

**Development of Corona virus Morbidity, Recovery  
and Fatality rates in Egypt and the world:  
A study in medical geography**

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## **DEVELOPMENT OF CORONA VIRUS MORBIDITY, RECOVERY AND FATALITY RATES IN EGYPT AND THE WORLD: A STUDY IN MEDICAL GEOGRAPHY**

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### **Abstract**

This paper aims to study the development of morbidity, recovery and fatality rates in Egypt during the period from February 2020 to the first of August 2020 and compare them worldwide. And answers a number of questions, including: Are the rates of infection and recovery for Corona disease in Egypt commensurate with those in the world? Are the fatality rates in Egypt commensurate with global rates? What is the pattern of the Corona virus disease morbidity, recovery and death curve, in Egypt and the world? Based on the above, is it possible to predict the future of Corona in Egypt and the world?

The incidence of the disease in the world increased logarithmically from 0.7 per 100,000 people on February 14, reach to 166 per 100,000 on July 10, 2020, and by comparing this rate for Egypt, the rate was 0.09 per 100,000 in 13 March, rising to 80.2 per 100,000 people on July 10, 2020.

Recovery rates in the world during the same period increased from 12.1% of the number of infected to 58.3% on July 10, 2020, while in Egypt, recovery rates it is half of the global percentage.

The percentage of Fatality rates increased from 2.7% in the world, to 4.5% on July 10, 2020, while the percentage in Egypt is close to it in the world.

Morbidity and fatality rates of the Corona

epidemic, although they tend to gradually decrease in Egypt and the world, also increase the recovery rate, except that the fluctuation of cases of infection and death due to disease from day to day makes it's difficult to predict the future of the disease in the time of ambiguity surrounding it on the one hand, and the absence of a vaccine that helps protect against the disease on the other hand.

**key words:** Corona, Epidemic, Morbidity, Recovery, Fatality.

### **Introduction**

Population geography in particular are concerned with the development of the population, births, deaths and natural increase rates in a certain period of time, or from time to time, in order to draw a holistic picture of the levels and rates of population increase in a region, and compare the morbidity, recovery and fatality rates with a disease or group of diseases, from one region to another or from one country to another.

This paper aims to study the development of morbidity, recovery and fatality rates in Egypt during the period from February to July 2020 and compare them worldwide, as Egypt is one of the countries that has maintained the rate of infection and death in the Corona epidemic that is much less than many countries in the developed and developing world as far as possible. Either, at a time when this rate was expected to be tragically high, as Egypt suffers from a decline in the standard of living, lack of health awareness and poor health for many people, but this didn't happen.

Although it is necessary to study the development cases numbers of infection, but when comparing countries or regions, we applying the rate or percentage of the infected and death or recovery cases, for the population become one of the basic criteria for comparison.

The number of cases in China cannot be compared with this number in Malaysia or Egypt, because the population of China is tens of times the number of those two countries.

The benefit of this study in knowing the true size of the problem in Egypt compared to the average of the countries in the world, and through that comparison, the state can take many procedures that would help prevent or reduce infection and death, and increasing of recovery cases, which Egypt has succeeded in limiting the spread of infection by closing sports halls, classrooms, theaters, conferences, weddings and birthday parties, which are precautionary measures taken by the state to reduce the risks of the epidemic.

### **Methods and materials**

The study follows the descriptive analytical approach that helps in making comparisons in the rates of morbidity, recovery and death due to Corona disease between Egypt and the world, as well as the inductive approach that can predict what the state of the epidemic will be in the future by tracking cases of infection, recovery and death. The research also follows the Disease Mapping approach that is concerned with cartographic, diagrams representation, as well as quantitative methods and statistical analysis depending on Excel.

### **Objectives**

This paper aims to study the development of Corona virus disease morbidity, recovery rates, as well as mortality rates, in order to draw a clear picture that benefits researchers in preventing, limiting its spread, and minimizing its risks. And if can predict the future of Corona spread possibility in Egypt and the world or not.

### **Search questions**

This paper answers a number of questions, which are summarized as follows:

1- Are the morbidity rates of corona disease in Egypt commensurate with global rates?

2- Are the Corona disease recovery rates consistent with global rates?

3- Are the Corona disease fatality rates in Egypt commensurate with global rates?

4- What is the pattern of the Corona virus disease morbidity, recovery and death curve, in Egypt and the world?

