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SARS-CoV-2: fear versus data

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ABSTRACT

SARS-CoV-2, the novel coronavirus from China, is spreading around the world, causing a huge reaction despite its current low incidence outside China and the Far East. Four common coronaviruses are in current circulation and cause millions of cases worldwide. This article compares the incidence and mortality rates of these four common coronaviruses with those of SARS-CoV-2 in Organisation for Economic Co-operation and Development countries. It is concluded that the problem of SARS-CoV-2 is probably being overestimated, as 2.6 million people die of respiratory infections each year compared with less than 4000 deaths for SARS-CoV-2 at the time of writing.

1. Introduction

Coronaviridae represent a very important family of animal and human viruses [1,2] that are in permanent circulation. Four common human coronaviruses (HKU1, NL63, OC43 and E229) cause 10–20% of respiratory infections worldwide and are present in all continents [3–14] (Table 1). Mortality is poorly assessed, but it is clear that there are chronic carriers as well as asymptomatic carriers. Studies have shown that there are as many asymptomatic carriers as symptomatic patients [3,9]. Three epidemic episodes of emerging coronaviruses have been reported. The first, severe acute respiratory syndrome (SARS) coronavirus, had very little impact on global morbidity and mortality, with more than 8000 recognized cases and 774 deaths [15,16]. The second, Middle East respiratory syndrome (MERS)-coronavirus, remained localized in Saudi Arabia, with a small epidemic of mainly nosocomial infections in South Korea [17]. MERS-coronavirus, like SARS-coronavirus, highlighted the major danger of nosocomial transmission to healthcare personnel, the health of whom is essential in these epidemics [18]. Finally, SARS-CoV-2, the novel coronavirus that appeared in December 2019, has expanded and has now affected more than 90 000 people worldwide [2,19,20]. At the time of writing, a significant number of cases had occurred in the Far East. It is incontestably contagious, as a quasi-experimental study on the *Diamond Princess* cruise ship showed that confinement of infected patients with uninfected patients resulted in rapid infection of the uninfected patients, leading to 700 additional cases on board [21]. However, coronaviruses in common circulation remain predominant because of their global distribution and their non-negligible mortality [14,22]. The aim of this study was to share the experience of a reference laboratory representing approximately 1% of serious and diagnosed respiratory infections, particularly seasonal, in France. This will allow the evaluation of the relative mortality of different human coronaviruses presented in hospitals in Marseille compared with that of SARS-CoV-2.

2. Materials and methods

Assistance Publique-Hôpitaux de Marseille (AP-HM) covers all public hospitals in Marseille, including four university hospitals: La Timone Hospital, Conception Hospital, North Hospital and South Hospital; this corresponds to 3400 beds and 125 000 admissions each year [23]. The IHU Méditerranée Infection diagnostic laboratory tests all samples from AP-HM in which respiratory viruses are suspected. Molecular biology is used for diagnosis. The results are monitored by a weekly automated surveillance system in the diagnostic laboratory, coupled with a laboratory informa-

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Table 1
Studies that tested for coronavirus in patients with fever in various countries

First author [reference number]	Country	Tested cases (*n*)	Diagnosis of coronavirus
Trombetta [7]	Brazil	775	7.6%
Zhang [10]	Guangzou, China	13 048	244 (2.25%)
Zeng [11]	Guangzou, China	11 399	489 (4.3%)
Killerby [14]	USA	18 806	2.2%
Kiyuka [13]	Kenya	5573	10.1%
Owusu [9]	Ghana	593 cases	13.7%
Dube [30]	South Africa	620 controls	10.5%
		214 (tuberculosis)	8%
Sipulwa [12]	Kenya	417	8.4%
Subramoney [31]	South Africa	860	4.8%
Nunes [32]	South Africa	1026	15%
Le-Viet [3]	Vietnam	378	4 (1.05%)

Table 2
Results from Assistance Publique-Hôpitaux de Marseille (AP-HM) diagnostic laboratory

