

The prevalence of burnout among pulmonologists or respiratory therapists pre- and post-COVID-19: a systematic review and meta-analysis

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ABSTRACT

Objectives: The coronavirus disease-19 (COVID-19) increased the already heavy workload in the pulmonary and respiratory departments, which therefore possibly increased the prevalence of burnout among pulmonologists or respiratory therapists. We aimed to compare the differences in burnout among pulmonologists or respiratory therapists pre- and post-COVID-19 by doing a systematic review with meta-analysis.

Methods: We searched pulmonologist, or pulmonary, or respiratory, and burnout up to 29 January 2023 in six databases. We included studies investigating pulmonologists or respiratory therapists and reporting the prevalence of burnout among them. The risk of bias was assessed by a tool for prevalence studies. The overall prevalence of burnout was pooled.

Results: A total of 2859 records were identified and 16 studies were included in the final analysis. The included studies reported 3610 responding individuals and 2336 burnouts. The pooled prevalence of burnout was 61.7% (95% confidence interval (CI), 48.6–73.2%; $I^2 = 96.3\%$). The pooled prevalence of burnout during COVID-19 was significantly higher than it was prior to the outbreak (68.4% vs. 41.6%, $p = .01$). The result of the meta-regression revealed that COVID-19 coverage was significantly associated with the prevalence of burnout ($p = .04$).

Conclusions: Burnout was widely prevalent among pulmonologists or respiratory therapists and increasingly perceived during COVID-19. Therefore, interventions were needed to reduce burnout in this specialty.

KEY MESSAGES

- The coronavirus disease-19 increased the already heavy workload in the pulmonary and respiratory departments.
- Burnout was widely prevalent among pulmonologists or respiratory therapists and increasingly perceived during COVID-19.

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KEYWORDS

COVID-19; burnout; pulmonologists; respiratory therapists


Introduction

The coronavirus disease-19 (COVID-19) has been declared an end as a global health emergency in May 2023 [1]. However, with 767 million confirmed cases and 6.9 million deaths as of writing, the disease remains a health threat to the public [2]. Life is returning to what it is like before COVID-19 with some

vaccines and anti-virus drugs, but a great number of health workers are still working in the frontline and fighting against local surges in cases and deaths. The outbreak once left no room for mental preparedness. COVID-19 increases the workload and stress placed on health workers, which has an impact on their physical and mental health, including professional burnout,

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depression and anxiety [3,4]. Burnout is a work-related syndrome of emotional exhaustion (EE), depersonalization (DP) and a reduced perception of personal accomplishment (PA) [5]. Multiple studies have indicated that during the COVID-19 pandemic, nurses [6], physicians [7], surgeons [8], residents [9] and medical students all experience high levels of burnout [10]. Significant differences were noticed across various specialities [11]. The disease causes respiratory-tracts-related symptoms increasing the already heavy workload in the pulmonary and respiratory departments. In 2015, the prevalence was reported as high as 47% among pulmonary medicine [12]. Several studies investigated the burnout of pulmonary physicians [13] and respiratory therapists during COVID-19 [14,15]. They observed that burnout was widely perceived and levelled up during the pandemic. However, there have not been studies to summarize the prevalence of burnout among pulmonologists and respiratory therapists. Therefore, we aimed to report the overall prevalence by conducting a systematic review and performing a meta-analysis.

Methods

We followed the PRISMA 2020 guideline to report this study [16].

Database search

We searched pulmonologist, or pulmonary, or respiratory, and burnout up to 29 January 2023 in the following databases: PubMed, EMBASE, PsycINFO, Cochrane Central Register of Controlled Trials (CENTRAL), Scopus and Web of Science. The search strategy for all databases was provided in the [supplementary material](#). We also screened the references of related publications to identify additional relevant studies. Two researchers independently searched the databases.

