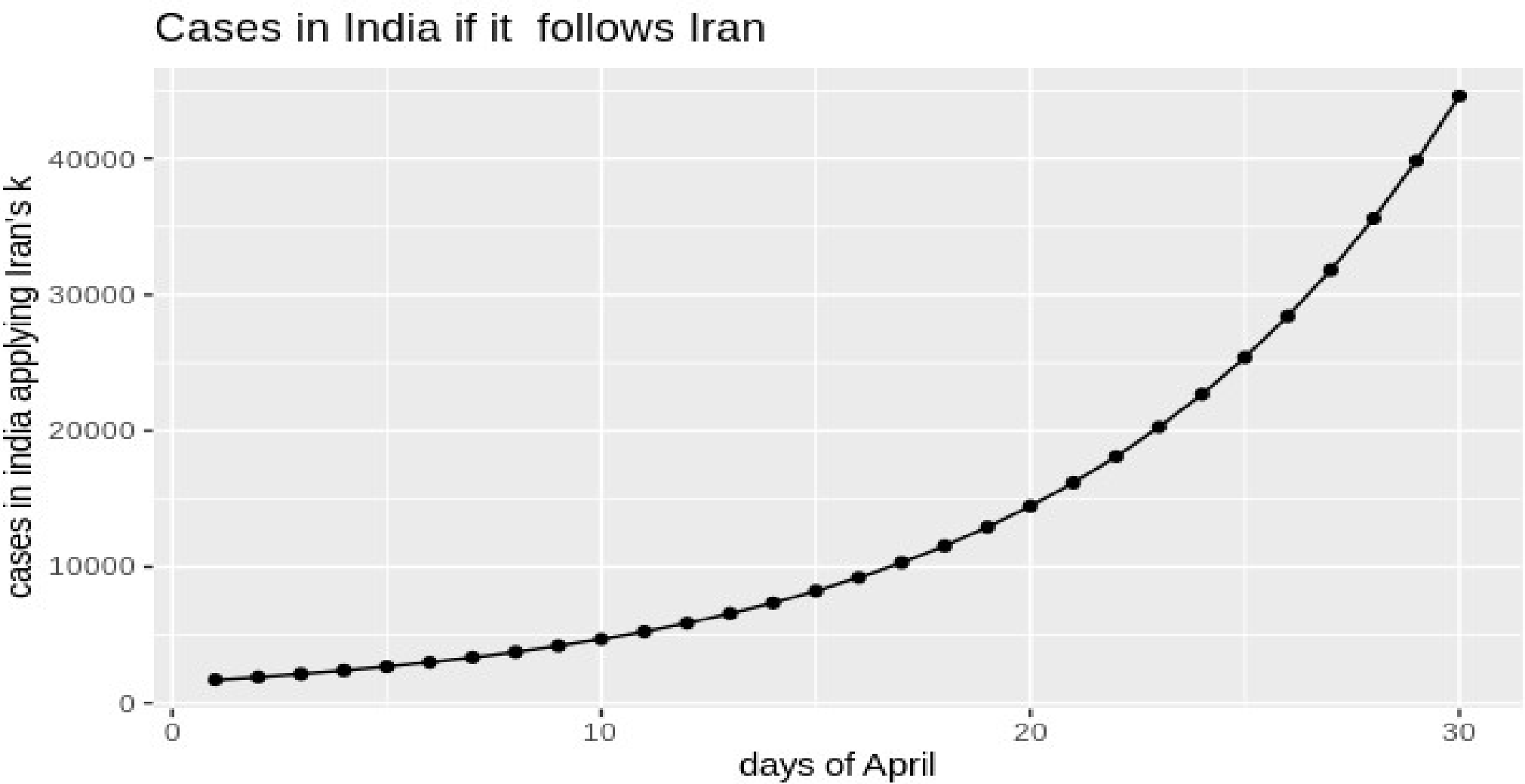
- All log(cases) vs time, at later stages have a bit linear path confirming our assumption and also our formula log(P)+kt=N or N=kt+C (where k and C are constants)
- The slight distortion in linear graph may be due to complete/partial isolation of some patient by the govt. or death of some cases(whose individual constant “k” tends to 0) leading to bend of linear graph.
- Since numbers of such pure isolations are bit less than total we roughly get a straight line in every country’s graph.