Agent	Location	Confirmed cases (*n*)	Deaths (*n*)	Mortality rate (%)
Coronavirus[a]	AP-			
Coronavirus OC43	HM,	160	4	0.0250
Coronavirus NL63	Mar-	74	2	0.0270
Coronavirus HKU1	seille,	63	1	0.0159
Coronavirus E229	France	92	1	0.0109
Coronavirus[b]	AP-			
Coronavirus OC43	HM,	77	1	0.0130
Coronavirus NL63	Mar-	146	0	0
Coronavirus HKU1	seille,	277	1	0.0036
Coronavirus E229	France	43	0	0

[a] From 1 January 2013 to 31 December 2019.
[b] From 1 January 2020 to 2 March 2020.

Table 3
SARS-CoV-2 international epidemiological situation (Organisation for Economic Co-operation and Development countries), 3 March 2020

Countries	Confirmed cases (*n*)	Deaths (*n*)	Mortality rate (%)
Germany	157	0	0.0
Australia	30	1	3.3
Austria	18	0	0.0
Belgium	8	0	0.0
Canada	24	0	0.0
South Korea	4335	28	0.6
Denmark	4	0	0.0
Spain	123	0	0.0
Estonia	1	0	0.0
USA	100	6	6.0
Finland	7	0	0.0
France	191	3	1.6
Greece	7	0	0.0
Ireland	1	0	0.0
Iceland	3	0	0.0
Israel	10	0	0.0
Italy	2036	52	2.6
Japan	274	6	2.2
Latvia	1	0	0.0
Lithuania	1	0	0.0
Luxembourg	1	0	0.0
Mexico	5	0	0.0
Norway	25	0	0.0
New Zealand	1	0	0.0
Netherlands	18	0	0.0
Portugal	2	0	0.0
Sweden	15	0	0.0
Switzerland	38	0	0.0
UK	40	0	0.0
Total	7476	96	1.3

tion system (Nexlabs) [23]. SARS-CoV-2 epidemiological data were obtained through an online platform gathering data from public agencies [24]. Statistical analyses were performed using BiostatGV software.

3. Results

In 2016, there were 594 000 deaths in France; 59.2% of these deaths occurred in a care establishment [25]. In the same year, AP-HM reported 2854 deaths. As such, it can be estimated that approximately 0.8% of deaths in care establishments in France occurred in AP-HM hospitals. This estimate provides an approximation of the number of people affected by a pathogen in France according to the number of people who died each year at AP-HM hospitals.

From 1 January 2013 to 31 December 2019, 21 662 samples were tested by the IHU Méditerranée Infection diagnostic laboratory. Among these, 770 samples were positive for coronavirus, with eight deaths (mortality rate 1%). Among identified coronaviruses, 63 were identified as HKU1 (one death, mortality rate 1.6%), 74 were identified as NL63 (two deaths, mortality rate 2.7%), 92 were identified as E229 (one death, mortality rate 1.1%) and 160 were identified as OC43 (four deaths, mortality rate 2.5%). Three hundred and eighty-one coronaviruses, diagnosed before 2017, were not assigned to any of these four strains (Table 2).

Systematic testing (molecular biology) for SARS-CoV-2 was performed from 1 January 2020 to 2 March 2020. In total, 7059 samples from patients presenting with infectious symptoms were tested by the IHU Méditerranée Infection diagnostic laboratory. Among them, 543 samples were positive for coronaviruses, with two deaths (mortality rate 0.36%): 277 samples were HKU1, 146 samples were NL63, 77 samples were OC43 and 43 samples were 229E. No cases of SARS-CoV-2 were identified among these samples. Of the two deaths, one patient had OC43 (mortality rate 1.3%) and one patient had HKU1 (mortality rate 0.36%). There were no deaths from NL63 or E229 during this period.

Over the same period, IHU Méditerranée Infection was the regional centre for detection of the novel coronavirus SARS-CoV-2. At the time of writing, 596 analyses have been performed on suspected cases since the emergence of the novel pathogen, from which four cases of SARS-CoV-2 have been identified. In addition, 337 French nationals returning from Hubei Province have been tested twice, and all were negative for SARS-CoV-2.

