Opinion Article

Assessing the severity of COVID-19

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Ever since the beginning of the current outbreak of coronavirus (SARS-CoV-2), which causes COVID-19, there has been great concern in the face of a disease that has spread rapidly in several regions of the world, with different impacts. According to the World Health Organization (WHO), on March 18th 2020 there were more than 214,000 confirmed COVID-19 cases globally. There were no strategic plans ready to be applied to a coronavirus epidemic – it is all new. Recommendations made by WHO,[1] the Brazilian Ministry of Health, the Centers for Disease Control and Prevention (United States CDC)[2] and other national and international organizations have suggested that influenza contingencies plans and their tools should be applied because of the clinical and epidemiological similarities between these respiratory viruses. These contingency plans provide for different actions according to pandemic severity.

The fourth update of the Pandemic Influenza Plan – PIP, prepared by the United States Department of Health and Human Services[3] and published in 2017, included measures for different government and civil society areas. In addition, in order for the response to be proportional to the severity of the situation, it uses the Pandemic Severity Assessment Framework – PSAF[4] as a risk assessment tool.

The PSAF proposes two assessment dimensions.[4] For the transmissibility dimension, the score ranges from 1 to 5, and the indicators are: symptomatic attack rate in different scenarios; R0 (basic reproductive number); and peak percentage outpatient visits for influenza-like illness. In turn, for the clinical severity dimension, the score ranges from 1 to 7, and the variables used are: case fatality rate; case-hospitalization ratio (proportion of hospitalization); and deaths-hospitalization ratio, considering only influenza cases, in the current COVID-19 situation. This framework, however, uses data that can be obtained at the onset of the occurrence of SARS-CoV-2 transmission, differently from its application in influenza epidemics, when the attack and fatality rates are used, these being population-based indicators and, therefore, hard to get from reliable databases at the start of any epidemic.

By using the PSAF, assessments can be done with available data at any time and can be increasingly refined as the pandemic progresses. As we are at the beginning of the COVID-19 epidemic, several clinical and epidemiological aspects of this disease are still not clear; nevertheless, a large number of peer-reviewed articles have been published recently in specialized periodicals. As such, for this assessment, we used data from a recent publication about 44,415 COVID-19 cases that occurred in China from January 11th 2020.[5]

As many seriously ill cases were still hospitalized at the time the articles were written, when calculating the proportion of hospitalization we only used cases for which the disease had had an outcome (recoveries, hospital discharge and deaths).[6] In order to refine the results, each of the periods of the epidemic in China was assessed separately. It is known that fatality can be affected by factors such as knowledge about the disease, existing diagnosis capacity and hospital overcrowding. In addition, more recent cases may still be hospitalized, without it being possible to know the outcome.

Applying PSAF indicators (Table 1 and Figure 1) shows a highly transmissible disease,[1,7,8] and the clinical severity indicators also suggest high severity.[9–11] Although it contains slight discrepancies in the

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clinical severity dimension, which is to be expected in non-randomized observational studies, the COVID-19 epidemic, assessed according to the PSAF using Chinese data, can be compared with severe historical epidemics, such as the 1918 influenza epidemic. Based on this initial assessment (Figure 1), COVID-19 appears as a disease with high transmissibility and high clinical severity, as revealed by the fatality seen in other countries where the epidemic is in the initial stage.[1]

Also noteworthy are the indictors found for health workers. Among Chinese health workers, fatality was lower than among the general population in that country (Table 1). However, with regard to incidence, the Italian Group for Evidence-based Medicine reported that 8.3% of total COVID-19 cases recorded in Italy occurred among health workers, this being double that reported in China (3.8%).[12] Lack of personal and collective protective equipment in health services, in addition to the large volume of cases, has contributed to this situation. In Brazil, guidance given for symptomatic individuals (runny nose, fever and cough) to seek primary health care services may result in high incidence rates among health workers there, in view of lack of structure and personal protective equipment, as already observed by government bodies. In order to overcome this challenge, several countries have proposed the creation of specific facilities for clinical assessment of medium severity cases, thus enabling concentrated investment in equipment as well as reducing the burden on higher complexity services where more serious cases need to be attended to.

