

## MORTALITY OF HEALTH WORKERS DURING THE COVID-19 PANDEMIC

Milena Šantrić Milićević<sup>1</sup>

<sup>1</sup> Univerzitet u Beogradu, Medicinski fakultet, Institut za socijalnu medicinu, Beograd, Srbija

<sup>1</sup> University of Belgrade, Faculty of Medicine, Institute of Social Medicine, Belgrade, Serbia

### SMRTNOST ZDRAVSTVENIH RADNIKA TOKOM PANDEMIJE KOVID-19 OBOLJENJA

Danas postoji dovoljno dokaza da pandemija KOVID-19 oboljenja najteže pogađa zemlje sa društveno specifičnim kontekstima [1,2], i u njima marginalizovane građane, populacione grupe sa najmanje ekonomskih resursa, i pripadnike rasnih i etničkih manjina [3–6]. Ova pandemija se naziva i sindemijom interakcija biološkog i društvenog konteksta [7], i može da odražava logističku pripravnost zemlje za krizu [8], usled čega se zajednice razlikuju u pogledu podložnosti oboljevanju i umiranju. Zbog više nego trostrukog rizika od infekcije u odnosu na opštu populaciju [9], zdravstveni radnici su bez sumnje podneli najveći teret borbe sa pandemijom KOVID-19 oboljenja.

Već u prvoj godini pandemije bolesti KOVID-19, priznati stručnjaci su u jednom uticajnom časopisu upozorili na potrebu preveniranja „paralelne pandemije” među zdravstvenim radnicima [10]. Kolektivno mišljenje aktivista američke Nacionalne Akademije Nauka, Inženjerstva i Medicine jeste neophodnost sveobuhvatnog merenja krize koja se prenosi na zdravstvenu radnu snagu, i izveštavanja o smrtnosti u toj populaciji [11]. Pokazatelji smrtnosti se smatraju najčvršćim dokazom zdravstvenog stanja populacije, a smrtnost

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Today, there is enough evidence that the COVID-19 pandemic most severely affects countries with socially specific contexts [1,2], and in them, marginalized citizens, population groups with the least economic resources available, as well as racial and ethnic minorities [3–6]. This pandemic has also been called the syndemic of interactions between the biological and social context [7] that can reflect the logistical preparedness of a country for crisis [8], which is why communities differ with respect to susceptibility to disease and dying. Due to more than a threefold risk of infection, as compared to the general population [9], health workers have, without doubt, borne the greatest burden of the fight with the COVID-19 pandemic.

In the first year of the pandemic, in a prominent journal, experts warned about the need for preventing a ‘parallel pandemic’ amongst health workers [10]. The collective opinion of the activists of The National Academies of Sciences, Engineering, and Medicine is that there is a necessity for comprehensive measuring of the crisis that is transferred onto the healthcare workforce, as well the necessity of reporting on the mortality in that population [11]. Indicators of mortality are considered

Autor za korespondenciju:

Milena Šantrić Milićević

Institut za socijalnu medicinu, Medicinski fakultet, Univerzitet u Beogradu

Dr Subotića 15, 11000 Beograd, Srbija

Elektronska adresa: milena.santric-milicevic@med.bg.ac.rs

Corresponding author:

Milena Šantrić Milićević

Institute of Social Medicine, Faculty of Medicine, University of Belgrade

15 Dr Subotića Street, 11000 Belgrade, Serbia

E-mail: milena.santric-milicevic@med.bg.ac.rs

**Primljeno • Received:** February 23, 2022; **Revidirano • Revised:** February 24, 2022; **Prihvaćeno • Accepted:** February 26, 2022; **Online first:** March 18, 2022.

DOI: 10.5937/3-36614

zdravstvene radne snage, kao jednog od ključnih resursa zdravstvenog sistema, odslikava vulnerabilnost postojećih kapaciteta za očuvanje i unapređenje zdravlja stanovnika.

