




Global burden of COVID-19 pandemic on healthcare workers

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Provision of PPE, placing experienced HCWs mostly in organisational positions, increasing testing, minimising exposure by adjusting shift schedules, and providing food and sleep facilities could be some restorative measures to protect HCWs from #COVID19 <https://bit.ly/2zcVARW>

Cite this article as: Papoutsis E, Giannakoulis VG, Ntella V *et al.* Global burden of COVID-19 pandemic on healthcare workers. *ERJ Open Res* 2020; 6: 00195-2020 [<https://doi.org/10.1183/23120541.00195-2020>].

The novel coronavirus disease (COVID-19) was declared a pandemic on March 11, 2020. Healthcare workers (HCWs), though vital for the functioning of the health systems during this global pandemic crisis, are unequivocally exposed to increased risk of infection through direct contact with patients. The European Respiratory Society, in a signed joint statement at the end of March, urged the European Union and national governments to prioritise health and safety of the frontline fight against COVID-19 [1]. In COVID-19 Situation Report 82, the World Health Organization (WHO) subject stressed the under-representativeness and paucity of publications and national situation reports that provide information on the number of infected HCWs. In this report, 52 countries had reported a total of 22 073 HCWs that had contracted COVID-19 [2]. Considering the current paucity of consolidated data on this, we attempted to quantify the number of reported HCW infections and case fatalities from COVID-19 in different areas and countries.

We searched all relevant grey literature up to April 17, 2020, in order to identify the most up-to-date government reports, official statements and newspaper reports concerning community or hospital-related COVID-19 infections and deaths of HCWs. Although methods for assessing risk of bias in controlled trials are well established, these may not be appropriate when grey literature is also included [3]. Therefore, a collaborative process was applied, where any disputes were thoroughly discussed and debated by the authors before a consensus was reached. The percentage of HCW cases in relation to the total country, region or city cases was either provided by government reports or calculated as:

$$\frac{\text{HCWs infected on day } x}{\text{Total cases in the country/region/city on day } x} \times 100\%$$

The dataset and sources supporting the conclusions of this editorial are publicly available in the FigShare repository at <https://doi.org/10.6084/m9.figshare.12148518.v1>.

Received: 18 April 2020 | Accepted after revision: 15 May 2020

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TABLE 1 Healthcare worker (HCW) infections among total cases in each region and the respective case fatality on the same day of the report, searched as of April 17, 2020