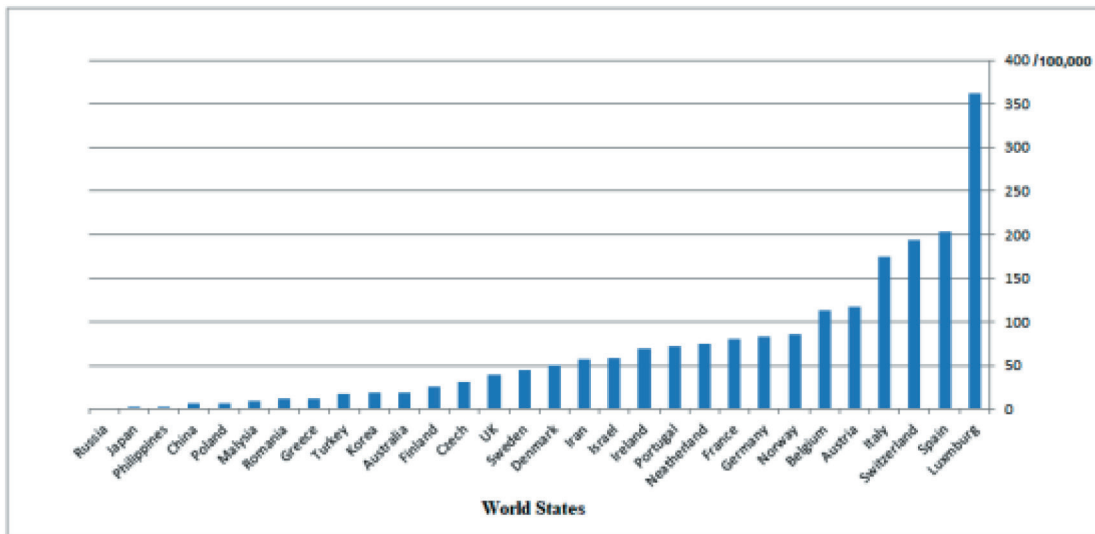
5- Is it possible to predict the future of Corona in Egypt and the world by following shape of the infection, recovery and death curve?

### **1- Morbidity rates**

Everyone considers that China, Italy, Spain, United Kingdom and the United States of America, in which the Corona epidemic broke out in large numbers, are the most affected countries in disease infection, this is wrong derivation because there is a difference between the absolute numbers of people infected with the disease, and the morbidity rate, and to demonstrate Therefore, we wonder whether a country like China has a population of 1,376 million, and the number of infected 82631 until April 1, 2020, with a country such as Malaysia in which the number of recorded and discovered cases reached only 2766 cases at the same time? The first impression is that there is no comparison, especially since the number of infected people in China is 30 times the number of people infected with the disease in Malaysia, but the truth is that the infection rate in Malaysia exceeds the infection rate in China, as this rate in China reached 6 while in Malaysia it reached 8.9 per 100,000 people. Fig (1) Therefore, Luxembourg is at the forefront of the world in terms of morbidity rate, although the number of cases did not exceed 2178 infected people, but because its population is 563 thousand people, or a little more than half a million