Navedimo samo podatak da su, tokom prve epidemije teškog akutnog respiratornog sindroma (SARS) 2003. godine, zdravstveni radnici činili jednu petinu umrlih lica u svetu [12]. Zbog zaražavanja Ebola virusom, u periodu od 2014. do 2016. godine, u Liberiji je umrlo 0,11% opšte populacije a više od 8% zdravstvene radne snage [13]. Tada su slične disproporcionalnosti zabeležene i u drugim zemljama Zapadne Afrike pogođene epidemijom Ebole, kao što su Sijera Leone i Gvineja [13].

Prema meta-analizama [14,15] rađenim u periodu pre pandemije KOVID-19 oboljenja, stopa samoubistava lekara bila je veća od stope samoubistava u opštoj populaciji, pa je važno sagledati da li se ta stopa promenila pod većim obimom posla koji je zahtevan od zaposlenih tokom pandemije, a koji je izvršio fizički i emocionalni pritisak na njihovo zdravlje.

Da bismo procenili direktne i indirektne efekte bolesti KOVID-19 na zdravstveni kadar, potrebno je preuzeti podatke o broju umrlih zdravstvenih radnika iz registara koji prate smrtnost usled profesionalne izloženosti koronavirusu, zatim iz registara koji beleže smrtnost koja se može dovesti u vezu sa stanjima kao što su umor, stres i izgaranje tokom KOVID-19 pandemije, kao i iz registara samoubistava u periodu od proglašenja pandemije.

Septembra 2021. godine, Svetska zdravstvena organizacija (SZO) je objavila prvi radni dokument o efektima pandemije KOVID-19 oboljenja na zdravstvene radnike [16], u kojem je istakla podregistraciju njihovog mortaliteta. Među faktorima, čiju jačinu povezanosti sa povećanom smrtnošću zdravstvenih radnika tokom pandemije KOVID-19 oboljenja treba ispitati, spadaju i: raspoloživost, distribucija i prenamena/relokacija zdravstvenih radnika, pritisak posla, absentizam, zaražavanje, stres, izgaranje, drugi mentalni poremećaji, korišćenje lične zaštitne opreme, vakcinacija, psihološka podrška, karantin, samoizolacija, podsticaji, stigmatizacija, diskriminacija, kao i porodična situacija. Ovi faktori odslikavaju dugogodišnje slabosti zdravstvenih sistema u nekim zemljama, i bili su ključni ometajući faktori za intenzivnu mobilizaciju neophodnih kadrova za borbu protiv pandemije.

Izveštavanje o tačnom broju umrlih usled KOVID-19 oboljenja je veliki izazov za sve zemlje [8]. To najbolje ilustruje podatak da je SZO, u maju 2021. godine, izvestila o registrovanju samo 6.643 smrtna slučaja među zdravstvenim radnicima uzrokovana KOVID-19

to be the soundest proof of the health status of the population, while the mortality of health workers, as one of the key resources of the healthcare system, reflects the vulnerability of existing capacities for maintaining and improving the health of the population.

It is important to note the fact that, during the first severe acute respiratory syndrome (SARS) epidemic in 2003, health workers made up a third of deceased worldwide [12]. In Liberia, between 2014 and 2016, 0.11% of the general population, and more than 8% of the healthcare workforce died due to the Ebola virus infection [13]. At the time, similar disproportion was also registered in other countries of West Africa affected by the Ebola epidemic, such as Sierra Leone and Guinea [13].

According to meta-analyses [14,15] carried out in the period before the COVID-19 pandemic, the suicide rate in doctors was higher than the suicide rate in the general population, which is why it is important to analyze whether this rate has changed in the context of increased workload required of the healthcare employees during the pandemic, which placed additional physical and emotional pressure on their health.

In order to assess direct and indirect effects of COVID-19 on health workers, it is necessary to assemble data on the number of deceased health workers from the registers recording mortality resulting from work-related exposure to the coronavirus, from registers recording mortality that can be connected to conditions such as fatigue, stress, and burnout during COVID-19, as well as from registers recording suicides in the period since the pandemic was declared.