Inclusion criteria

The inclusion criteria of eligible studies were as follows: studies investigating the population of pulmonologists or respiratory therapists; studies reporting the prevalence of burnout among the aforementioned population. Studies were excluded if they (1) failed to state the number of burnouts among pulmonologists or respiratory therapists; (2) were qualitative studies without reporting the prevalence of burnout; (3) only investigated the interventions against burnout without reporting the baseline prevalence of burnout; and (4) were case reports, reviews, comments, editorials, corrections, replies, notes or book chapters.

Study selection

EndNote 20 (Clarivate PLC, Jersey, UK) was used to manage the records imported from each database. Duplicated publications were initially removed by the same DOI number and then verified manually. Studies were first screened by reviewing the titles and abstracts. The possibly eligible ones subsequently underwent full-text reviews. The selection was independently conducted by the two reviewers (Z.W. and X.B.). A third reviewer (L.W.) was involved in the disagreements of the included studies that could not be resolved through discussion.

Data extraction

Based on the purpose of the study, the following information was extracted: first author, publication year, study setting, COVID-19 experience, centres, study design, study period and survey response rate. The following information was extracted from the investigated population: specialty, clinical level, burnout measure instrument, the total number of respondents, demographic characteristics of respondents (sex, age, marriage and COVID-19 care), number of burnouts, the prevalence of burnout, risk factors of burnout and their odds ratios. Two reviewers (Z.W. and X.B.) independently collected data using a standard collection form.

Risk of bias assessment

The risk of bias in included studies was assessed by a tool proposed by Hoy et al. for prevalence studies [17]. This tool consists of 10 items, one point for each, addressing bias of selection, nonresponse, measurement and analysis. The risk of bias was graded as low (score 0–3), moderate [4–6] and high [7–10]. Certainty was graded using a variation version of the Grading of Recommendations Assessment, Development and Evaluation (GRADE) for environmental and occupational health [18].

Statistical analysis

R 4.2.1 (R Foundation, Vienna, Austria) was used for all statistical analyses. The prevalence of burnout among pulmonologists and respiratory therapists was pooled by using logit transformation and presented in a forest plot. No study was excluded because all studies included reported their prevalence of burnout. Heterogeneity was evaluated by measure of I^2 and considered significant when $I^2 \geq 50\%$. When there was significant

heterogeneity between studies, the random-effects model was used for pooling; otherwise, the fixed-effects model was used. The generalized linear mixed model and the logit transformation were used in the meta-analysis of proportions. The subgroup analysis of burnout prevalence was performed based on their COVID-19 coverage, survey respondent rate, respondent size, measurement instrument and department. A meta-regression was conducted to determine if there were any independent risk factors for burnout prevalence. The difference was considered significant when a two-sided p value was less than .05. Influence analysis by leaving out one study at a time was performed to the pooled prevalence to assess its robustness.

Results

Included studies

A total of 2859 records were identified from PubMed ($n = 422$), EMBASE ($n = 820$), PsycINFO ($n = 77$), CENTRAL ($n = 27$), Scopus ($n = 432$) and Web of

Science ($n = 1081$). There were 1088 duplicates removed. The remaining 1771 records went through title-and-abstract reviews. A total of 1662 records were excluded owing to the following reasons: inappropriate type of publications ($n = 636$), uninterested population ($n = 521$), unspecified clinicians ($n = 255$), unrelated topics ($n = 152$), other psychological symptoms ($n = 44$), interventional studies ($n = 32$) and pulmonary or respiratory diseases ($n = 22$). Therefore, 109 records were considered eligible when evaluated by full-text reviews. Ninety-four records were excluded for the following reasons: an unspecified number of pulmonologists or respiratory therapists ($n = 52$), not reporting burnout ($n = 17$) or not reporting the prevalence of burnout ($n = 25$). One additional paper was found by screening the reference lists of the included studies. Therefore, the final analysis comprised 16 studies (Figure 1) [14,19–33]. Risk of bias was assessed as low in 13 studies, and moderate in the other three studies (Supplementary Table 1).