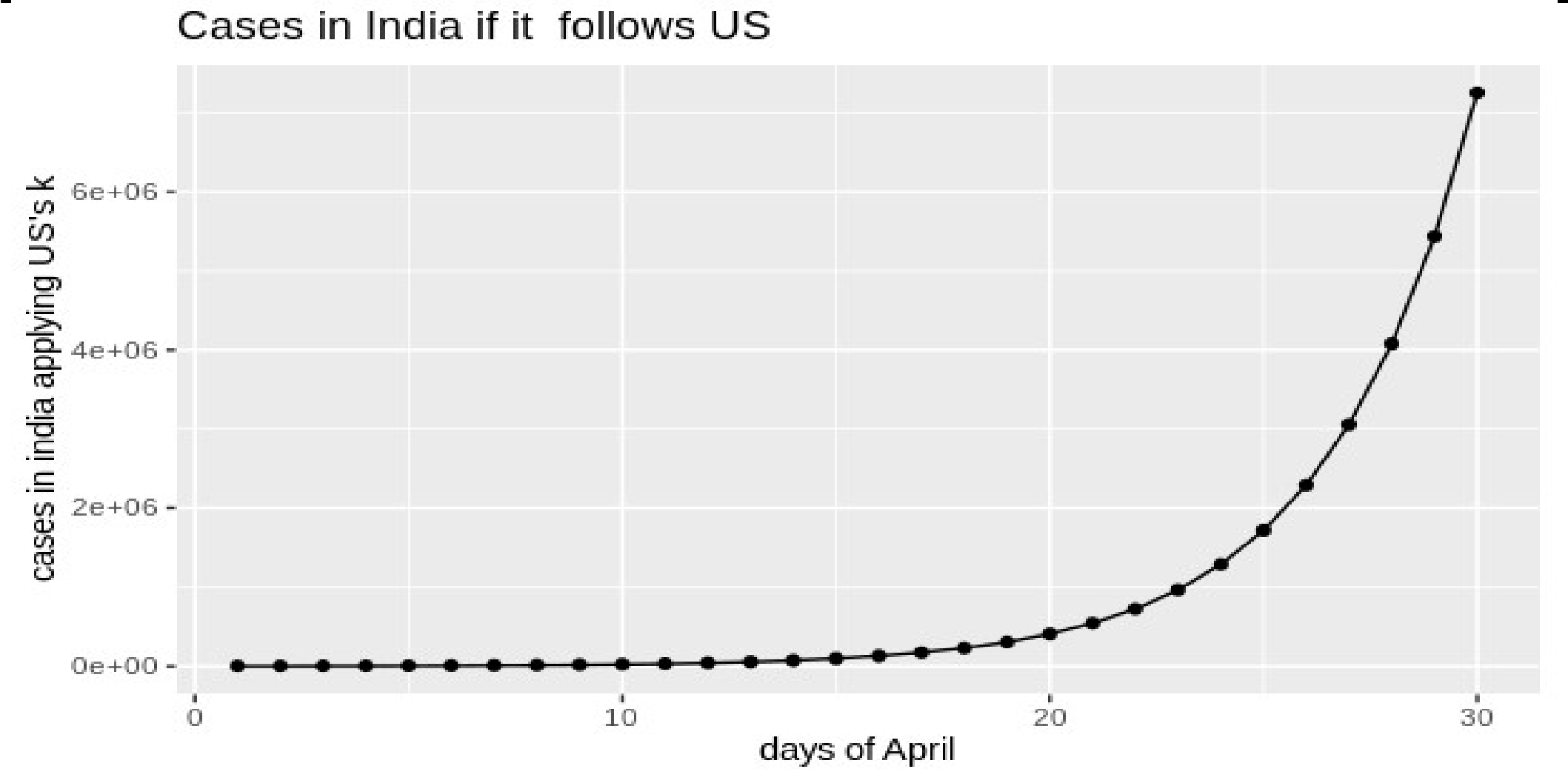
- Some rate constant “k” in the formula dN/dt=kN are given below which tells us about the rate at which a case speads the disease at later stages
- The following constants(k) have been found after plotting log of cases vs time and geting slope using linear regression
- Data is used only from later stages of major initial hit nations i.e 1 march onwards for linear regression and not whole time’s dataset

COUNTRY	RATE CONSTANT (k) slope of log(cases) vs time(24hrs=1)
CHINA	0.000729
IRAN	0.112662
ITALY	0.154547
FRANCE	0.212338
UK	0.231165
GERMANY	0.236270
SPAIN	0.264056
US	0.288228

- If we consider rates(k) of US,China and Iran at there later stages and apply to data of Indian cases for the month of april.
- On 1st of april we took original data and then applied three different k's.
- Outcome for three different cases were completely different and surprising.




Cases in India if it follows Iran
cases in india applying Iran's k
40000
30000
20000
10000
0
0
10
20
30
days of April


Cases in India if it follows US
cases in india applying US's k
6e+06
4e+06
2e+06
0e+00
0
10
20
30
days of April

Exponential constants k's for China,Iran,US are 0.000729,0.112662,0.288228

Since exponential graph may lead to drastic effect,an urgent effect is needed to control the curve

The following may be the result on 30th of April considering different path but same begining of 1700 cases on 1st april.