Conceptual Paper

Recovery from Covid-19 and evolution, 03.22.2020

Abstract

Among the clinical categories described in the daily report by the W.H.O. on the incidence of COVID-19 worldwide, one concerns the number of recovering patients. However, in the subsequent accounts by various agencies, medical or otherwise, the data regarding convalescence are usually subdued. A relatively small proportion of recovery was noted in Germany and Israel and the query on the relevance of these figures was the basis of our investigation. The relative significance of the daily number of healing patients, as compared with the number of serious-critical patients and of death, together with the rate of these patients out of the total number of infected individuals were employed in our comparative study.

Keywords: novel coronavirus, SARS-CoV-2, COVID-19, recovery, worldometer, serious-critical, numerous mutations

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Abbreviations: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; COVID-19, Coronavirus disease 2019; worldometer, site of WHO report on COVID-19

Introduction

Although the numbers of patients contaminated by the novel coronavirus have remained modest in Israel, it is of note that those of the patients recovering from the infection are even more limited. In contrast with our general assumption, healing is often unforeseen. A comparison with other countries' situation is called for and so is the different behavior of a mild form of the disease, when compared with a serious-to-critical condition of the patients. The relevance of the above markers of COVID-19 in different geographic areas might pertain to a variable biological conduct of the virus in different countries, although the virus behavior might evolve in time and so will the disease.

Methods

The present study concerns the rates of healing attached to the COVID-19 morbidity, as those described in Israel were found to be limited. The countries selected for this comparative study, displayed, therefore high to low rates of this parameter. The data were retrieved from tables published in the media (worldometer.coronavirus). One day in March was chosen at random (03.22.2020) for the data collection. Additional parameters were included: total number of infected patients in the given country for the chosen day, total deaths, total recovery and last the number of serious-critical patients, as well as their percentage. Different nations were then segregated into three groups (category) based on a combination of the four variables, in an attempt to highlight, as far as possible a group that shows a mild response to the infectious disease; an aggressive category and a group, the performance of which is intermediary or, at least, distinct.

The subsequent developments, occurring in some countries and showing unusual behavior, as well as in a compilation of the global results, will close the report.

Results

COVID-19 in Israel on 03.22.2020

The novel coronavirus distribution in Israel showed contamination in 1,071 patients, one of whom died (Table 1). It is remarkable that

only 37 of the patients recovered (3.45%). In Italy, 7,024 patients (11.88%) recovered; in Spain – 2,575 (8.95%), but in China – 72,440 (89.37%) have healed. Table1 displays also the corresponding values for the novel coronavirus infection numbers; death of COVID-19 and for the recovery rate. At this time, it is striking that the number of novel coronavirus patients in Israel is very modest. Though this is a tiny country, its size may not play a part in the restricted share of deaths from the disease, nor does it contribute to the limited rate of recovery (Table 1).

The severity of COVID-19 is also noted in Table 1. This table confirms that, in Germany, Israel and the UK (Group A), a vast majority of the patients display a mild disease. In this subset, however, the rate of recovery varies from 1.069% in Germany, to 3.45% in Israel. Total deaths are low, as well (94 in Germany, 1 in Israel).

In contrast, the selected Group B countries, including Italy, Spain and France present a higher proportion of patients in serious-to-critical condition (1746-3000 patients), with a high mortality, but also a high healing rate (Table 2). Group C includes mainly South-East Asian countries, Japan, South Korea, Hong Kong, as well as Iran. They mimic to some extent those of Group A. However, they show a recovery rate, which is certainly more akin to that of the Group B countries (235 patients - 21.34%, to 2909 - 32.7%), (Table 3).

Since news reports concerning the COVID-19 morbidity in the USA are frequent and unremitting, we have looked into the numbers, using our criteria (Table 4). Although the total number of infections is impressive, this country belongs, most evidently to the Group A, as the remaining three parameters are of restricted importance. Eight days after the first evaluation (03.27.2020), the picture is not much different (04.04.2020), indicating that the USA is incurring an indolent type of COVID-19 (Group A).

On 03.27.2020, Germany, another Group A state, displayed an increase of 3,340 infected patients within a single day. The variables in this country were compared with those from 03.22.2020 (Table 1). Though the figures for serious-critical patients, as well as those for total deaths, remain in the same range as in Table 1, the number and percent of healing patients had increased markedly. This pattern is most consistent with a conversion into a Group C country.

Among the countries classified as belonging to Group B, Italy, Spain, France, at the outset (03.22.2020), the last two nations evolved

rapidly into Group C countries, as the recovery index increased significantly. Others, including China, South Korea, Japan, and a compilation of the global nations, belonged all from the start to Group C.