The 16 studies were conducted in eight countries, including the United States ($n = 6$), Saudi Arabia

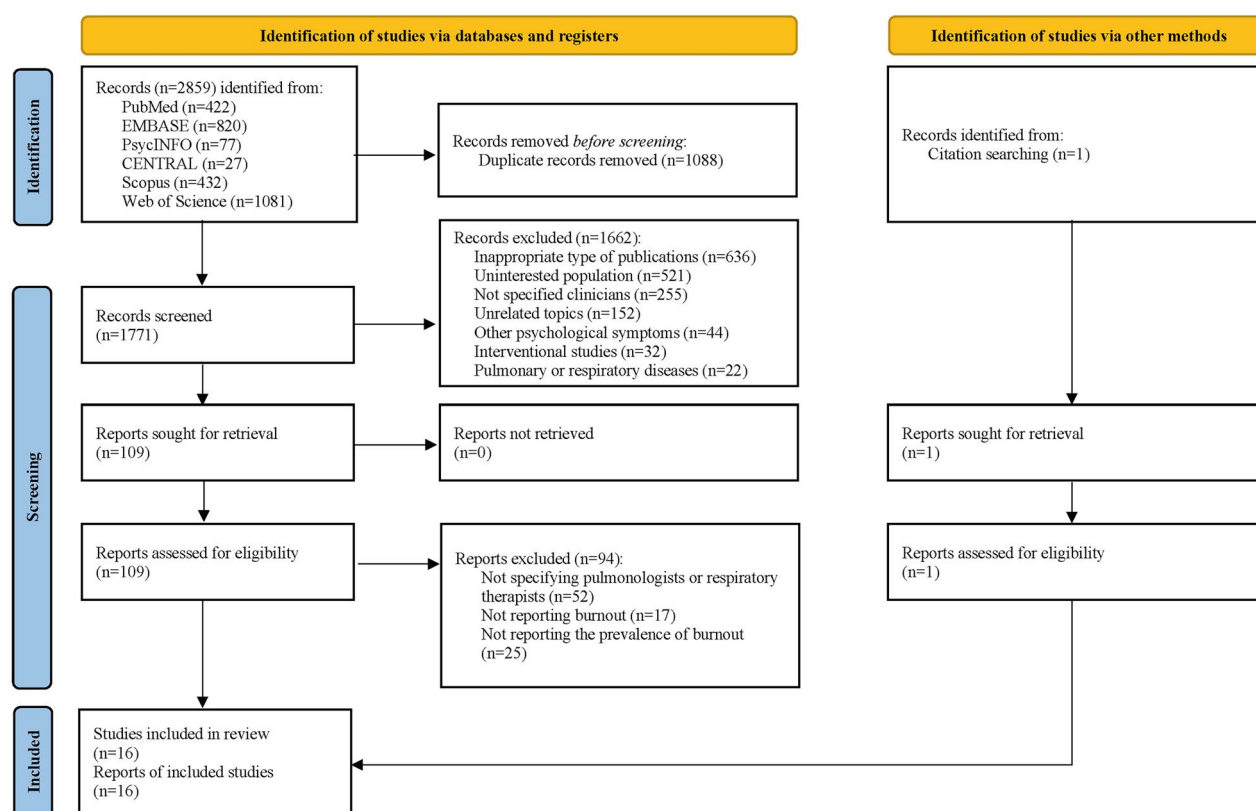


Figure 1. PRISMA flow of study selection. A total of 2859 records were identified from PubMed ($n = 422$), EMBASE ($n = 820$), PsycINFO ($n = 77$), CENTRAL ($n = 27$), Scopus ($n = 432$) and Web of Science ($n = 1081$). There were 1088 duplicates removed. The remaining 1771 records went through title-and-abstract reviews. We excluded 1662 records due to reasons presented in the figure. Therefore, 109 records were further evaluated by full-text reviews. Ninety-four were excluded because of reasons in the above column. One additional paper was found by screening the reference lists of the included studies. Thus, 16 studies were included in the final analysis.

Table 1. Information of the included studies ($n = 16$).

