

Systematic review of productivity loss among healthcare workers due to Covid-19

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Abstract

Objective: To assess existing evidence on the effects of COVID-19 on healthcare workers (HCWs) using the health-related productivity loss approach.

Methods: A systematic search of online databases including PubMed, Scopus, Ovid, Web of Science, and EMBASE was conducted up to 25 August 2020. Following two screening stages, studies related to the effects of COVID-19 on healthcare workers were included in the study.

Results: 82 studies were included in the analysis. The COVID-19 related death rate among HCWs ranged from 0.00–0.7%, while the positive test incidence varied between 0.00 and 24.4%. 39 evidences assessed psychological disorders. A wide range of psychological disorders observed among HCWs: 5.2 to 71.2% in anxiety, 1.00 to 88.3% in stress, 8.27 to 61.67% in insomnia, and 4.5 to 50.4% in depression.

Conclusions: The early evidence suggests that healthcare workers are one of the most vulnerable groups when it comes to positive COVID-19 infection, mortality, and mental illness.

KEYWORDS

absenteeism, COVID-19, health care workers, presenteeism

1 | INTRODUCTION & OBJECTIVES

A significant number of infections and even deaths among health care workers (HCWs) are caused by COVID-19.¹ The loss of health professionals by healthcare systems, along with shortage problems in some countries, increases the severity of the problem.²

Work absences and working while illness will lead to productivity losses for workers.^{3,4} Health-related productivity loss means productivity loss (PL) due to health problems.⁵ In the Valuation of Lost Productivity Approach (VOLP) health-related productivity loss appears to be driven by three variables: absenteeism (being absent from work), presenteeism (working while sick), and the inability to do unpaid work due to illness.^{6,7}

There are several ways COVID-19 may impact health-related productivity among HCWs. The first way involves the death of HCWs. Some studies have reported deaths among HCWs due to COVID-19.^{8,9} Healthcare systems have difficulty compensating for death of professionals in the field. Another way is to infect HCWs with COVID-19. A COVID-19 infection is most likely to cause productivity loss through absenteeism during the illness period and the quarantine period. As of 8 April 2020, the World Health Organization (WHO) reported that 2073 health care workers in 52 countries were infected with COVID-19, however these numbers are based solely on reports that have been submitted to the WHO. According to this report, the incidence of COVID-19 infection among HCWs was 3.8% in China and 11% in Italy among the entire infected population.¹⁰ Third, HCWs are at risk for physical and psychological disorders. The main focus is on psychological disorders such as anxiety, depression, and insomnia.¹¹⁻¹³ A physical or psychological disorder may result in absenteeism or presenteeism among healthcare workers.

As a result of COVID-19, death, infection, and physical and psychological disorders threaten productivity in healthcare settings, and these issues must be addressed separately.

The aim of this review is to:

- Reaching out to a framework for Health-related productivity loss among HCWs using Disability-adjusted life year (DALY) approach.
- Assess existing evidence about the effects of COVID-19 on healthcare workers by physical and psychological disorders, quarantine due to infection and death.

2 | METHODS

This systematic review conducted in August 2020 based on available evidences in scientific databases including published, accepted, and preprinted ones. This study conducted following the PRISMA- Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement based on the 27 items checklist.

2.1 | Data sources and search strategy

To formulate search strategies, keywords selected based on the literature review.

The following terms were used for searching in titles, abstracts, and keywords in PubMed, Scopus, Web of Science, Ovid, and EMBASE from 20th August to 25th August:

#1: "COVID-19" OR "Coronavirus" OR "SARS-Cov-2"

#2: "Health-care worker" OR "Healthcare personnel" OR "Health professionals" OR "Nurse" OR "Medical staff"

#3: "Death" OR "Mortality" OR "physical disorder" OR "Psychological disorder" OR "Mental health" OR "Absenteeism" OR "Presenteeism" OR "Disability adjusted life years"

#4: #1 AND #2 AND #3 limited to 2020 and 2021. Some articles were published in 2021, so this year was also considered in the search. Different spellings of keywords were also considered. After the initial search, a total of 2922 articles were found. Details of the search procedure and the list of the final articles entered into the study are presented in Table 1.

Unrelated and duplicate studies eliminated. Reviewing the titles and abstracts of articles was done by two authors, and 1738 articles which were irrelevant to the objectives of the study excluded. Moreover, 534 articles were removed because they were duplicates. Finally, 650 articles assessed.

2.2 | Inclusion and exclusion criteria

Inclusion criteria:

- Available full text or at least English abstract;
- Quantitative report based on primary data;
- Letter to editors, commentaries, and the like with primary data;
- Being specifically conducted among HCWs; and
- Clear and specific sample size.