In September 2021, the World Health Organization (WHO) published its first working paper on the impact of COVID-19 on health workers [16], where the under-registration of health worker mortality is highlighted. Amongst the factors which need to be analyzed in the context of the strength of their connection to the elevated mortality of health workers during the COVID-19 pandemic, are the following: availability, distribution, and reallocation/relocation of health workers, work pressure, absenteeism, contracting the infection, stress, burnout, other mental disorders, use of personal protective equipment, vaccination, psychological support, quarantine, self-isolation, incentives, stigmatization, discrimination, as well as family circumstances. These factors reflect lasting weaknesses of healthcare systems in some countries and were key obstructors for intensive mobilization of staff necessary in the fight against the pandemic.

Reporting on the precise number of COVID-related deaths is a great challenge for all countries [8]. This is best illustrated by the fact that, in May 2021, the WHO reported only 6,643 registered COVID-19 related deaths amongst health workers, which is many times less than

oboljenjem, što je višestruko manje od 115.493 takvih smrti, koje je kao podatak dobila procenom zasnovanom na proporciji zdravstvenih radnika u populaciji (proporcija zdravstvene radne snage u populaciji se kreće od manje od 3%, u nerazvijenim zemljama, pa do 3% – 7%, u visoko razvijenim zemljama) i u populaciji broja umrlih od KOVID-19 oboljenja, odnosno na osnovu procena koje je američki Institut za zdravstvene pokazatelje i evaluaciju napravio na osnovu globalne smrtnosti usled KOVID-19 oboljenja, a koja iznosi 179.500 umrlih zdravstvenih radnika [16]. Ostale procene o broju umrlih lica od KOVID-19 oboljenja u zdravstvenom sektoru su manje-više usaglašene, i iznose 83.000 – 133.000 smrti, što su podaci dobijeni triangulacijom izvora (korišćenjem metoda indirektno standardizacije), odnosno 80.000 – 160.000 smrtnih slučajeva, što su podaci procenjeni meta-analizom u vezi sa PCR testiranjem [16].

Postoji više razloga za neusaglašenost u brojevima, uključujući javni interes da korisnici bez oklevanja i straha koriste osnovne zdravstvene usluge. Zbog toga što KOVID-19 oboljenje kruži u zajednici, teško je utvrditi poreklo zaražavanja umrlog zdravstvenog radnika. Ipak, činjenice sugerišu da je KOVID-19 infekcija češća među zdravstvenim radnicima kojima nedostaje odgovarajuća lična zaštitna oprema ili koji rade u radnim okruženjima bez odgovarajućih protokola.

S tim u vezi, da bismo procenili direktne i indirektno efekte KOVID-19 oboljenja na zdravstveni kadar, potrebno je metodološki standardizovanim alatima preuzeti podatke o broju umrlih zdravstvenih radnika iz registara koji prate smrtnost usled profesionalne izloženosti koronavirusu, smrtnost koja se može dovesti u vezu sa stanjima kao što su umor, stres i izgaranje tokom KOVID-19 pandemije, i registara samoubistava od proglašenja pandemije.

Najčešće navođen razlog za podregistraciju jeste da ne postoji rutinsko izveštavanje o broju umrlih po zanimanjima. U potvrdama o smrti retko se beleže informacije o zanimanju umrlog, i često se dešava da se prijavljuje najduže obavljan posao (posebno za žene), a ne zanimanje neposredno pre smrti [17]. Bitna je i informacija ko se prijavljuje pod pojmom zdravstveni radnik i saradnik. Pitanje je da li se smrtnost prati za sve zaposlene u zdravstvenoj ustanovi (i čistačica, na primer) ili se samo prijavljuje smrt medicinskog osoblja. Osim toga, način identifikovanja korona virusa kod kasnije umrlih osoba, može da prikaže lažnu sliku, jer je poznato da senzitivnost njegove detekcije uz pomoć nazofaringealnog brisa može dostići do 79%, uz eventualno dvostruko testiranje [18].