Study	Period	COVID-19	Setting	Center	Specialty	Level	Response rate, %
Shbeer and Ageel [19]	2021 August–November	Amidst	Saudi Arabia	Multiple	ICU	RT	69.3
Spirczak et al. [30]	2020 July–August	Amidst	United States	Multiple	Respiratory care department	RT	84.8
Siraj et al. [31]	2021 March–May	Amidst	Saudi Arabia	Multiple	Respiratory therapy programs	RT students	69.9
Roberts and coworkers [14]	2020 July–2021 May	Amidst	United States	Single	ICU	RT	NA
Kerlin [32]	2020 July, 2020 October, 2021 January	Amidst	United States	Multiple	ICU	RT	54
Ahmad et al. [33]	2020 November	Amidst	Saudi Arabia	Multiple	NA	RT	60.8
Omar et al. [20]	2021 January	Amidst	Qatar	Multiple	ICU	RT	36.4
Castro et al. [21] ^b	2021 April–May	Amidst	Italy	Single	NA	RT	84.2
Alhaykan [22]	2020 December–2021 January	Amidst	United States	Multiple	NA	RT	NA
Algarni et al. [23]	2021 September–November	Amidst	Saudi Arabia	Single	Respiratory care department	RT	66.0
Sharp et al. [24]	2019 January–February	Pre-	United States	Multiple	Pulmonary, PCCM, CCM	Fellow	51.4
Miller et al. [25] ^a	2021 January–March	Amidst	United States	Multiple	NA	RT	37.0
Zhou et al. [26]	2020 March–May	Amidst	China	Single	Pulmonary	Physician	96.2
Piracha et al. [27] ^a	NA	NA	United Kingdom	Multiple	NA	Physician	NA
Fumis et al. [28]	2015 August–September	Pre-	Brail	Single	ICU	RT	72.7
Austria-Corrales et al. [29] ^b	2009 April–May	Pre-	Mexico	Single	Respiratory medicine	Resident	NA

CCM: critical care medicine; ICU: intensive critical care; NA: not available; PCCM: pulmonary critical care medicine; RT: respiratory therapist.

^aFull texts were not available and information was extracted from the abstract.

^bTexts were not in English and translated into English by Google translation.

($n = 4$), Qatar, Italy, China, the United Kingdom, Brazil and Mexico ($n = 1$ for each). A cross-sectional design was used for 15 investigations, whereas a longitudinal analysis was used in the other study. The cross-sections spanned from 2009 to 2021 with 12 studies covering the outbreak of COVID-19. The median response rate was 67.6% (range: 36.4–96.2%). Six studies had respondent sizes <100, whereas the other 10 studies had sizes >100. While the nine studies were from multiple centres, the other six were from single sites. Twelve studies investigated respiratory therapists (students), while the other four reported fellows, physicians ($n = 2$) and residents. Five studies focused on the intensive care unit (ICU), six on the pulmonary and respiratory medicine departments, and the remaining five were from unspecified departments. This information is presented in Table 1.

Respondent characteristics

The included studies reported a total of 3610 responding individuals, with nine studies presenting the demographic characteristics of their respondent population ($n = 2100$, 58%) [20, 22–24, 26, 29–31,33]. The reported mean or median ages ranged from 20 to 40 years old. The pooled percentage of males was 46.8% (95% confidence interval (CI), 34.4–60.0%; $I^2 = 95.7%$). The pooled percentage of married individuals was 52.7% (95% CI, 26.1–77.9%; $I^2 = 98.7%$). Additionally, the studies reported features of the region, workload, years of experience, education level, night shifts and others.

Prevalence of burnout

Most studies ($n = 10$) used the Maslach Burnout Inventory (MBI) to measure burnout. One study used the MBI two-item, an adapted tool from MBI [24]. The instruments of the other five studies are listed in Table 2, including three tools not available owing to restricted access to their full texts. The 10 studies varied in their definitions and grading cutoffs of burnout despite employing the same tool, MBI, to evaluate burnout (Table 2). Collectively, six studies defined burnout as the combination of high EE, high DP and low PA. Another two studies defined less strictly as fulfilling one of the above three manifestations. The other two did not give the exact definition of burnout; however, they presented the respective number of burnouts concerning the three aspects.