Exclusion criteria:

- Qualitative studies, systematic reviews, and meta-analysis; and
- Reports based on the entire population or all infected cases in the country.

2.3 | Study selection

Databases searched by one of the authors. Screening and assessing articles based on the inclusion and exclusion criteria performed by two independent authors. In the first stage of screening, the existing English abstract and quantitative reports assessed in terms of the inclusion and exclusion criteria based on primary data. Therefore, articles with secondary data (e.g., systematic review and meta-analysis) and qualitative studies excluded. Articles that included primary data in letter to editors, editorials, commentaries, etc. were also considered. Based on the first stage of screening, 112 articles were excluded, and the 538 remaining articles were screened in the second stage. In the second stage, two inclusion criteria, that is, conducting research specifically among HCWs and specific sample size considered and studies reported based on the general population were excluded. At this stage, out of 538 articles, 82 articles were

TABLE 1 Search features in scientific databases

Keywords	Databases	Total articles	Initial article selection	Final articles
COVID-19, Coronavirus, SARS-Cov-2, health-care worker, healthcare personnel, health professionals, nurse, medical staff, death, mortality, physical disorder, psychological disorder, mental health, absenteeism, presenteeism, disability adjusted life years	PubMed	409	650	82
	Scopus	1406		
	Ovid	409		
	EMBASE	388		
	Web of science	310		

selected (Figure 1). Presenting the results of the selected articles assessed by two authors using STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist. The quality of the studies assessed with Critical Appraisal Skills Programme checklists (CASP).¹⁴ These checklists review a variety of study designs. We used a general 10-item checklist; each item scored from 0 to 5 (total score 0 to 50). The minimum acceptable score was 31. Manuscript Scores between 30 and 40 classified “good” and 41–50 “excellent”.¹⁵

2.4 | Data extraction, variables and data analysis

All 82 articles scoped and summarized in terms of author/authors, country of the study, type of HCWs, sample size and their main findings using a data extraction form in MS Excel 2010. The effects of COVID-19 on productivity loss (PL) of HCWs investigated in terms of several categories based on the conceptual framework presented in the Figure 2. In this study, the productivity loss of HCWs caused by COVID-19 was combined with the Disability-Adjusted Life Years (DALY) approach and categorized into four groups. The groups included deaths (YLLs), absenteeism due to quarantine, physical YLDs, and Mental YLDs.

3 | RESULTS

Eighty two studies included in the analysis.

In evaluating the quality of the studies, out of 82 articles submitted, all studies obtained the minimum quality criteria. Quality of studies in 63 studies (76.8%) were excellent and 19 (23.2%) were good. The characteristics of the selected articles are depicted in Figure 3.

Summarizing and reporting were based on the conceptual framework. At first, HCWs morbidities related to physical and psychological disorders caused by COVID-19 reported. After reporting the absence from work from COVID-19 infection and quarantine, the mortality from COVID-19 infection was reported.

3.1 | Productivity lost due to morbidity

3.1.1 | Years lost due to disability (YLDs)

Physical YLD

Few studies have focused specifically on physical disorders caused by COVID-19 among HCWs. In order to determine the effects of COVID-19 on HCWs physical conditions, it is necessary to wait for future reports. Results showed that skin problems were common among HCWs due to wearing masks and protective equipment (Table 2).

Mental YLD

The diversity of mental disorders reported by HCWs due to COVID-19 varies from fear and anxiety and loneliness to Post-traumatic Stress Disorder (PTSD). The most commonly reported mental disorders included stress and anxiety, sleep disorders and depression (Table 3).