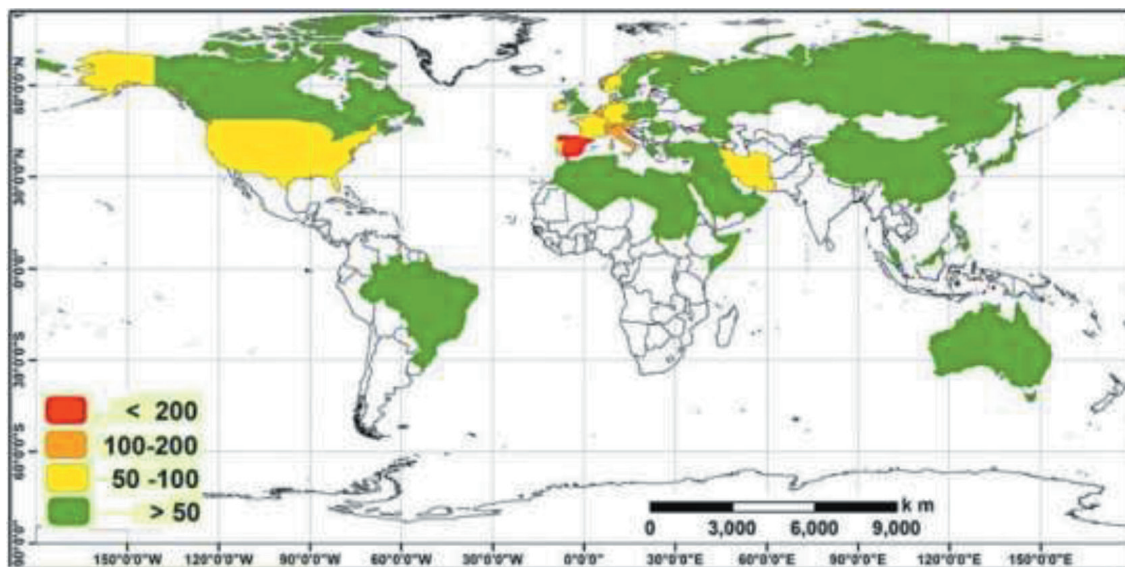
people, this is what led to the high incidence of the disease and its ranking the first state in the world, and China will come in the 34 th rank in the morbidity rate, but the United States of America, which the number of infected people reached the largest number in the world at all (163199), ranks fifteenth in morbidity rates. As indicated by the Fig, (1),(2)

The first case of the disease infection appeared in Egypt on February 14, 2020, and at that time, there were 55,748 cases in the world, most of them in China. Table (1) And figure (3) shows of the morbidity rates, in Egypt compared to the world, rate or ratio is summarized as follows: -



Source : rates by researcher calculation depending on W.H.O data.

Fig (1) Corona Morbidity rate/100000 in the highest 35 state in the world Until 1 April 2020



Source: rates by researcher analysis depending on W.H.O data of Corona Virus.

Fig (2) Corona Morbidity rate in the World until 1 of April 2020

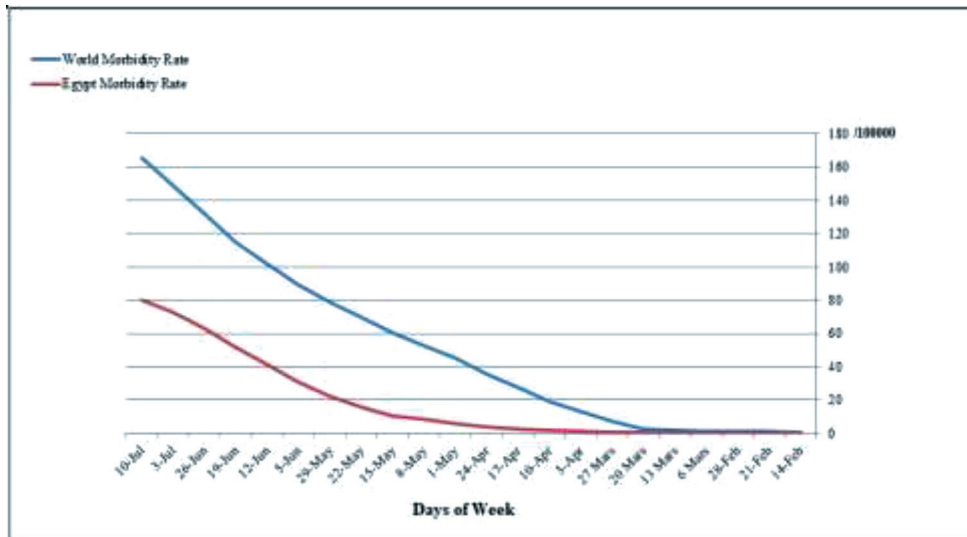
Table ( 1 ) Morbidity, Recovery and Fatality Rates in Egypt and the world during the period from February 14 to July 10, 2020