Podjednako je važno reći i da li se u registar unose podaci samo ustanova koje su u sistemu za lečenje

115,493 deaths, which data was obtained through estimation based on the ratio of health workers in the population (the ratio of the healthcare workforce spans from 3%, in underdeveloped countries, to 3% – 7%, in highly developed countries) and in the population of the number of deaths due to COVID-19, i.e., on the basis of assessments made by the American Institute for Health Metrics and Evaluation, founded on global COVID-19 related mortality, which amounted to 179,500 deceased health workers [16]. Other estimations on the number of deaths caused by COVID-19 in the health sector are more or less consistent, and amount to 83,000 – 133,000 deaths, which data were obtained by source triangulation (by applying the method of indirect standardization), i.e., 80,000 – 160,000 deaths, which are data estimated by PCR related meta-analysis [16].

There are numerous reasons for the discrepancy in the numbers, including the public interest of patients using basic healthcare services without hesitation or fear. Due to the fact that COVID-19 circulates in the population, it is difficult to determine the source of infection for a deceased health worker. However, facts suggest that the COVID-19 infection is more frequent amongst health workers lacking appropriate personal protective equipment or those working in work environments lacking appropriate protocols.

To that effect, in order to estimate direct and indirect effects of COVID-19 on health workers, it is necessary to apply methodologically standardized tools to assemble data on deceased health workers from registers recording mortality caused by work-related exposure to the coronavirus, registers recording mortality that can be linked to conditions such as fatigue, stress, and burnout during the COVID-19 pandemic, and registers recording suicide from the time that the pandemic was declared.

The most commonly stated reason for underregistration is the lack of routine reporting on the number of deaths, by profession. In the death certificates, information on the occupation of the deceased is seldom recorded, and it often occurs that the occupation which the deceased had performed for the longest period of time is recorded (especially for women) rather than the occupation performed immediately before death [17]. The information as to who is recorded under the category of health or care worker is also important. The question remains as to whether mortality is recorded for all employees in a healthcare facility (including cleaners, for instance) or whether it is reported only for the deaths of medical staff. Additionally, the way of identifying the corona virus in people who die later, may offer a false picture, as it is known that the sensitivity of its detection with the help of a nasopharyngeal swab may reach up to 79%, with double testing [18].



obolelih od KOVID-19 oboljenja, ili svih zdravstvenih ustanova. Moguće je očekivati podregistraciju o broju umrlih zaposlenih u zdravstvenom sektoru kada ne postoji jedinstven međunarodni/nacionalni okvir za prikupljanje, evidentiranje i prijavljivanje podataka o mortalitetu i morbiditetu zdravstvenih radnika i saradnika povezanih sa KOVID-19 oboljenjem. Nedoslednost koraka u tom pravcu, umanjuje sposobnost nadležnih za smisljeno poređenje i sprovođenje reprezentativnih kombinovanih analiza i donošenje tačnih zaključaka o razmerama smrtnosti zdravstvenih radnika i saradnika tokom pandemije KOVID-19 oboljenja.

Na kompletnost izveštavanja utiču i kapaciteti za testiranje i praćenje infekcije i smrti. U skladu sa raspoloživim kapacitetima, moguće je da varira registracija umrlih. Slično se odnosi i na podatke o osoblju i korisnicima domova za stara lica, i institucija za dugotrajnu negu ili zbrinjavanje. Naime, dešavalo se da su prijavljivani samo oni zdravstveni radnici ili saradnici, tj. građani, za koje je testom na KOVID-19 infekciju potvrđen pozitivan nalaz na SARS-CoV-2 virus ili koji su umrli tokom lečenja od KOVID-19 oboljenja u zdravstvenoj ustanovi.