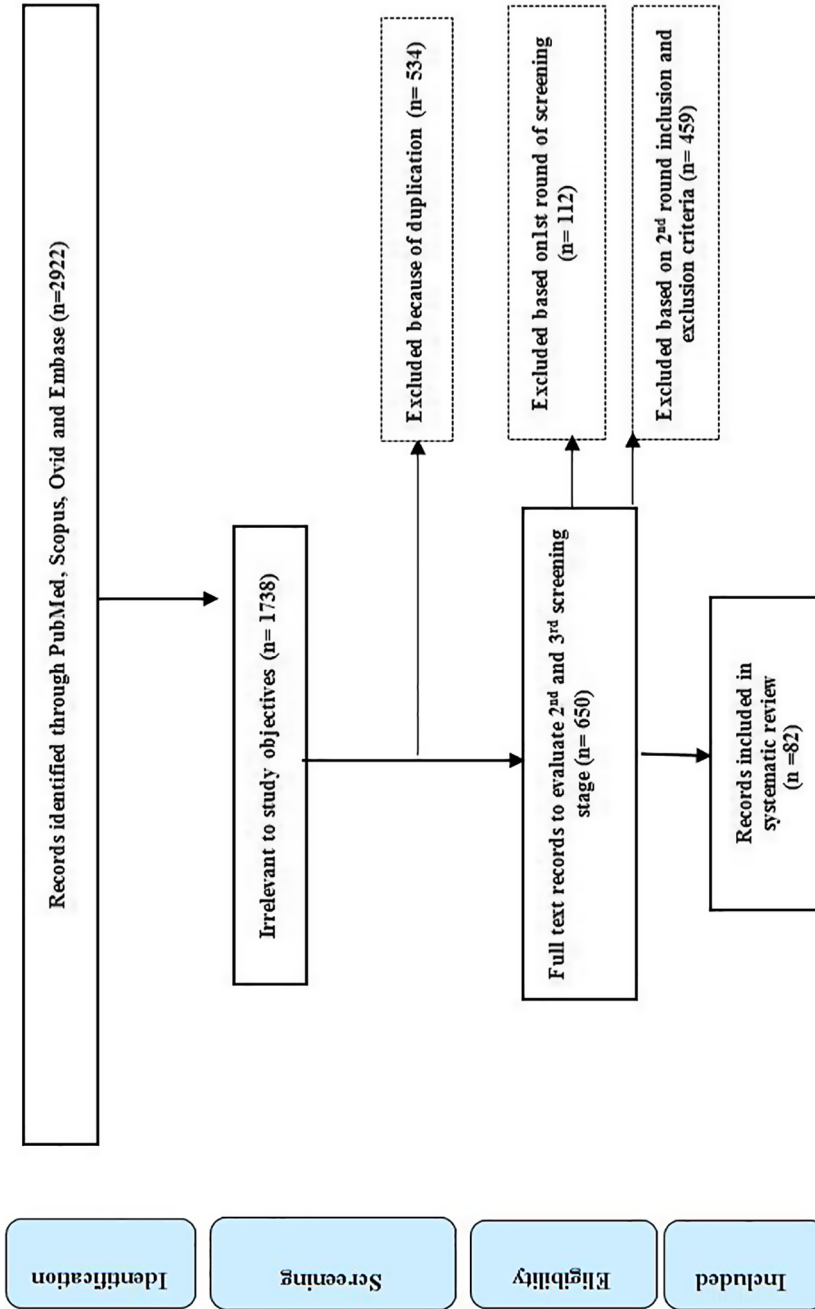


FIGURE 1 Flow chart of study selection process [Colour figure can be viewed at wileyonlinelibrary.com]

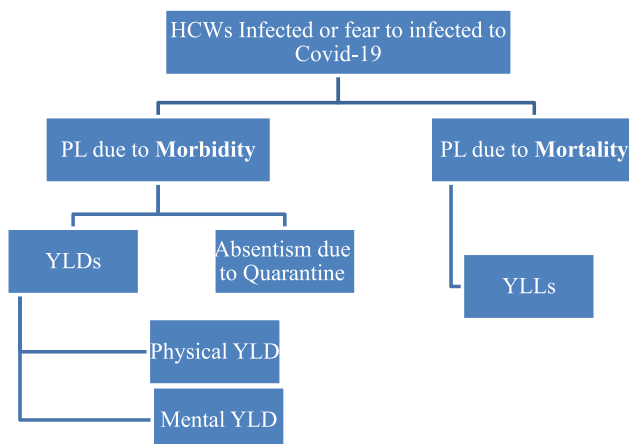


FIGURE 2 Conceptual framework of study. PL, productivity lost; YLD, years lost due to disability; YLL, years of life lost [Colour figure can be viewed at wileyonlinelibrary.com]

3.1.2 | Absenteeism due to quarantine

Any case of COVID-19 and long absence from work will affect productivity, and it will not be possible to use infected HCWs until full recovery. For different study populations, COVID-19 incidences among HCWs range from 0.00% to about 25% (Table 4).

3.2 | Productivity lost due to mortality

3.2.1 | Years of life lost (YLLs)

HCWs dying from COVID-19 can impact PL because these workers are highly valued, education and deployment are costly, and replacement is hard. The situation is worse in countries with a high shortage of health care workers. Based on the results, the mortality rate among HCWs ranges from 0.00 to 0.7%. Based on the PL approach, even one case of mortality among HCWs can significantly reduce productivity (Table 5).

4 | DISCUSSION

In this study, the productivity loss of HCWs due to COVID-19 categorized into four groups: deaths (YLLs), absenteeism due to quarantine, physical YLDs, and mental YLDs.