Egypt						world						DATE OF INFECTION
%	Death N.	%	recov No.	Mob rate	infected No	%	Death N.	%	recov No.	Mob rate	infected No.	
					1	2.7	1486	12.1	6723	0.7	55748	14 FEB
					1	2.8	2145	24.5	19000	1	77500	21 FEB
					2	3.3	2858	48.2	40000	1.1	83000	28 FEB
		40	8	0.02	20	3.4	3456	61.9	62375	1.3	100842	6 MARS
2.1	2	22.3	21	0.09	94	3.8	5000	48.4	64216	1.7	132567	13 MARS
2.8	8	21.1	60	0.3	285	4.2	8700	42.1	88000	2.7	209000	20 MARS
6.7	36	21.6	116	0.5	536	4.5	24110	22.9	122710	6.9	537042	27 MARS
6.7	66	21.9	216	1	985	5.2	52771	25.8	260055	13	1007977	3 APRIL
7.5	135	21.4	384	1.8	1794	5.7	85500	23.8	357000	19.3	1500000	10 APRIL
7.2	205	22.7	646	2.8	2844	6.9	146899	25.8	553260	27.5	2140000	17 APRIL
7.2	294	34.6	1417	4.1	4092	7	191422	27.5	751799	35.2	2736181	24 APRIL
6.9	406	24.8	1460	5.9	5895	6.8	239622	29.3	1039588	45.6	3545000	1 MAY
5.9	503	23	1945	8.5	8476	6.9	271029	34.3	1349699	52.4	3932984	8 MAY
5.6	570	23.5	2400	10.2	10193	6.7	303709	37.7	1713281	60.6	4543300	15 MAY
4.5	707	27.7	4374	15.8	15786	6.4	334997	40.2	2094143	69.5	5214039	22 MAY
4	879	25	5511	22.1	22082	6.1	362459	43.8	2593120	79	5924107	29 MAY
3.8	1166	26.2	8158	31.1	31115	5.9	393537	48.5	3263970	89.7	6725195	5 JUNE
3.4	1422	26.9	11108	41.3	41303	5.6	424137	50.6	3852889	102	7 613578	12 JUNE
3.9	2017	26.7	13928	52.2	52211	5.3	456727	52.9	4549677	115	8599287	19 JUNE
4.2	2620	26.7	16737	62.8	62755	5	492000	53.8	5317404	132	9876129	26 JUNE
4.4	3201	27.1	19690	72.7	72711	4.7	528,078	55.8	6,230931	149	11,162313	3 JUL
4.6	3702	29	23274	80.2	80235	4.5	557923	58.3	7241601	166	12415582	10 JUL

Source: rates by researcher analysis depending on W.H.O data of Corona Virus.

The global morbidity rate increased logarithmically from 0.7 per 100,000 people on February 14 to reach 1.7 on March 13, and to 13 on April 3, then to 45.6 people on May 1, 2020, to reach 166 per 100,000 people on 10 July 2020, by comparing this rate for Egypt, we find that it reached 0.09 per 100 thousand on March 13, and only 1 on April 3, and to 5.9 on May 1, 2020, to rise to 80.2 per 100 thousand people

on July 10, 2020 Fig. (3). This means that the rate of infection in Egypt is almost half that of the world’s counterpart. Some may believe that not all cases of infection are recorded in Egypt and other infected and undiscovered cases, but they are recovering without treatment. This is true, but we have to rely registered data, and we cannot predict or infer other expectations.



Source: researcher calculation depending on W.H.O data.

Figure (3) Comparison of Morbidity rate/ 100,000 between Egypt and the world during the period from February 14 to July 10, 2020

## 2- Recovery Rates

The recovery rate from infection with the Corona disease is one of the important indicators in calculating the severity of the disease, and it is calculated by dividing the number of infected people who were cured of infection by dividing the number of cases of infection discovered multiplied by 100, and results are called the recovery rate.

**Through follow-up The accumulated number of cases that occurred in a number of countries of the world until Tuesday 7 April 2020 for the most affected countries can be seen in fig (4) as follows:**