The included studies reported 2336 burnouts. The pooled prevalence of burnout was 61.7% (95% CI,

Table 2. The measure, definition and prevalence of burnout of the included studies ($n = 16$).

Study	Instrument	Definition of burnout in high level	No. of total	No. of burnout	Prevalence, %	High EE	High DP	Low PA
Shbeer and Ageel [19]	MBI	NA (cut-off, EE \geq 28, DP \geq 11, PA \leq 29)	12	6	50	6	4	4
Spirczak et al. [30]	ProQOL	Score of burnout questions \geq 42	218	128	59 ^a	NA		
Siraj et al. [31]	MBI	EE \geq 27, DP \geq 10 and PA \leq 33	559	436	78	291	330	307
Roberts and coworkers [14]	NA	NA	108	82	75	NA		
Kerlin [32]	WBI, SPFI	SPFI \geq 1.33, or WBI \geq 4	100	74	74	NA		
Ahmad et al. [32]	MBI	EE \geq 38, DP \geq 18 and PA \leq 33	152	68	45	68	51	71
Omar et al. [20]	MBI	EE \geq 27, or DP \geq 13, or PA \leq 33	84	45	54	22	8	38
Castro et al. [21]	MBI	EE \geq 22, DP \geq 7 and PA \leq 34	9	8	89	NA		
Alhaykan [22]	MBI	EE \geq 27, DP \geq 10 and PA \leq 33	295	100	34	197	139	192
Algarni et al. [23]	MBI	NA (cut-off, EE \geq 27, DP \geq 10, PA \leq 33)	66	65	98	51	65	48
Sharp et al. [24]	MBI 2-item	Either item \geq 1 week	502	276	55	NA		
Miller et al. [25]	NA	NA	1114	880	79	NA		
Zhou et al. [26]	MBI	EE \geq 27 and/or DP \geq 10 (PA $<$ 33)	125	61	49	56	34	36
Piracha et al. [27]	NA	NA	110	59	54	NA		
Fumis et al. [28]	MBI	EE \geq 27, DP \geq 10 and PA \leq 33	57	12	21	NA		
Austria-Corrales et al. [29]	MBI	EE \geq 26, DP \geq 10 and PA \leq 34	99	36	36	NA		

DP: depersonalization; EE: emotional exhaustion; MBI: Maslach Burnout Inventory; NA: not available; PA: personal accomplishment; ProQOL: professional quality of life scale; SPFI: Stanford Professional Fulfilment Index; WBI: Well-Being Index.

^aSum of burnout in medium and high level.