	HCW cases among total cases	Case fatality	Tests per million population	Medical doctors per 10000 population	Data as of
Afghanistan	5.57% (15/269)	NA	NA	2.782	April 3, 2020
Albania	13.89% (36/259)	NA	1765	12.164	April 1, 2020
Andorra	23.95% (80/334)	NA	21 653	33.333	March 29, 2020
Victoria, Australia	12.65% (157/1241)	NA	15354	15.354	April 2, 2020
Bangladesh	6.03% (111/1838)	0.9% (1/111)	117	5.809	April 3, 2020
Sao Paulo, Brazil	15.16% (452/2981)	NA	296	21.643	April 1, 2020
Bulgaria	5.01% (20/399)	NA	2663	40.332	March 31, 2020
Canada[#]	10.04% (773/7699)	NA	12920	23.105	March 25–April 12, 2020
Alberta	10.21% (77/754)	>1.29% (1/77)	12920	23 105	March 31, 2020
British Columbia	11.90% (55/462)	NA	12920	23.105	March 25, 2020
Manitoba	8.53% (21/246)	NA	12920	23.105	April 15, 2020
Ontario	9.94% (620/6237)	0.16% (1/620)	12920	23.105	April 10, 2020
China	4.38% (3387/77262)	0.67% (23/3387)	NA	19.798	April 3, 2020
Croatia	14.14% (199/1407)	NA	5104	29.996	April 9, 2020
Egypt	2.37% (46/1939)	6.52% (3/46)	244	4521	April 12, 2020
Germany	3.12% (2300/73522)	NA	20629	42.488	April 2, 2020
Greece	7.47% (125/1673)	0.8% (1/125)	4871	54.789	April 5, 2020
Hong Kong, China	0% (0/42)		17579	NA	February 10, 2020
Hungary	12.53% (85/678)	NA	4305	34.075	April 4, 2020
India	0.98% (90/9205)	NA	220	NA	April 12, 2020
Jakarta, Indonesia	4.78% (95/1986)	18.95% (18/95)	136	4.269	April 5, 2020
Iran	2.62% (927/35408)	8.41% (78/927)	3808	15.844	March 28, 2020
Ireland	24.09% (1949/8089)	NA	18358	44.587	April 11, 2020
Israel	4.75% (42/883)	NA	21 634	46.249	March 21, 2020
Italy	10.71% (16 650/155 467)	0.77% (128/16 650)	19 490	39.774	April 15, 2020
Jamaica	2.77% (1/36)	0% (0/1)	481	13.061	March 31, 2020
Kazakhstan	19.34% (211/1091)	NA	4566	39.800	April 13, 2020
Latvia	8.11% (40/493)	NA	17 409	31.905	April 3, 2020
Lebanon	11.00% (12/109)	NA	2811	21.038	March 17, 2020
Lithuania	13.17% (111/843)	NA	19 506	63.528	April 6, 2020
Malaysia	5.15% (224/4346)	NA	2988	15.358	April 10, 2020
Montenegro	9.52% (10/105)	NA	6168	27.557	March 31, 2020
Philippines	19.65% (740/3764)	2.83% (21/740)	440	6	April 8, 2020
Poland	17.07% (461/2700)	0.21% (1/461)	4747	23.788	April 3, 2020
Portugal	11.77% (2131/18091)	NA	21 678	47.487	April 16, 2020
Romania	12.24% (812/6633)	NA	4460	29.807	April 13, 2020
Slovenia	18.5% (208/1124)	NA	18 918	30.861	March 30, 2020
South Korea	1.2% (121/10062)	0.8% (1/121)	10 659	NA	April 3, 2020
Spain[¶]	19.6% (18513/94 689 on subgroup of total cases)	NA	19 896	38.723	April 16, 2020
Thailand	>3.85% (102/2643)	0.98% (1/102)	1440	8.050	April 15, 2020
Turkey	3.83% (601/15679)	0.17% (1/600)	6621	18.492	April 1, 2020
Ukraine	18.9% (788/4161)	NA	1077	29.923	April 16, 2020
UK	6.4% (5733/88 625)	0.61% (35/5733)	6467	28.12	April 14, 2020
USA[¶]	11% (estimated from 16% of national cases)	0.29% (27/9200)	10 333	26.120	April 15, 2020
Uzbekistan	13.25% (11/83)	9% (1/11)	4063	23.742	March 27, 2020

Data are presented as % (n/N) unless otherwise stated. Detailed sources for the table are available from the FigShare repository at <https://doi.org/10.6084/m9.figshare.12148518.v1>. NA: not available. [#]: calculated from Alberta, British Columbia, Manitoba and Ontario province data; [¶]: percentage mentioned in official government estimates.

In areas where an “at least” number was reported, the safest estimate was included. Similarly, case fatality was calculated as:

$$\frac{\text{HCW deaths on day } x}{\text{HCWs infected on day } x} \times 100\%$$

Simple descriptive statistics such as median and range were also utilised.

Data were available for 41 countries out of over 150 searched, a number close to the 52 reported by WHO. Where up-to-date data were not available, the most recent values were included. The retrieved findings are presented in table 1, showing the number of total cases and HCW infections, and case fatality, as well as health workforce density and total tests per million of population in each country (to assess health system and testing policy). Notably, in many countries, such as France, Finland and Sweden, data on the number of HCW infections could not be found. The percentage of HCW infections among total cases is depicted in a global, colour-scale map (figure 1). The median HCW infection percentage among total cases was 10.04% (range 0–24.09%). South Korea, Hong Kong (China), Iran, India, Egypt and Jamaica had <3% HCWs infected among total cases, whereas in Andorra, Brazil, Ireland, Kazakhstan, Philippines, Poland, Slovenia, Spain and Ukraine, the respective percentage was >15%. Case fatality could be calculated in 18 regions, with a median value of 0.8% (range 0–18.95%). The maximum case fatality value was observed in Indonesia (18.95%), followed by Uzbekistan (9%), Iran (8.41%), Egypt (6.52%), Philippines (2.83%), Alberta (Canada) (1.29%), Thailand (0.98%), Bangladesh (0.9%), Greece (0.8%), South Korea (0.8%), Italy (0.77%), China (0.67%), the UK (0.61%) and the USA (0.29%). Finally, we have also retrieved an “In Memoriam” list of healthcare workers who died of COVID-19 globally [4]. In this list, on the date accessed (April 8, 2020), age data were retrieved for 230 out of 341 HCWs, with a calculated median value of 62 years (range 24–93 years).