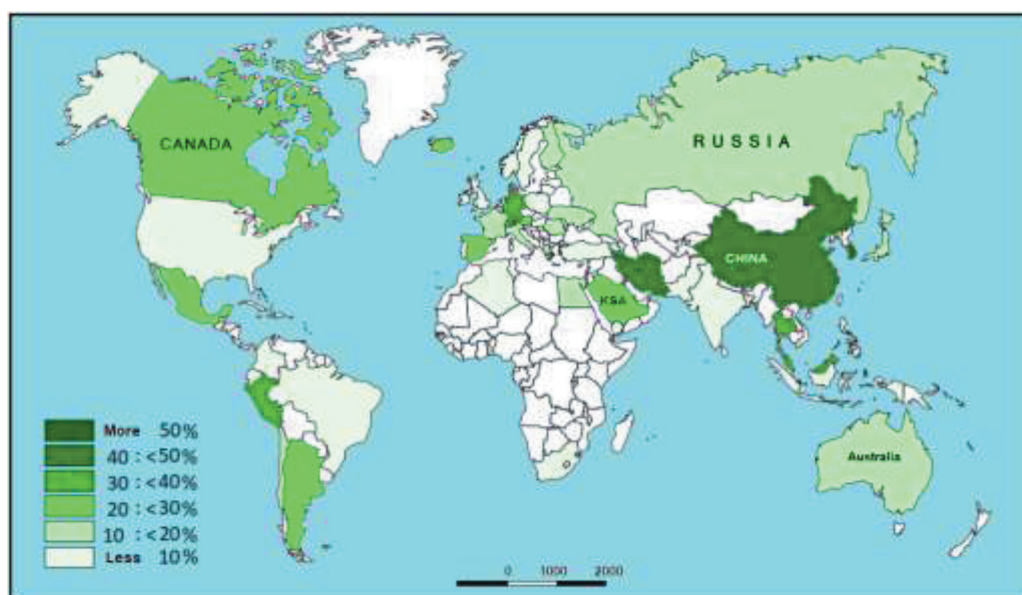
1 - The most countries in the world that recorded the largest rate of recovery and recovery rates from the disease were China and South Korea, which are the two countries in which the cure rate exceeded 50% of the number of infected people, as the percentage of cases that recovered completely in China reached 94.4% of the total number of infected , Followed by South Korea, at 64.8%.

2 - Iran comes in the second category in which the recovery rate ranges from 40:> 50% of the number of infected, where this percentage reached 40.1%.

3 - The third category in which the recovery rate ranges from 30:> 40% of the number of infected, includes Germany, Switzerland, Denmark, Malaysia, Peru and Thailand.

4 - The fourth category in which the recovery rate ranges from 20:> 30%, include, respectively, Spain, Iceland, Austria, Mexico, Singapore, Canada, Argentina, Saudi Arabia, Egypt, Belgium, Australia, Luxembourg, France, Italy, Greece, Japan, Chile, Finland and Romania.

5- The fifth category has a recovery rate of less than 10% are includes many countries of the world, The United States of America, United Kingdom, Switzerland, Netherlands, Brazil, Portugal, Israel, Sweden, Russia, Norway, Ireland, Czech, India, Poland, Pakistan, Ecuador, Philippines, Indonesia, Serbia, Panama, UAE, Qatar, South Africa, Dominica, Colombia and Algeria.



Source: researcher calculation depending on W.H.O data.

Fig (4) Recovery rate from Corona Virus in some states in the world from the beginning of epidemic until 7 of April 2020

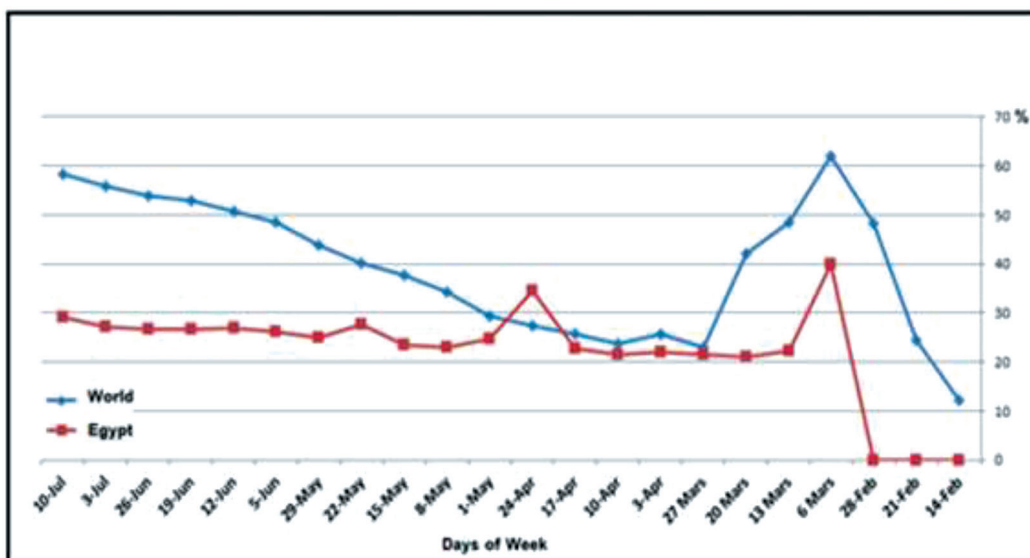
Cases of disease recovery rates are among the reliable rates when comparing Egypt and the world as well. By following the recovery rates in the world during the period from February 14 to July 10, 2020 as shown in Table 1 and Figure 5, we can find that 12.1% of the number of The infected doubled to 24.5% on February 21, and doubled again to 48.2% on February 28, and decreased to 42.1, 22.9, and 25.8 in the following successive weeks, and then rose to 58.3% on July 10, 2020, This fluctuation reflects an important note, which is That at the beginning of the disease, cases were few and countries were able to treat them, as respiratory instruments were proportional to the number of cases, and after the number of cases doubled to tens of thousands, countries were unable to track the increase in the number of infections and treat them, so the percentage of cases that were recovering decreased.