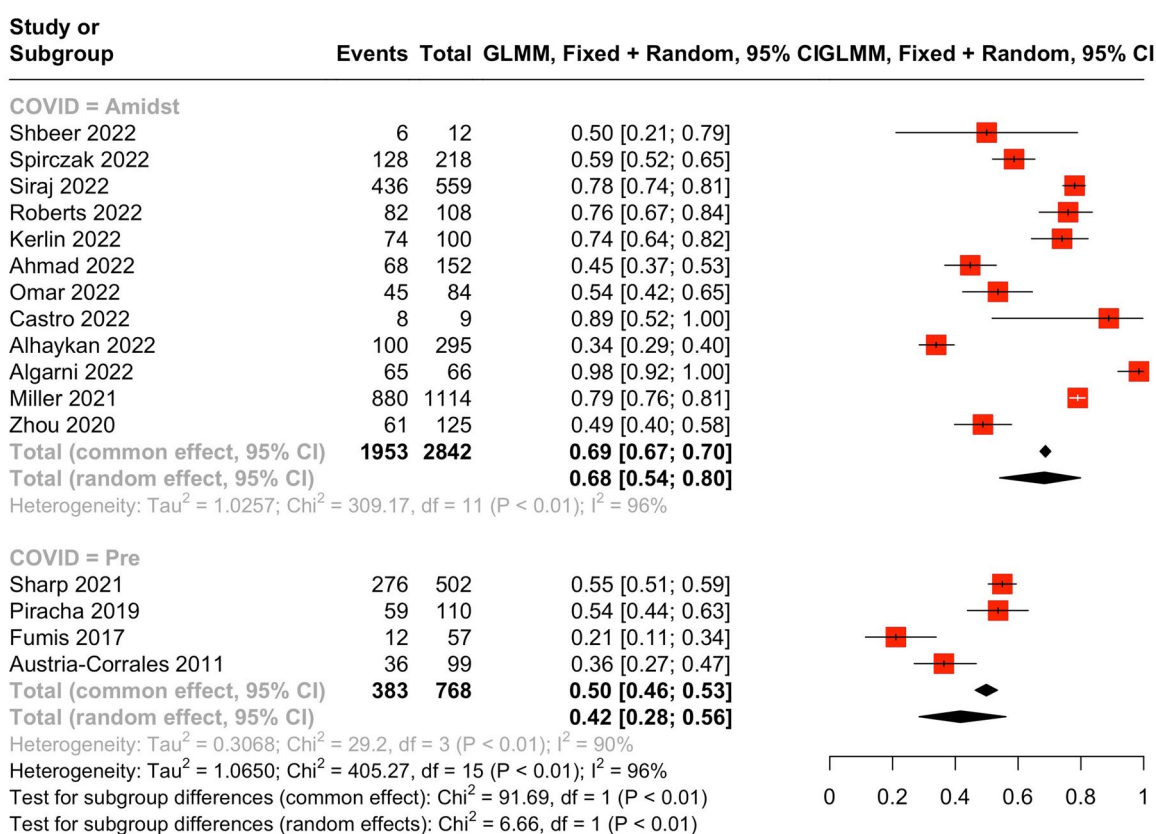


Figure 2. Forest plot of the overall prevalence of burnout. The included studies reported a total of 3610 responding individuals and 2100 burnouts. The pooled prevalence of burnout was 61.7% (95% CI, 48.6–73.2%; $I^2 = 96.3\%$). The pooled prevalence of burnout during COVID-19 was significantly higher than it was prior to the outbreak (68.4% vs. 41.6%, $p = .01$).

48.6–73.2%; $I^2 = 96.3\%$). Influence analysis revealed that the value was not significantly changed by omitting one study at a time. The pooled prevalence was 58.5% (95% CI, 39.5–75.2%; $I^2 = 95.5\%$) if only included studies using the MBI instrument and 60.9% (95% CI, 46.0–74.0%; $I^2 = 94.8\%$) if only included studies in full text. The subgroup analysis revealed that experiencing COVID-19 was significantly associated with burnout prevalence. The

pooled prevalence of burnout during COVID-19 was significantly higher than it was prior to the outbreak (68.4% vs. 41.6%, $p = .01$, Figure 2). The subgroup analysis showed subgroups separated by the sample size (<100 vs. \geq 100), the survey response rate (>50% vs. \geq 50%), the measurement instrument (MBI vs. non-MBI) and the department (ICU vs. non-ICU) were not significantly different in the prevalence of burnout ($p = .65, .83, .50$ and

.37, respectively). The outcome of the meta-regression revealed that COVID-19 was significantly associated with the prevalence of burnout ($p = .04$). The certainty was graded as low by using adapted GRADE tool mainly because all were cross-sectional studies.

Risk factors

Eight studies reported the risk factors of burnout [20, 23–26, 30, 31, 33]. Female pulmonologists or respiratory therapists tended to experience more burnout than their male counterparts [20, 23, 26]. In two studies, a heavier weekly workload was reported to exacerbate burnout [24, 26], while another study presented that the weekly workload was not significantly associated with burnout [20]. The coverage system and mental health services were reported to be protective factors from burnout [24]. Age, academic year and nationality were also found to be significant factors associated with burnout [30, 31, 33].

Discussion

To the best of our knowledge, this study was the first meta-analysis to provide a summary of the prevalence of burnout among pulmonologists and respiratory therapists. The overall burnout prevalence was determined to be 61.7%, which was higher (68.4%) during the outbreak than it had been before (40.7%).