Contrary to aforementioned number of infected HCWs from WHO, our research revealed ≥67569 cases of COVID-19 infected HCWs. Interestingly, countries in Asia seem to have lower infection rates among HCWs; this could possibly be attributed either to the readiness of these countries to deal with outbreaks [5, 6] or to the relatively lower health workforce density in south-east Asia [7]. However, a possible pitfall in comparing HCW infections across countries is that in each country, different policies regarding testing and other measures apply (e.g. under-reporting of total cases or prioritisation of HCW testing). In

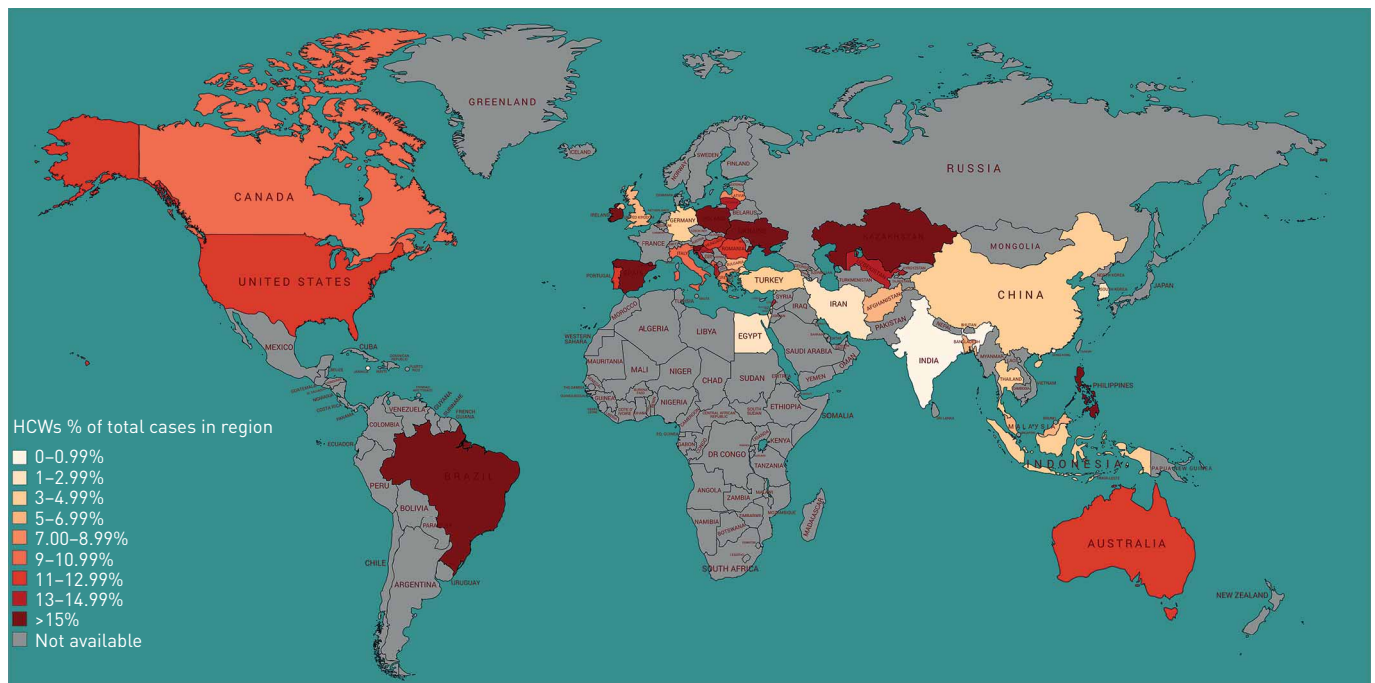


FIGURE 1 Global map depicting, in colour scale, the percentage healthcare workers (HCWs) among total cases in each region. Data for the following countries refer to certain regions: Australia (Victoria), Brazil (Sao Paolo), Canada (Alberta, British Columbia, Manitoba and Ontario) and Indonesia (Jakarta). This map was created at <https://www.mapchart.net/> and is distributed under the terms of the Creative Commons Attribution ShareAlike 4.0 International Licence.

addition, findings derived from grey literature are inherently of limited quality and time-dependent due to the rapid progress of the situation.