Despite the relevance of the findings, indicator heterogeneity between different regions where there is transmission needs to be taken into consideration, given that indicators vary according to actions, routines, availability of supplies, health and surveillance service structure, as well as cultural and political issues. The PSAF is a tool that was developed based on United States data for initial assessment of pandemic influenza and the document itself makes the proviso that successive reassessments are important, given that information is dynamic. SARS-CoV-2 is a respiratory virus that is

Table 1 – COVID-19 pandemic transmissibility and severity indicators using the Pandemic Severity Assessment Framework – PSAF and Chinese case data up to February 11th 2020

Transmissibility	Population			Results(%) (95%CI)	Score*
Secondary case attack rate in family outbreaks	China[7]			22.0	5
R0 (basic reproductive number)	China[8]			2.2 (95%CI 1.4; 3.9)	5
	China[1]			2.0; 2.5	5
Clinical severity	**Population**	**Period**	**deaths/confirmed cases**	**Results(%) (95%CI)**	**Score***
Fatality		Up to 11/Feb/2020			
	China (general population)[5]	Prior to 31/Dec/2019	15/104	14.4 (7.7; 21.2)	7
		1–10/Jan/2020	102/653	15.6 (12.8; 18.4)	7
		11–20/Jan/2020	310/5,417	5.7 (5.1; 6.3)	7
		21–31/Jan/2020	494/26,468	1.9 (1.7; 2.0)	7
		1/Feb/2020	102/12,030	0.8 (0.7; 1.0)	6
	China (health workers)[5]	Prior to 31/Dec/2019	-/-	-	-
		1–10/Jan/2020	1/20	5.0 (0.0; 14.6)	7
		11–20/Jan/2020	1/310	0.3 (0.0; 1.0)	5
		21–31/Jan/2020	2/1,036	0.2 (0.0; 0.5)	4
		1/Feb/2020	1/322	0.3 (0.0; 0.9)	5

to be continued

continuation

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Clinical severity	Population	Period	deaths/ confirmed cases	Results% (95%CI)	Score*
		As at 3/Mar/2020			
	Wuhan[1]	Entire period	2,803/67,103	4.2 (4.0; 4.3)	7
	Rest of China[1]	Entire period	112/13,071	0.9 (0.7; 1.0)	6
	United States[2]	Entire period	6/60	10.0 (2.4; 17.6)	7
	Italy[1]	Entire period	52/2,036	2.6 (1.9; 3.2)	7
	South Korea[1]	Entire period	28/4,812	0.6 (0.4; 0.8)	6
	Japan[1]	Entire period	6/268	2.2 (0.5; 4.0)	7
	Iran[1]	Entire period	66/1,501	4.4 (3.4; 5.4)	7
	Population	**Period**	**Severe+critical cases/total cases**	**Results% (95%CI)**	**Score**
Proportion of hospitalization (due to COVID-19)	China (health workers)[5]	Entire period up to 11/Feb/2020	247/1,688	14.6 (12.9; 16.3)	7
	China (general population)[5]	Entire period up to 11/ Feb/2020	8,255/44,415	18.6 (18.2; 18.9)	7
	Population	**Period**	**deaths/ (cured+ discharges+ deaths)**	**Results (%) (95%CI)**	**Score**
Hospital mortality rate (due to COVID-19)	Jinyintan Hospital (Wuhan)[9]	1–20/Jan/2020	11/42	26.2 (12.9; 39.5)	7
	Zhongnan Hospital of Wuhan University[10]	1–28/Jan/2020	6/53	11.3 (2.8; 19.9)	4
	China[11]	11/Dec/2019 a 29/Jan/2020	15/79	19.0 (10.3; 27.6)	7