Egypt has kept extending the period since the discovery of the first case, bringing the total number of cases recorded on the first of May to 5895 cases in two and a half months, and the recovering rates ranged from 40% on March 6 down and up to 24.8% of the number of people infected with the disease on the first of May 2020 to 29% On July 10, 2020, and it is half of its percentage compared to the world.

**3-Fatality rates**

Fatality risk or case fatality ratio (CFR). Is easy to calculate. by the number of people who have died by Corona virus, and divide it by the total number of people diagnosed with the Corona disease. So if 10 people have died, and 100 people have been diagnosed with the Corona disease, the CFR is [10 / 100], or 10%. (John,L.,2001,24)

$$\text{Case Fertility Rate (CFR, in\%)} = \frac{\text{Number of Deaths from disease}}{\text{Number of diagnosed cases of disease}} \times 100$$



Source : researcher calculation depending on W.H.O data

Figure ( 5 ) Development of Coronavirus recovery rate in Egypt and World during 14 February to 10 July, 2020

Fatality rate due to corona worldwide has evolved from 2.7% of the number of people infected on February 14 to 3.3% on February 28, and to 4.5% on March 27, rising to 6.8% on May 1, 2020, then it decreases to 4.5% On July 10, 2020.

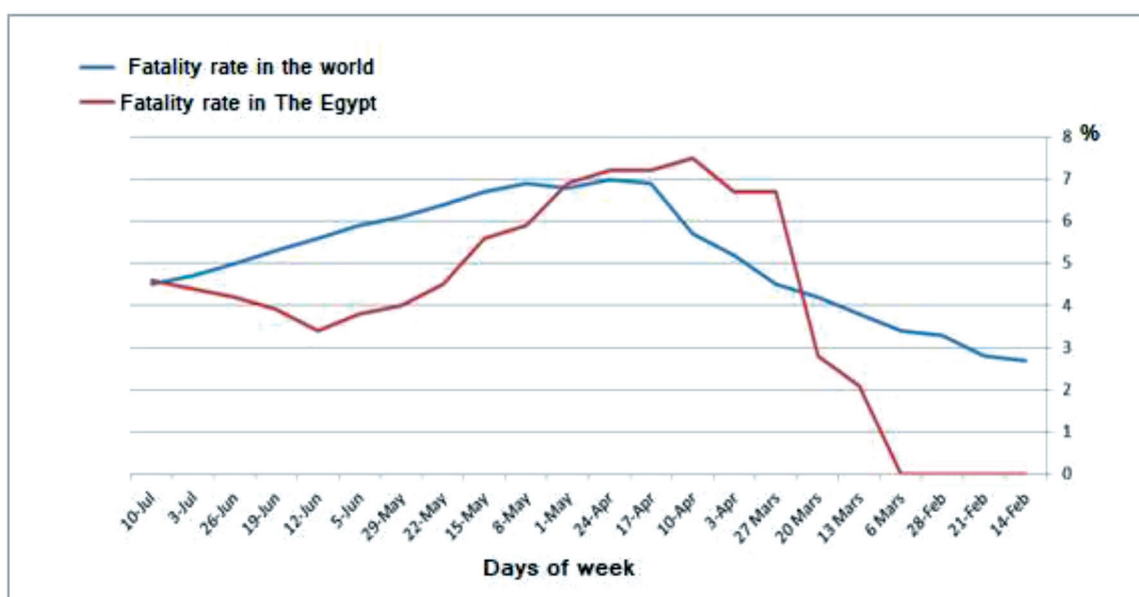
This means that the fatality rates in the world as a result of the epidemic have increased by 36.4% compared to the beginning of the disease on February 14.