Za sad, ostaje nepoznanica o tačnim razmerama mortaliteta zdravstvenih radnika i saradnika usled KOVID-19 oboljenja, uzimajući u obzir zastupljenost takvih smrtnih slučajeva među netestiranim licima, među smrtnim slučajevima van zdravstvenih ustanova, i među umrlima za koje je uzrok smrti ostao neidentifikovan i šifriran takozvanim "smeće kodovima" (engl. garbage codes) [19]. Ovi smrtni slučajevi jesu obuhvaćeni pokazateljima opšteg mortaliteta, ali je neophodno izračunati opterećenje zdravstvenog sistema smrtnošću usled KOVID-19 oboljenja.

S obzirom da smo u trećoj godini pandemije, razumljiva je zabrinutost za zdravlje zdravstvenih radnika i saradnika, stoga je pitanje tačnog broja smrtnih slučajeva u ovoj populaciji koji je moguće pripisati KOVID-19 oboljenju, postalo važno javnozdravstveno i političko pitanje na koje treba dati odgovor, ne samo da bi se precizno identifikovala smrtnost zdravstvenih radnika i saradnika, već i stimulisala ulaganja u njihovu bezbednost i održivost zdravstvenog sistema, u kontekstu vanrednih situacija visokog rizika.

**Sukob interesa:** Nije prijavljen.

It is equally important to state whether data from all health institutions are being entered into the register or only from those health facilities that are a part of the system for treating COVID-19 patients. It is possible to expect underregistration of the number of deceased health sector employees if there is an absence of an international or national framework for the collection, recording, and reporting of COVID-19 related mortality and morbidity data regarding health and care workers. Inconsistency of steps taken in that direction decrease the ability of the authorities to meaningfully compare and carry out representative combined analyses and reach correct conclusions on the extent of the mortality of health and care workers during the COVID-19 pandemic.

The completeness of reporting is also affected by the capacities for testing and monitoring infection and death. Depending on the the available capacities, it is possible for the registration of the deceased to vary. The same also applies to data on the staff and beneficiaries of retirement homes and facilities for long-term care. Namely, it has happened that only those health and care workers, i.e., citizens, in whom the COVID-19 infection had been confirmed though a positive SARS-CoV-2 test or who had died while being treated for COVID-19 in a healthcare facility, were registered.

At present, the exact extent of COVID-related mortality of health and care workers remains unknown, due to the incidence of such deaths amongst untested persons, amongst deaths outside of healthcare facilities, and amongst the deceased for whom the cause of death remained unidentified and was coded with so called garbage codes [19]. These deaths are covered by indicators of crude mortality, but it is necessary to calculate the COVID-19-related burden of mortality of the healthcare system.

Bearing in mind that we are now in the third year of the pandemic, the concern for the health of health and care workers is understandable, which is why the matter of the exact number of deaths in this population which can be attributed to COVID-19 has become an important policy and public health issue which needs to be dealt with, not only in order to precisely identify the mortality of health and care workers, but also in order to stimulate investment into their safety and the sustainability of the healthcare system, in the context of high-risk emergency situations.