Table 1 Features of COVIX-19 from countries with a low recovery rates, Group A

Country	Total nb. of infected cases	Serious-critical N (%)	Total deaths N (%)	Total recovery N (%)
Germany (1)	24,873	23 (0.092)	94 (0.38)	266 (1.069)
Germany (2)	47,873	23 (0.05)	281 (0.59)	5,673 (12)
Israel (1)	1,071	18 (1.68)	1(0.093)	37 (3.45)
Israel (2)	5591	97 (1.73)	25 (0.45)	226 (4.04)
UK	5,683	20 (0.35)	281 (4.94)	131 (2.3)

Germany (1) – 03.22.2020; Germany (2) – 03.27.2020;
Israel (1) – 03.22.2020; Israel (2) – 04.01.2020

Table 2 Features of COVID-19 that displays an aggressive behavior, Group B.

Country	Total infected	Serious-critical N (%)	Total deaths N (%)	Total recovery N (%)
Italy (1)	59,138	3,000 (5.07)	5,476 (9.26)	7,024 (11.88)
Italy (2)	110,574	4,035 (3.65)	13,155 (11.19)	16,847 (15,24)
Spain (1)	28,768	1,785 (6.20)	1,772 (6.16)	2,575 (8.95)
Spain (2)	102,136	5,872 (5.75)	9,053 (8.86)	22,647 (22.17)
France (1)	16,018	1,746 (10.9)	674 (4.2)	2,200 (13.73)
France (2)	44,550	5,056 (11.35)	3,024 (6.78)	7,927 (17.79)

Italy (1) – 03.22.2020; Italy (2) – 04.01.2020
Spain (1) – 03.22.2020; Spain (2) – 04.01.2020
France (1) – 03.22.2020; France (2) – 03.31.2020

Table 3 Characteristics of COVID-19 in Group C countries

Country	Total infected	Serious-critical N (%)	Total deaths N (%)	Total recovery N (%)
Japan (1)	1,101	49 (4.45)	41 (3.72)	235 (21.34)
S. Korea (1)	8,897	59 (0.66)	104 (1.169)	2909 (32.7)
S. Korea (2)	9887	55 (056)	165 (1.67)	5,567 (56.3)
Hong Kong	318	4 (1.26)	4 (1.26)	100 (31.44)
China (1)	81,054	1,845 (2.28)	3,261 (4.02)	72,440 (89.37)
China (2)	81,554	446(0.57)	3,312 (4.06)	72,238 (93.48)
Iran (1)	21,628	NA	1,685 (7.79)	7,913 (36.57)
Globally	920,056	34,884 (3.79)	46,150 (5.02)	193,350(21.02)

China (1) – 03.22.2020; China (2) – 04.01.2020
Japan (1) – 03.22.2020
S.Korea (1) – 03.22.2020; S.Korea (2) – 04.01.2020
Hong Kong – 03.22.2020
Iran – 03.22.2020
Global compilation – 04.01.2020

Table 4 COVID-19 in the USA

Country	Total nb. of infected cases	Serious-critical	Total deaths	Total recovery
USA (1)	85,612	2,122 (2.48%)	1,301 (1.52%)	1,868 (2,18%)
USA (2)	279,500	5,804 (2.07)	7,457 (2.66)	12,729 (4.55)

USA (1) – 03.27.2020;   USA (2) – 04.04.2020

Table 5 COVID-19 classification by nations

Group A: USA; UK; Israel
Germany: transformation into Group C.
Group B: Italy.
Spain: transformation into Group C.
France: transformation into Group C.
Group C: Global compilation.
Others: Might have been analyzed by us at a late stage and thus may have belonged previously to another Group: China, Japan, South-Korea, Hong Kong, Iran.

Conclusion

COVID-19 in Israel is characterized by a low level of morbidity, probably unrelated to the size of the population. However, a negligible mortality is observed. Of note, recovery is highly limited (37 patients – 3.45%). Not less striking is the marked predominance of mild, indolent COVID-19 (98.9%) in this country.

The nations included herein are distributed into three subsets, based on the allocation of the variables chosen for this study, and notably on the recovery index. Thus, a high rate of morbidity (59,138 patients), of mortality (5,476) and of recovery (4,025 – 11.88%) was noted in Italy on 03.22.2020. But the frequency of a severe-to-critical illness was as high as 3,000 for this country. No major significance was attributed to the total number of infected patients in our analysis.

The first group of countries (A) comprises at the outset, the USA, Germany, the UK, and Israel. It is characterized by a variable number of cases positive for SARS-Cov-2; a low number of patients with a serious-to-critical condition; a low degree of recovery and of death.

It is suggested that the patients included among these countries have an indolent type of illness; that their recovery rate is limited; but that they tend to survive the infection. Due to their mode of convalescence, however, they are prone to remain carriers for a time so far undetermined (Table 1).