As for Egypt, this percentage has also evolved from 2.1% on March 13 to reach 6.9% on May 1, 2020, and decreases to 4.6% on July 10, 2020, an increase of 120% over March 13, 2020.

Figure (6) The percentage in Egypt near world level, although Egypt as a developing country was expected to have tragic situations in comparison to other countries of the world, due to the lack of health awareness, the low standard of living, the increase in congestion in markets and public transportation, and the lack of commitment to apply the principle of social distance, but this didn't happen, and the explanation of the limited numbers Which

amounted to 3702 deaths until July 10, 2020, and 80 thousand and 235 recorded cases of infected, that the state has taken early procedures to suspend studies in all stages of education, football matches, gatherings in markets, cafes and beaches, close airports, prevent meetings, and imposed a partial curfew, which is what It clearly reduced the numbers, and perhaps this decrease in numbers was also due to reasons related to immunity and the vaccinations that the Egyptians received in their childhood, including the BCG that was taken to prevent tuberculosis and the triple vaccination, so it was a wall of the forearm. On their resistance to disease, and genetic factors may have a role in that as well, and this requires extensive studies to identify the reasons for this.

Fig 7 shows that the peak of fatality rate due to the Corona virus epidemic was in Egypt in the second week of April 2020, at 7.6% , and was on April 24,2020 worldwide, then the mortality rate began to gradually decline until it reached 4.5% in both Egypt and the World average on July 10,2020 .



Source: researcher calculation depending on W.H.O data.

Figure (6) The development of the Coronavirus Fatality rate in the Egypt and the World during the February 14 to July 10, 2020.



Through the previous presentation, it's clear that the morbidity and fatality rates of the Corona epidemic, although they tend to gradually decrease in Egypt and the world, also increase the recovery rate, except that the fluctuation of cases of infection and death due to disease from day to day makes it difficult to predict the future of the disease in the time of ambiguity surrounding it on the one hand, and the absence of a vaccine that helps protect against the disease on the other hand.

### Conclusion

This research deals with the study of the development of morbidity, recovery and fatality rates due to the epidemic Corona virus disease in Egypt compared to the world since the emergence of the disease at the beginning of the year until July 2020,

The study showed that the first infection case of the disease in Egypt was on February 14, 2020, and the infection rate in Egypt is less than its equivalent in the world by almost half, as the incidence of the disease in the world increased logarithmically from 0.7 per 100,000 people on February 14 to reach 1.7 on March 13, to 13 on April 3, and then to 45.6 people on May 1, 2020, to reach 166 per 100,000 on July 10, 2020, and by comparing this rate for Egypt, it kept extending the period from discovering the first case in it to reach the total number of cases recorded on the first of May to 5,895 cases over two and a half months, and the rate was 0.09 per 100,000 in 13 March, and only 1 on April 3, and to 5.9 on May 1, 2020, rising to 80.2 per 100,000 people on July 10, 2020. With a total of 80235 cases registered until this date.

As for the recovery rates in the world during the period from February 14 to July 10, 2020, we find that they increased from 12.1% of the number of infected to 24.5% on February 21,

and doubled again to 48.2% on February 28, then decreased to 42.1, 22.9, 25.8 in the following successive weeks, to rise again to 58.3% on July 10, 2020, while in Egypt, recovery rates ranged from 40% on March 6, down and up to reach 24.8% of the number of people infected with the disease on May 1, 2020, to 29% on 10 July 2020, and it is half of the global percentage.

As for the fatality rates in the world, the percentage increased from 2.7% of the number of injured on February 14 to 3.3% on February 28, and to 4.5% on March 27, rising to 6.8% on May 1, 2020, and then decreasing to 4.5% on July 10, 2020. This means that the mortality rates in the world as a result of the epidemic have increased by 36.4% compared to the beginning of the outbreak of the disease on February 14, while the percentage in Egypt is close to it in the world despite the fact that Egypt as a developing country was expected to have tragic cases in it compared to the countries of the world. Due to the lack of health awareness and the low standard of living, but this did not happen, and the explanation for the limited numbers, which amounted to 3702 deaths until July 10, 2020.

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