Evidently, our findings represent only a “snapshot” of the current situation. However, they highlight the fact that the number of infected or deceased HCWs embody a concerning percentage of total cases in many countries. What is more, the median age of HCWs as calculated in the In Memoriam list reveals that a substantial proportion of them belonged to a vulnerable population subgroup. Nonetheless, the age of the deceased ranged between 24 and 93 years, highlighting that young and healthy HCWs could also be in danger.

A month after the declaration of COVID-19 as a pandemic, global health systems showed gross unreadiness for such a pandemic, leaving some of their HCWs as casualties. Adequate personal protective equipment (PPE) is essential for all healthcare professionals involved in the treatment of COVID-19 in order to protect their health and safety. However, the shortage of PPE worldwide, leaves most HCWs exposed to COVID-19. Moreover, since the virus is in the community and could be spread from asymptomatic carriers, HCWs not working with already diagnosed COVID-19 patients risk exposure to the virus and, hence, also need protective measures. Consequently, prioritising the provision of PPE, increasing testing, placing older, more experienced HCWs mostly in organisational positions, minimising exposure by adjusting shift schedules, providing food and sleep facilities, and regular breaks and adequate time off between shifts could be some first restorative measures in the right direction [8, 9]. Additionally, the importance of provisions for the mental wellbeing of HCWs should not be underestimated [10, 11]. Finally, adequate training of HCWs in the proper use of respiratory devices and handling of COVID-19 patients is essential, as this pandemic sets new norms.

The study is not without flaws as the use of grey literature and unsophisticated methodology present some challenges. However, in the absence of a completely consolidated picture, the present work is indicative and presents an opportunity to open vigorous public discourse on the safety of HCWs.

Acknowledgements: The authors thank Ilias I. Siempos from Weill Cornell Medicine, New York, NY, USA, for his insightful thoughts towards improving the manuscript, and Alexander Osarogue for proofreading.

Author contributions: P. Katsaounou, E. Papoutsi, V.G. Giannakoulis and V. Ntella designed the study. E. Papoutsi, V.G. Giannakoulis and V. Ntella performed the literature search. S. Pappa helped with the literature search and reviewed the manuscript. V.G. Giannakoulis, E. Papoutsi and V. Ntella wrote the first draft of the manuscript. P. Katsaounou suggested improvements, wrote the second draft and supervised the publication. E. Papoutsi and V. Ntella created the supplementary table. V.G. Giannakoulis created the illustration. E. Papoutsi, V.G. Giannakoulis and V. Ntella contributed equally to this work.

Conflict of interest: V. Ntella has nothing to disclose. S. Pappa reports travel grants and honoraria from Janssen, Sunovion and Recordati outside the submitted work. V.G. Giannakoulis has nothing to disclose. E. Papoutsi has nothing to disclose. P. Katsaounou reports travel grants, honoraria and grants from Astra, GSK, Pfizer and Chiesi outside the submitted work.

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From the Editor:

This is an important paper but from my personal observations of how we are handling the pandemic in hospitals, it is perhaps not the risk of dealing with the patients that is the problem. In my institution, we have been fortunate to have sufficient personal protective equipment (PPE) and we are well protected when entering the ward environment. However, wearing PPE is uncomfortable and it is disposed of on leaving the patient's room. Staff then congregate at the nurses' station and in the offices, where it is impossible to observe social isolation. I believe that the main threat to healthcare workers is other healthcare workers! We have had ward-based outbreaks with staff all contracting the virus simultaneously, presumably from an asymptomatic carrier in the workplace. This issue needs to be urgently addressed.

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Conflict of interest: A.H. Morice has received grants and/or personal fees from AstraZeneca, Boehringer Ingelheim, Chiesi Ltd, Merck Sharp & Dohme, Sanofi, Airway Vista 2018 South Korea, Menlo Pharmaceuticals, Pfizer, National Medical Research Council, JOMO-UKCPA, Bellus Health, AIST Congress Italy, SA.MA Congress Service Italy, Association for Respiratory Technology and Physiology, Mederic Edicious SL Spain, SRxA USA and National Lung Health Congress 2018 Turkey.