The quality of the studies included in the present study is generally an important issue for systematic review. Although quality assessment is limited in cases where results are reported quickly due to urgency in COVID-19, none of articles excluded. Quality assessment may reflect the incompleteness of the report to some extent, and poor reporting remains a widespread problem. There are no homogeneous and accurate statistics on the death rate among HCWs due to COVID-19. In some studies, HCWs mortality reported among the entire population. Some studies specifically report the death rate among HCWs, while others only report the general number of deaths. The main point is that HCWs lose their lives because of COVID-19. In addition to the invaluable sacrifices made by HCWs during the COVID-19 outbreak, their absence can cause many problems for healthcare systems. This issue can become more complicated in developing countries dealing with various shortages.⁹⁷

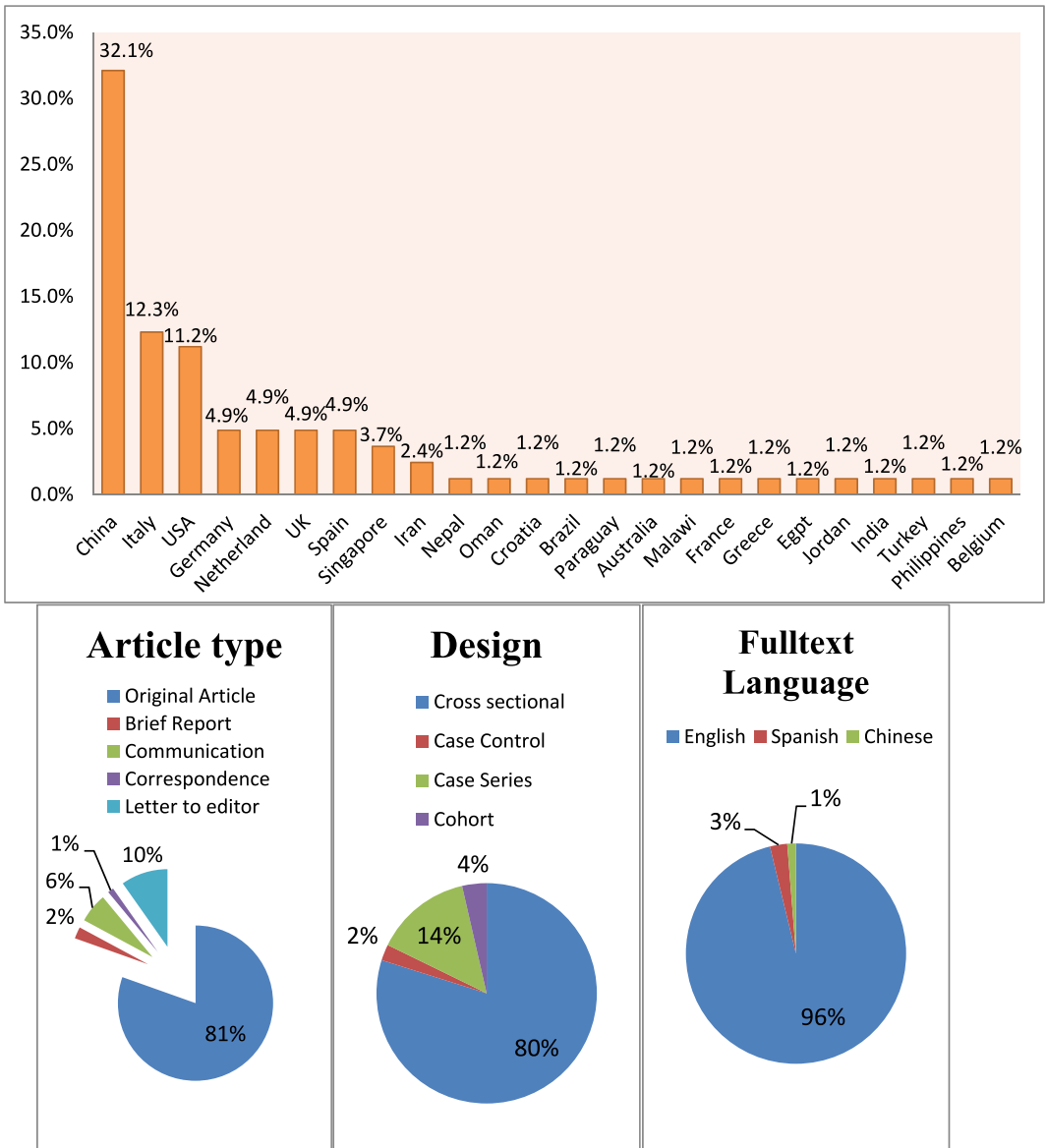


FIGURE 3 Characteristics of included articles [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Physical disorders related to COVID-19 among health care workers

Authors	Country	HCWs types	Study sample & main outcome	CASP score
Lan et al. ¹⁶	China	NA	526 HCWs: Skin damages- dryness/tightness 370 (70.3%), tenderness 299 (56.8%), itching 276 (52.5%) and burning/pain 200 (38.0%)	38

Abbreviations: CASP, critical appraisal skills programme checklists; HCW, health care workers.