By 2 March 2020, a total of 90 307 patients have tested positive for SARS-CoV-2 worldwide, with 3086 deaths (mortality rate 3.4%). Among the Organisation for Economic Co-operation and Development (OECD) countries, 7476 patients have tested positive for SARS-CoV-2, with 96 deaths (mortality rate 1.3%) (Table 3). In France, 191 people have tested positive for SARS-CoV-2, with three deaths (mortality rate 1.6%).

This study compared the mortality rate of SARS-CoV-2 in OECD countries (1.3%) with the mortality rate of common coronaviruses identified in AP-HM patients (0.8%) from 1 January 2013 to 2 March 2020. Chi-squared test was performed, and the *P*-value was 0.11 (not significant).

4. Discussion

This study found that the mortality rate of common coronavirus infections is 0.8% in France. In comparison, the mortality rate of SARS-CoV-2 in European or American developed countries of a comparable economic level is 1.3% (Table 3). If the extrapolation of deaths in AP-HM hospitals is correct, in metropolitan France, this would represent $543/0.8 * 100 = 67\,875$ cases of patients hospitalized with a respiratory infection with common coronaviruses in 2 months, which is almost as many cases as for SARS-CoV-2 worldwide. In fact, mortality from respiratory infections is extremely dependent on the quality of care and access to care, and

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severe forms have a better prognosis in countries with superior medical infrastructures. Under these conditions, there does not seem to be a significant difference between the mortality rate of SARS-CoV-2 in OECD countries and that of common coronaviruses (χ^2 test, P=0.11). Of course, the major flaw in this study is that the percentage of deaths attributable to the virus is not determined, but this is the case for all studies reporting respiratory virus infections, including SARS-CoV-2. Indeed, viral infections are ecosystem infections where the outcome depends on the inoculums and the surrounding microbiota [26]. Thus, certain bacteria seem to be associated with symptomatic manifestations, such as *Streptococcus pneumoniae, Haemophilus influenzae* and *Staphylococcus aureus*, which are known to cause an excess of mortality due to secondary infection. Finally, seasonality, geographic location, heat and humidity are co-factors, as are age, gender and underlying pathologies. Under these conditions, and all other things being equal, SARS-CoV-2 infection cannot be described as being statistically more severe than infection with other coronaviruses in common circulation.

Finally, in OECD countries, SARS-CoV-2 does not seem to be deadlier than other circulating viruses. In addition to coronaviruses, there are 16 endemic viruses in common circulation in developed countries (adenovirus, bocavirus, cytomegalovirus, enterovirus, influenza A H1N1 virus, influenza A H3N2 virus, influenza B virus, metapneumovirus, parainfluenzae virus 1, parainfluenzae virus 2, parainfluenzae virus 3, parainfluenzae virus 4, parechovirus, picornavirus, rhinovirus, syncytial respiratory virus), and 2.6 million deaths from respiratory infections (excluding tuberculosis) per year have been noted in recent years worldwide [27]. There is little chance that the emergence of SARS-CoV-2 could change this statistic significantly. Fear could have a larger impact than the virus itself; a case of suicide motivated by the fear of SARS-COV-2 has been reported in India [28].

In addition, coronaviruses that have rarely been tested systematically around the world may persist in the pharynx of asymptomatic people, representing a potential source of population immunity [29]. Furthermore, it should be noted that systematic studies of other coronaviruses (but not yet for SARS-CoV-2) have found that the percentage of asymptomatic carriers is equal to or even higher than the percentage of symptomatic patients. The same data for SARS-CoV-2 may soon be available, which will further reduce the relative risk associated with this specific pathology.

Declarations

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Competing interests: None declared.

Ethical approval: Not applicable. Testing of repatriates was approved by the ethical board of the Committee for the Protection of Persons (CPP Ile de France VI, 6 February 2020).

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