Patients of group B are those with the most severe malady (serious-critical: 3,000 patients; rate of recovery: 11.88%; total death: 5,476) for Italy. Though the death rate is high, their propensity to recover is elevated. In spite of a most severe disease, often requiring intensive care and showing complications, convalescence leads most often to cure, mostly, without perseverance of the virus (Table 2).

Group C included originally South-Eastern Asian countries only: China, Japan, South Korea, Hong Kong with Iran, in addition. The patients are unexpectedly few. They resemble those of Group A, with few patients in a critical condition and few deaths. However the recovery rate remains high, indicating probably a tendency to recuperate with cure (Group B), instead of the expected prolonged carrier state found in Group A(Table 3).

Although an estimation regarding which of the Groups may reach the best score in the near-future, might be meaningless, one may favor Group B. This may be due to a most demanding exposure to the novel coronavirus, with high morbidity and mortality, and to usual termination by a cure, in those who did survive. However, Group B

was found *a posteriori* to include very few countries, as transition to a different group, mainly into Group C, occurred most often.

The dichotomy observed between the subsets A and B, is not without evoking that described between low grade non Hodgkin lymphomas, most of which are indolent, but often resist treatment (see Group A), and aggressive B-cell lymphomas, which might kill the patient but on the other hand may be treated successfully for cure (see Group B).[1]

Moreover, low grade lymphomas tend to transform in 10-40% of the cases into a high grade (aggressive) lymphoma, which is poorly treatable.[1]This situation parallels that of Group A: a non-aggressive disease (indolent); which does not kill; and ends up in a carrier state. If pressed for a speculation, one may want to assume that Group A will show a propensity for relapse or will even progress into a more aggressive form of COVID-19.

It is striking that a similar situation is also met with infectious diseases, i.e. in AIDS in which one might find a bimodal condition that reminds of that described above with non-Hodgkin lymphomas. On the one hand, one may come across patients with an aggressive infectious disease, but who will be easily treated and reach a remission. On the other hand, at times, a case of AIDS will occur, with indolent features, and that will resist treatment, but persist for a lengthy period of time. Thus, the above dichotomy described in lymphomas is tenable with infectious diseases as well.[2–4]

An unexpected evolution has been noted in Germany, only 5 days after its classification into Group A. It was restricted to an increased rate of recovery, similar in range to that found in Group B nations. As demonstrated before, this alteration places Germany, not in Group A anymore, but in Group C. The significance of this change is probably that, the infectious disease not only remains indolent, but it becomes curable! This is a most significant change and the question is what has brought up this evolution at all. This could represent one pathway adopted by some countries involved in the pandemic(Figure 1). The occurrence of a new mutation cannot be excluded.

Tables 3 and 5 summarize the data for a global compilation and show that the world, as an entity facing COVID-19, belongs to Group C. This group is then, the most prevalent subset, and it highlights again the mild overall nature of the pandemic, in spite of the high mortality increment in China, Spain and others.

Finally, new evidence concerning the novel coronavirus, has just appeared. Accordingly, SARS-Cov-2 might originate from a recombination between two viruses. The first virus would possess a 99% similarity with the novel coronavirus, and be possibly found in a small mammal sold, among other places, in the Wuhan seafood markets (Manisjavanica).[5–7] Controversy is raging, however, regarding a possible role for this Pangolin mammal as an intermediate host in this infectious disease, and that might account for transmissibility to humans. The second virus, RaTG13 isolated in a bat (Rhinolophusaffinis) has a 77% affinity with the SARS-Cov-2.[8–10]

If real substance is to be found in these hypotheses, one may elaborate on the following scenario. The recombination which created the new virus (the novel coronavirus), will confer onto it some degree of genomic instability. As the virus comes into contact with different types of environments and, most importantly with different populations, it might develop variations in structure, i.e. mutations and/or in function.[11] Moreover, all the members of the coronavirus

family have displayed an increased propensity for mutations.[12] The fact that this genomic instability might be translated into of three categories with different epidemiological features, is perhaps sustained by the existence of glycoproteins recently characterized in serological studies of SARS-Cov-2.[13,14] A report from Iceland has recently suggested that SARS-CoV-2 exhibits the capacity to generate some 40 mutations, which might be distributed into three subsets. The findings remain however to be confirmed.[15]

A final note concerns what looks to us an overemphasized response from the US. This, since we consider our results for this nation, as pointing out at an indolent illness, generating a relatively low mortality and low rate of critical patients (Figure 4). The US medical system is now portrayed as insufficient to face this crisis. Could one of the causes of this situation stand on the predilection in this country for organized private medicine?

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Conflict of interest

The author declares no conflict of interest exists.

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