The level of burnout we obtained was consistent with prior reports from a more general medical population. According to a meta-analysis, the prevalence of burnout among European physicians, using a unidimensional definition, was 43.2% [34], which was comparable to what we observed in the pre-COVID-19 subgroup. The prevalence during COVID-19 was approximately 67% [35], which was consistent with the pooled subgroup result we reported. Furthermore, our findings suggested that there was an increase over the past 3 years, which was observed elsewhere. According to a longitudinal cohort study, burnout was more prevalent during COVID-19, with a post-peak rate being approximately 13% higher than before [36]. Other studies among various demographics have reported that COVID-19 has an impact on the increase in burnout [37–39].

Pulmonologists and respiratory therapists work in close relation with healthcare professionals in the ICU or critical care medicine. Both departments have long been reported to present high burnout prevalence owing to extensive workloads, mental stress, emergency burden and the complexity of patients' conditions [40–43]. The severe acute respiratory syndrome coronavirus 2 enters the respiratory tract, subsequently

harming the respiratory system [44]. Therefore, the likelihood of increased stress and burnout levels in several specific departments was high [45]. Our findings were close to the prevalence of burnout among frontline workers in the ICU [43,46]. Therefore, it was possible that both daunting work stress and overwhelming pandemic together put on a heavy burden on pulmonologists and respiratory therapists to level up the perception of occupational burnout.

The extent COVID-19 contributed to burnout (if any) could not be determined. The pandemic affected practically every facet of daily life. Thus, it may have been a confounding factor that masked several important factors, such as lack of wellness resources [37], shortage of personal protective equipment [47] and poor leadership [48]. Future individual studies could delve into the greater impact of COVID-19.

Immediate interventions are necessary to address burnout. Out of 10 pulmonologists or respiratory therapists, six to seven experience burnout. This number was not only higher than the frontline health workers during COVID-19 [49], but also much higher than nurses (even working in ICU) [6,50]. On the other hand, there is strong evidence linking occupational burnout to clinicians' less sustainable career development and, consequently, lowering healthcare quality [51]. The high prevalence of burnout and the significant harm to healthcare organizations highlight the need for urgent interventions to improve burnout. Series of studies among Serbian health workers revealed that fostering resilience and mentalizing would be helpful to reduce burnout [52–54]. Clinicians could pay more attention to their own mental status and find their own solutions towards occupational burnout. The healthcare system should also take burnout into account and facilitate clinicians to reduce burnout. It was observed that residents and trainees were more susceptible to burnout [51]. In addition, COVID-19 served as an obstacle to physical skill training [55]. This highlights yet another need for training programs to establish effective individual-focused or organizational strategies to reduce burnout [56].

There were some limitations in our study. A reliable assessment of the prevalence of burnout among physicians was difficult owing to the inconsistency of the definition and cut-off of burnout [57,58]. This circumstance was also observed in our study. Few studies have reported burnout among pulmonologists, which makes further research difficult. Moreover, the participant sizes in about half of the identified studies were <100 and some studies had response rates <50%. These tend to introduce a respondent bias since burnout is self-reported [59].

Conclusions

We reported that the overall prevalence of burnout among pulmonologists or respiratory therapists was as high as 61.4%, which was 68.4% during COVID-19 and 40.7% predating the pandemic. The high prevalence and the significant increase in burnout established the need for immediate interventions to reduce burnout in this specialty.

Ethical approval

Not applicable.

Consent form

Not applicable.

Author contributions

Conception and design: XB, ZW, JT and LW. Administrative support: LW and XT. Provision of study materials or patients: XB, ZW, JT and DZ. Collection and assembly of data: XB, ZW and LW. Data analysis and interpretation: DZ, XW, KS, LQ, YZ, YW, WC, WJ and XT. ZW prepared the figures and tables. Manuscript writing and reviewing: all authors. Final approval of manuscript: all authors.

Disclosure statement

All of us declare that we have no competing interests.

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Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

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