TABLE 3 Psychological disorders related to COVID-19 among health care workers

Authors	Country	HCWs types	Study sample & main outcome	CASP score
Labrague & santos ¹⁷	Philippines	Nurses	325 nurses: Dysfunctional levels of anxiety 123 (37.8%)	43
Gupta et al. ¹⁸	Nepal	Nursing staff, faculty members and other	150 HCWs: Anxiety disorder 56 (37.3%), depression 12 (8%)	47
Zandifar et al. ¹⁹	Iran	NA	892 HCWs: Depression 41.7%, anxiety 51.2%, stress 33.9%	46
Salopek-Žiha et al. ²⁰	Croatia	All	124 HCWs: 11% moderate to very-severe depression, 17% moderate to extremely-severe anxiety, 10% moderate to extremely-severe stress	38
Badahdah et al. ²¹	Oman	Physician and nurses	509 physician and nurses: High anxiety 132 (25.9), high stress 287 (56.4%)	46
Luceño-Moreno et al. ²²	Spain	All	1422 HCWs: Posttraumatic stress disorder (PTSD) 56.6%, anxiety disorder 58.6%, depressive disorder 46%, feel emotionally drained 41.1%	43
Dal'Boscol et al. ²³	Brazil	Nurses	88 nurses: Anxiety (48.9%) and depression (25%)	49
Samaniego et al. ²⁴	Paraguay	NA	126 HCWs: Moderate and severe depression 32.2%, anxiety 41.3%, insomnia 27.8%, distress 38.9%, fatigue 64.3%	45
Giusti et al. ²⁵	Italy	NA	330 health professionals: 235 (71.2%) anxiety above the clinical cutoff, 88 (26.8%) clinical levels of depression, 103 (31.3%) of anxiety, 113 (34.3%) of stress, 121 (36.7%) of post-traumatic stress.	36
Rossi et al. ²⁶	Italy	Nurse, GP, assistant, laboratory, radiology, physiotherapists	1379 HCWs: (PTSS) 681 (49.38%), depression 341 (24.73%), anxiety 273 (19.80%), insomnia 114 (8.27%), High perceived stress 302 (21.90%)	47
Magnavita et al. ²⁷	Italy	Physician, nurse, technician, clerk, other	595 HCWs: Anxiety (16.6%), depression (20.3%)	46
De sio et al. ²⁸	Italy	Physicians	695 physicians: Distress of (93.8%), poor well-being (58.9%)	47
Ni et al. ²⁹	China	NA	214 HCWs: Anxiety 47 (22.0%), depression 41 (19.2%)	42
Zhou et al. ³⁰	China	NA	1931 HCWs: Poor sleep quality (18.4%)	41
Que et al. ³¹	China	Physicians, medical residents, nurses, technicians and public health	2285 HCWs: Anxiety (46.04%), depression (44.37%), insomnia (28.75%) and the overall psychological problems (56.59%)	41
Song et al. ³²	China	Medical staff nurses	14825HCWs: Depressive symptoms (25.2%), post-traumatic stress disorder (PTSD) (9.1%)	44

(Continues)

TABLE 3 (Continued)