**Conflict of interest:** None declared

## LITERATURA / REFERENCES

1. Mendenhall E. The COVID-19 syndemic is not global: context matters. *Lancet*. 2020 Nov 28;396(10264):1731. doi: 10.1016/S0140-6736(20)32218-2.
2. Arceo-Gomez EO, Campos-Vazquez RM, Esquivel G, Alcaraz E, Martinez LA, Lopez NG. The income gradient in COVID-19 mortality and hospitalisation: An observational study with social security administrative records in Mexico. *Lancet Reg Health Am*. 2022 Feb;6:100115. doi: 10.1016/j.lana.2021.100115.
3. Bambra R, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. *J Epidemiol Community Health*. 2020 Nov;74(11):964-8. doi: 10.1136/jech-2020-214401.
4. Pan D, Sze S, Minhas JS, Bangash MN, Pareek N, Divall P, et al. The impact of ethnicity on clinical outcomes in COVID-19: A systematic review. *EClinicalMedicine*. 2020 Jun 3;23:100404. doi: 10.1016/j.eclinm.2020.100404.
5. Upshaw TL, Brown C, Smith R, Perri M, Ziegler C, Pinto AD. Social determinants of COVID-19 incidence and outcomes: A rapid review. *PLoS One*. 2021 Mar 31;16(3):e0248336. doi: 10.1371/journal.pone.0248336.
6. Abrams EM, Szeffler SJ. COVID-19 and the impact of social determinants of health. *Lancet Respir Med*. 2020 Jul;8(7):659-61. doi: 10.1016/S2213-2600(20)30234-4.
7. Horton R. Offline: COVID-19 is not a pandemic. *Lancet*. 2020 Sep 26;396(10255):874. doi: 10.1016/S0140-6736(20)32000-6.
8. Kumar A K A, Mishra N. Mortality during the COVID-19 pandemic: the blind spots in statistics [published online ahead of print, 2021 Dec 22]. *Lancet Infect Dis*. 2021;S1473-3099(21)00767-2. doi:10.1016/S1473-3099(21)00767-2.
9. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, et al.; Coronavirus Pandemic Epidemiology Consortium. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *Lancet Public Health*. 2020 Sep;5(9):e475-83. doi: 10.1016/S2468-2667(20)30164-X.
10. Dzau VJ, Kirch D, Nasca T. Preventing a Parallel Pandemic - A National Strategy to Protect Clinicians' Well-Being. *N Engl J Med*. 2020 Aug 6;383(6):513-5. doi: 10.1056/NEJMp2011027.
11. Kursumovic E, Lennane S, Cook TM. Deaths in healthcare workers due to COVID-19: the need for robust data and analysis. *Anaesthesia*. 2020 Aug;75(8):989-92. doi: 10.1111/anae.15116.
12. World Health Organization. World Health Organization summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003 [Internet]; [Pristupljeno: 2022 Februar 20]. Dostupno na: <https://www.who.int/publications/m/item/summary-of-probable-sars-cases-with-onset-of-illness-from-1-november-2002-to-31-july-2003>
13. Evans DK, Goldstein M, Popova A. Health-care worker mortality and the legacy of the Ebola epidemic. *Lancet Glob Health*. 2015 Aug;3(8):e439-40. doi: 10.1016/S2214-109X(15)00065-0.
14. Gold KJ, Sen A, Schwenk TL. Details on suicide among US physicians: data from the National Violent Death Reporting System. *Gen Hosp Psychiatry*. 2013 Jan-Feb;35(1):45-9. doi: 10.1016/j.genhosppsych.2012.08.005.
15. Duteil F, Aubert C, Pereira B, Dambrun M, Moustafa F, Mermillod M, et al. Suicide among physicians and health-care workers: A systematic review and meta-analysis. *PLoS One*. 2019 Dec 12;14(12):e0226361. doi: 10.1371/journal.pone.0226361.
16. World Health Organization. The impact of COVID-19 on health and care workers: a closer look at deaths. Health Workforce Department – Working Paper 1. Geneva: World Health Organization; 2021 [Internet]; [Pristupljeno: 2022 Februar 20]. Dostupno na: <https://apps.who.int/iris/bitstream/handle/10665/345300/WHO-HWF-WorkingPaper-2021.1-eng.pdf?sequence=1&isAllowed=y>
17. Industrial Inquiries Advisory Council. (2021). Independent report: COVID-19 and occupation: position paper 48. London: Department of Works and Pensions; [Internet]; [Pristupljeno: 2022 Februar 20]. Dostupno na: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/964524/covid-19-and-occupation-policy-paper-48.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/964524/covid-19-and-occupation-policy-paper-48.pdf)
18. Clerici B, Muscatello A, Bai F, Pavanello D, Orlandi M, Marchetti GC, et al. Sensitivity of SARS-CoV-2 Detection With Nasopharyngeal Swabs. *Front Public Health*. 2021 Jan 26;8:593491. doi: 10.3389/fpubh.2020.593491.
19. Mathers CD, Fat DM, Inoue M, Rao C, Lopez AD. Counting the dead and what they died from: an assessment of the global status of cause of death data. *Bull World Health Organ*. 2005;83(3):171-77. PMID: 15798840.