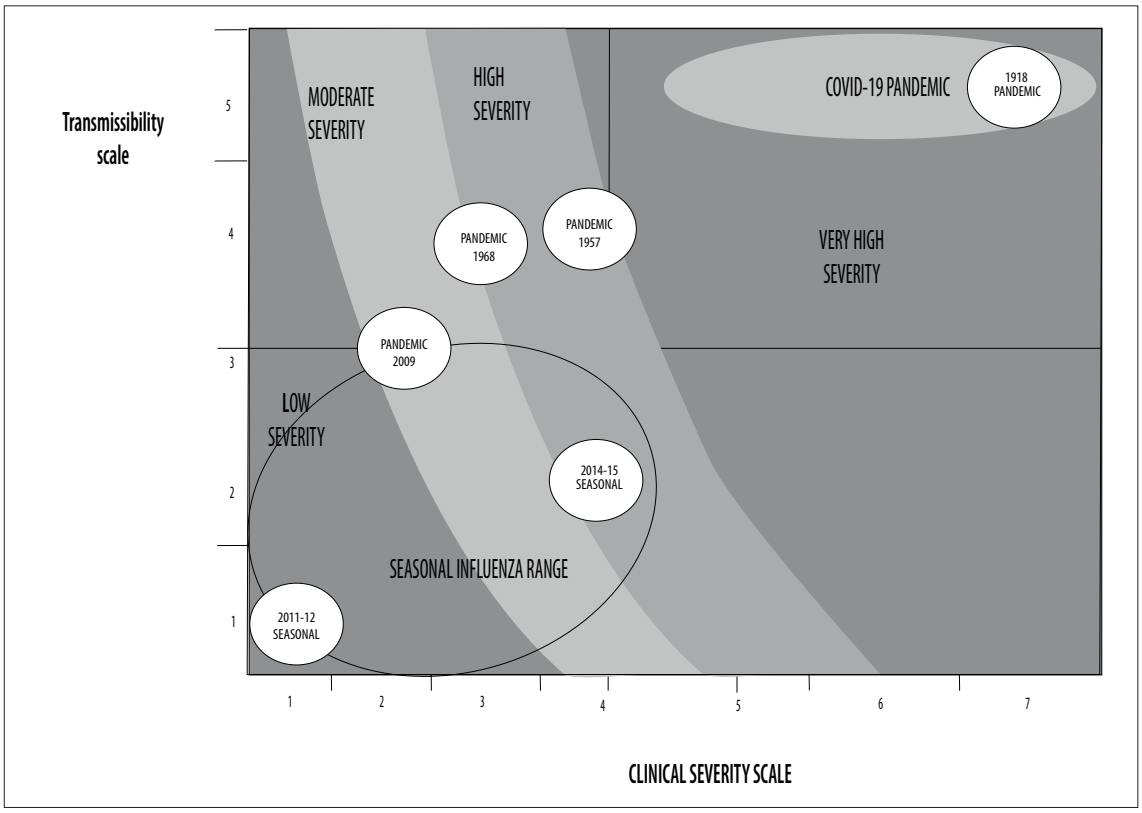
* Severity score (1-7) using Pandemic Severity Assessment Framework indicators.[4]

different to the influenza virus and its behavior has not yet been totally enlightened. As such, applying these indicators in the social, political and epidemiological context of other countries may lead to results different to those expected.

This assessment of the COVID-19 epidemic needs to be modified as and when new information is added. However, the need is stressed for the scientific community and national and international epidemiological surveillance teams to take great care when monitoring the epidemic's trends, critically assessing the tools available for understanding the situation.

Authors' contributions

Freitas ARF, Napimoga MH and Donalisio MR contributed to the conception and design of the article, data analysis and interpretation, as well as drafting the first version of the manuscript and reviewing it critically. All the authors have approved the final version and are responsible for all aspects of this work, including the guarantee of its accuracy and integrity.



Adapted from: Reed C, Biggerstaff M, Finelli, Koonin LM, et al, Novel framework for assessingn epidemiologic effect of influenza epidemics pandemic. Emerg infect Dis 2013;19(1):85-91

Figure 1 – Application of COVID-19 transmissibility and clinical severity scale results on the influenza effects assessment graph, with (scaled) examples of influenza pandemics and seasonal influenza outbreaks

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