Authors	Country	HCWs types	Study sample & main outcome	CASP score
Tu et al. ³³	China	Nurses	100 nurses: Poor sleep quality (60%), depression symptoms (46%), anxiety symptoms (40%)	48
Tian et al. ³⁴	China	Frontline health professionals (76.8% nurses)	845 HCWs: Moderate to severe stress level (60.8%), depression (45.6%), anxiety (20.7%), insomnia symptoms (27%)	47
Jin et al. ³⁵	China	Medical staffs, nurses, medical technicians	103 HCWs: Psychological stress or emotional changes during their isolation period after infection (88.3%)	33
Li et al. ³⁶	China	Women HCW	4369 women HCWs: Depression 621 (14.2%), anxiety 1101 (25.2%), acute stress symptoms 1382 (31.6%)	46
Zhan et al. ³⁷	China	Nurses	2667 nurses: 935 (35.06%) in the fatigue status	46
Wang et al. ³⁸	China	Doctors and nurses	274 HCWs: Combined prevalence of anxiety, depression and insomnia of staff backing Hubei reached as high as (38%)	39
Dong et al. ³⁹	China	All	4618 HCWs: 24.2% high levels of anxiety or/and depressive symptoms	43
Zhang et al. ⁴⁰	China	Medical staffs	1563 medical staffs: 564 (36.1%) insomnia symptoms	41
Wang et al. ⁴¹	China	All	2737 HCWs: Sleep problems (61.6%), anxiety (22.6%), depressive symptoms (35%)	45
Huang et al. ⁴²	China	Medical staffs	230 medical staffs: 53 (23.04%) anxiety	46
Wu & Wei ⁴³	China	Medical staffs	120 medical staffs: Moderate insomnia (61.67%), severe insomnia (26.67%)	37
Liu et al. ⁴⁴	China	Medical staffs	2031 medical staffs: Depression (14.81%), anxiety (18.3%), stress symptoms (9.98%)	48
Lai et al. ¹³	China	All	1257 HCWs: Depression 634 (50.4%), anxiety 560 (44.6%), insomnia 427 (34%), distress 899 (71.5%)	44
Yin et al. ⁴⁵	China	All	377 HCWs: Posttraumatic stress symptoms-PTSS (3.8%)	42
Cai et al. ⁴⁶	China	Frontline and non-frontline medical workers	1173 frontline and 1173 non-frontline medical workers: Mental problem (52.6% vs. 34.0%), anxiety symptoms (15.7% vs. 7.4%), depressed mood (14.3% vs. 10.1%) and insomnia (47.8% vs. 29.1) among frontline and non-frontline medical workers.	38
Zhao et al. et al. ⁴⁷	China	All	972 frontline staff: Anxiety 438 (45.1%), depressive symptoms 313 (32.2%), insomnia 380 (39.1%)	35

TABLE 3 (Continued)

Authors	Country	HCWs types	Study sample & main outcome	CASP score
Wang et al. ⁴⁸	China	Nurses	202 nurses: Post-traumatic stress disorder (PTSD) (16.83%)	42
Leng et al. ⁴⁹	China	Nurses	90 nurses: Post-traumatic stress disorder (PTSD) 5 (5.6%)	46
Zhang et al. ⁵⁰	China	Medical health workers	927 medical health workers: Insomnia (38.4%), anxiety (13%), depression (12.2%), somatization (1.6%), obsessive-compulsive symptoms (5.3%)	39
Shechter et al. ⁵¹	USA	Physicians, advanced practice providers, residents/fellows, and nurses	657 HCW: Acute stress (57%), depressive (48%), anxiety symptoms (33%)	41
Civantos et al. ⁵²	USA	Physician	349 physicians: Anxiety 167 (47.9%), distress 210 (60.2%), burnout 76 (21.8%), depression 37 (10.6%)	47
Tan et al. ⁵³	Singapore	Physician, nurse, allied healthcare, technician, Clerical staff, administrator, maintenance worker	470 HCWs: Depression (8.93%), anxiety (14.46%), stress (6.59%), PTSD (7.65%)	45
Chew et al. ⁵⁴	Singapore	Doctors, nurses, allied healthcare, administrators, clerical staff and maintenance workers	906 HCWs: Moderate to very-severe depression (5.3%), moderate to extremely-severe anxiety (8.7%), moderate to extremely-severe stress (2.2%), moderate to severe levels of psychological distress (3.8%).	46
Chew et al. ⁵⁵	Multi countries	Physician, nurse, technician, Clerical staff/executive, administrator, maintenance worker, allied professional	1146 HCWs: Depression (4.5%), anxiety (5.2%), stress (1.0%), PTSD (7.9%)	45

Abbreviations: CASP, critical appraisal skills programme checklists; HCW, health care workers.

A systematic review reported presenteeism productivity losses ranging from 2000 USD to 15,541 USD per health-care employee annually. Moreover, absenteeism costs were higher than presenteeism (463 vs. 340 USD per person). These estimates were based on a general calculation and not related to a specific disease.² Although presenteeism is more prevalent among HCWs, the monetary value of absenteeism is higher.⁹⁸ In Nurchis et al. (2020), the burden of COVID-19 for the Italian population calculated by DALY and the human capital approach and mortality and disability caused by COVID-19 were considered. According to Nurchis et al., the permanent and temporary productivity loss estimated around 300 million € and 100 million €, respectively.⁹⁹ In South Korea, the DALY of COVID-19 estimated for the total population, accounting for 10.3% of YLLs and 89.7% of YLDs.¹⁰⁰ These studies show that despite lower mortalities than disabilities, the monetary value of YLLs is higher than that of YLDs, with greater impact on productivity loss.

HCWs infection during COVID-19 is one of the contributing factors to absenteeism. There are various statistics on the infection rates. The length of the quarantine, receiving treatment, and absence from work affect productivity

TABLE 4 Number and percentage of infection (positive cases) related to COVID-19 among HCWs

Authors	Country	HCWs type	Study sample & main outcome	CASP score
Behrens et al. ⁵⁶	Germany	NA	217 HCWs: 45 (21%) infected	45
Brandstetter et al. ⁵⁷	Germany	NA	201 HCWs: 31 (15.4%) infected	48
Korth et al. ⁵⁸	Germany	NA	316 HCWs: 5 (1.6%) infected	43
Schmidt et al. ⁵⁹	Germany	All	406 HCWs: 2.7% infected	39
Kempker et al. ⁶⁰	USA	NA	283 HCWs: 51 (18%) infected	48
Mani et al. ⁶¹	USA	All	3477 HCWs: 185 (5.3%) infected	46
Demmer et al. ⁶²	USA	All	489 HCWs: 0 (0.00%) infected	45
Cummings et al. ⁶³	USA	NA	4689 HCWs: 387 (8%) infected	43
Stubblefield et al. ⁶⁴	USA	Nurses, providers, radiology technicians, others	249 HCWs: 19 (7.6%) infected	47
Hartmann et al. ⁶⁵	USA	All	56,855 HCWs: 5458 (9.6%) infected	47
Reusken et al. ⁶⁶	Netherland	NA	1097 HCW: 45 (4.1%) infected	34
Tostmann et al. ⁶⁷	Netherland	NA	803 HCWs: 90 (11.2%) infected	39
Sikkema et al. ⁶⁸	Netherland	NA	1796 HCWs: 96 (5%) infected	37
Kluytmans-van den bergh et al. ⁶⁹	Netherland	All	9075 HCWs: 85 (1%) infected	43
Martin et al. ⁷⁰	Belgium	Physicians, nurses, paramedical staff, stretcher-bearers and cleaners, administrative employees	326 HCWs: 37 (11.3%) infected	36
Garcia-Basteiro et al. ⁷¹	Spain	All	578 HCWs: 65 (11.2%) infected	49
Moreno-Casbas et al. ⁷²	Spain	NA	2230 HCWs: 275 (12.3%) infected	45
Alvarez Gallego et al. ⁷³	Spain	Surgeons	50 surgeons: 12 (24.4%) infected	39
Zheng et al. ⁷⁴	China	All	117,100 HCWs: 2457 (2.09%) infected	41
Lai et al. ⁷⁵	China	Medical staffs	9684 medical staffs: 110 (1.1%) infected	45
Brown et al. ⁷⁶	UK	All	1152 HCWs: 23 (2.0%) infected	47
Bampoe et al. ⁷⁷	UK	Anaesthetists, midwives and obstetricians	200 HCWs: 29 (14.5%) infected	47
Keeley et al. ⁷⁸	UK	NA	1533 HCW: 282 (18%) infected	48
Felice et al. ⁷⁹	Italy	All	388 HCWs: 18 infected	38
Lombardi et al. ⁸⁰	Italy	All	1573 HCWs: 139 (8.8%) infected	47
Paderno et al. ⁸¹	Italy	All staffs of otolaryngology unit	58 HCWs: 5 (9%) infected	41
Garzaro et al. ⁸²	Italy	NA	830 HCWs: 80 (9.6%) infected	43
Lahner et al. ⁸³	Italy	All	2057 HCWs: 58 (2.7%) infected	43
Magnavita et al. ²⁷	Italy	Physician, nurse, technician, clerk, other	595 HCWs: 82 (13.78%) infected	48

TABLE 4 (Continued)

Authors	Country	HCWs type	Study sample & main outcome	CASP score
Muhi et al. ⁸⁴	Australia	NA	1160 HCWs: 11 (0.94%) infected	42
Gheysaradeh et al. ⁸⁵	Iran	Nurses	125 nurses: 5 (4%) infected	34
Chibwana et al. ⁸⁶	Malawi	All	500 HCWs: 12.3% infected	47
Wee et al. ⁸⁷	Singapore	NA	1642 HCWs: 9 (0.54%) infected.	47
Contejean et al. ⁸⁸	France	All	1344 HCWs: 373 (28%) infected	46
Maltezou et al. ⁸⁹	Greece	All	3398 HCWs: 66 (1.9%) infected	32
Kassem et al. ⁹⁰	Egypt	Physician, nurse, patient transporters/cleaners, administrative employees	74 HCWs: 10 (13.5%) infected	45
Al-zoubi et al. ⁹¹	Jordan	All	370 HCWs: 0 (0.00%) infected	35
Jha et al. ⁹²	India	NA	1113 HCWs: 20 (1.8%) infected	46
Çelebi et al. ⁹³	Turkey	Physicians nurses cleaning personnel other occupations	703 HCWs: 50 (7.1%) infected. Physicians 6.3%, nurses 8.0%, Cleaning personnel 9.1% and the other occupations 2.6%.	43

Abbreviations: CASP, critical appraisal skills programme checklists; HCW, health care workers.

loss due to the number of days it takes a person to return to work. The number of days it takes for a person to return to work estimated around 10-14 days.¹⁰¹ In Gianino et al. (2019), absenteeism due to seasonal influenza calculated among 5041 HCWs, and the results showed over 11,100 working days/year lost, costs were approximately 1.7 million euros, and the average work loss valued around €327/person.¹⁰² The study carried out by Gianino et al. shows the level of productivity loss due to viral infections.

In this study, presenteeism categorized to physical and psychological disorders. Presenteeism is highly prevalent among HCWs. In a study in Saudi Arabia among physicians, nurses, dentists, pharmacists, and other professionals at a tertiary center, 74% of employees reported having sickness presenteeism during the year.¹⁰³ In a study in Turkey among HCWs, the monetary value of presenteeism productivity loss estimated at 19.92 to 315.57 TRY for two weeks and 478.08 to 7573.68 TRY for one year.¹⁰⁴

Physical disorders among HCWs caused by COVID-19 have been reported in a limited number of studies, and there is a need for further research. Based on the results, skin damage due to COVID-19 observed. In case of eczema mentioned in the results, Van der Meer et al. (2013) showed that 12% of HCWs had eczema and 3.1% of HCWs reported high levels of presenteeism due to eczema during the year.¹⁰⁵

Results of the current study showed that mental disorders caused by COVID-19 were relatively high among HCWs. Mental illnesses after chronic low back pain have the highest rate of daily productivity loss among HCWs¹⁰⁶ which was the most important factor affecting YLDs.¹⁰⁷ Studies on stress among HCWs in China showed that there was a significant relationship between stress and presenteeism in a way that with increasing stress, presenteeism also increased.^{108,109} These problems increase the risk of burnout among HCWs.¹¹⁰ A study conducted among nurses in Croatia showed a significant relationship between stress and presenteeism; however, this relationship was not significant for absenteeism.¹¹¹ All these studies show the importance and effects of psychological disorders on productivity loss.

Diversity of reported outcomes in physical and psychological disorders, infection rate based on symptoms and serology tests and death rate for meta-analysis made the authors not to expand the results. Also, studies which were at risk of bias may lead to misleading analysis. Our study was limited in these ways.

TABLE 5 Number and percentage of Death related to COVID-19 among HCWs

Authors	Country	HCWs type	Study Sample & main outcome	CASP score
CDC COVID-19 response Team ⁹⁴	USA	NA	9282 HCWs: 27 (0.29%) death	46
Hartmann et al. ⁶⁵	USA	All	56,855 HCWs: 398 (0.7%) death	48
Çelebi et al. ⁹³	Turkey	Physicians, nurses, cleaning personnel, Other occupations	703 HCWs: 0 (0.00%) death	47
Levene et al. ⁹⁵	UK	Doctor, nurse and others	147 HCW death: 19.1% doctors ($n = 28$, including 10 GPs), 42.9% nurses ($n = 63$), and other HCWs 38.1% ($n = 56$). The cumulative mortality rates for doctors 0.15 per 1000, nurses 0.17 per 1000 nurses, and 0.10 per 1000 other HCWs	41
Contejean et al. ⁸⁸	France	All	1344 HCWs: 0 (0.00%) death	48
Lapolla et al. ⁹⁶	Italy	All	205 HCWs deaths: Medical staffs 119 (57.8%), nurses 34 (16.5%), nurse aides 17 (8.3%), dentists 12 (5.8%), pharmacists 10 (4.9%)	43

Abbreviations: CASP, critical appraisal skills programme checklists; HCW, health care workers.

5 | CONCLUSION

According to the results, HCWs are one of the most vulnerable groups in COVID-19 outbreak in terms of infection, mortalities, and disabilities. As a result, they become patients, fail to show up at work, or have ineffective performances at work. These issues among HCWs can lead to absenteeism and presenteeism and they can cause productivity loss due to health problems among healthcare providers. Therefore, planning in terms of helping HCWs to continue service delivery, proper shifting schedule and psychological counselling should be implemented.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

ETHICS STATEMENT

The ethics committee of the Baqiyatallah University of Medical Sciences (BUMS) approved this study (Approval ID: IR. BMSU.REC.1399.411).

AUTHORS' CONTRIBUTIONS

MY and MMA were equally involved in study design and conception, data collection, analysis and interpretation. MS is the MSc student, who was involved in data collection as well as drafting the manuscript.

CONSENT FOR PUBLICATION

All authors have seen and approved the final version of the articles for publication.

DATA AVAILABILITY STATEMENT

The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

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