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Human Resources for Health

REVIEW

Open Access

Prevalence and risk factors of burnout symptoms among nurses during the COVID-19 pandemic: an updated systematic review and meta-analysis

Feten Fekih-Romdhane[1,2*], Frederic Harb[3], Sana Al Banna[4], Sahar Obeid[5] and Souheil Hallit[6,7,8*]

Abstract

Background COVID-19 has been a substantial challenge for nurses globally, as they have gone through prolonged crisis times where they were continually under immense psychological pressure. Working in these conditions for months and years has resulted in an increase in the prevalence of job burnout among nurses. This systematic review was conducted to provide solid evidence on the prevalence of burnout and its related factors among nursing staff in different parts of the world after the occurrence of the COVID-19 pandemic.

Methods Several electronic databases were searched, between January 2020 and September 15, 2024, for relevant studies, namely MEDLINE, Web of Science, Embase, Scopus, ScienceDirect, ProQuest, APA PsycINFO, Google Scholar, and EBSCOhost Research Platform. Multiple search keywords were defined for the search process. The Newcastle–Ottawa Scale was used to evaluate the quality of each study included. Our main outcome was the prevalence of burnout in nurses during COVID-19. We subsequently analyzed our data by age (< 30 vs. ≥ 30 years), country income levels (defined based on the World Bank Classification for the 2023 fiscal year), and culture (Western vs. Non-Western). We used RevMan software, developed by Cochrane, to perform the statistical analysis. The outcomes were assessed using odds ratios (OR) with corresponding 95% confidence intervals (CI) to ensure accurate and reliable estimates.

Results Data from the 19 studies and 11 countries indicated an overall burnout prevalence rate of 59.5% in the nurse population during COVID-19. In addition, analyses of 37 studies and 15,015 nurses revealed a pooled prevalence rate for emotional exhaustion of 36.1%. Analyses of 36 studies involving 14,864 nurses showed a pooled prevalence rate for depersonalization of 32.4%. Finally, data from 36 studies and 14,864 participants found a pooled prevalence rate for reduced personal accomplishment of 33.3%. Regarding subgroup analysis of total burnout by nurses' characteristics, our results demonstrated that nurses working in higher income countries reported significantly higher prevalence rates of burnout relative to those working in low- and lower-to-middle-income countries. Those working in a Western context exhibited significantly higher risk for overall burnout compared to those working in a non-Western context. Finally, comparisons across age groups noted significantly higher levels of burnout among nurses aged 30 years and above compared to those aged < 30 years.

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Conclusion This review urges nursing leaders' intervention, hospital administrators, and policymakers to minimize and prevent burnout among nurses, especially during crises times such as the COVID-19 pandemic. This review also encourages further research into efficient evidence-based interventions to support nurses and combat burnout in the nursing profession.

Keywords Burnout, Nurses, COVID-19, Prevalence, Culture, Country income, Meta-analysis, Systematic review

Introduction

A pandemic is defined as an epidemic that spreads over a large geographic area, affects a significant portion of the population, and causes great distress, disruption of daily life, and a high mortality rate [1]. This century has seen numerous pandemics, such as the Zika virus, chikungunya, Middle East respiratory syndrome (MERS), the H1N1 influenza, and the severe acute respiratory syndrome (SARS) [2]. Coronavirus disease 2019 (COVID-19) began as a pandemic of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) when it was first identified in December 2019 in Wuhan, China. It has become the deadliest and most widespread pandemic of the twenty-first century by both cases and deaths [3]. Its impact on healthcare systems has been significant, leaving devastating effects on healthcare professionals' mental health [4–6], including nurses.

Even before COVID-19, nurses were already facing extreme physical and psychological pressure, beyond what their training and the health system can cope with, due to the need to reconcile the simultaneous obligations of caring for patients and managing their own stress [7]. During the pandemic, nurses have been placed in unpredictable, high-risk situations, compounding their physical, mental, and emotional distress by being at the forefront of testing and treatment during the pandemic. They have faced great anxiety as they had to care for patients while navigating serious changes in their personal and professional lives [8]. Therefore, several researchers have called for a specific emphasis on the pandemic's consequences on public health nurses to alleviate their psychological distress and work-related stress, prevent staff shortages, and ensure sustainable health systems [9].

One of the most dreadful consequences of the pandemic on nurses' mental health has been burnout [10]. The burnout syndrome can be defined as "a state of physical, emotional and mental exhaustion that results from long-term involvement in work situations that are emotionally demanding" [11]. According to Maslach and Jackson [12], burnout encompasses three dimensions: depersonalization (DP, feelings of distance or indifference in relation to others in the workplace), emotional exhaustion (EE, feelings of physical/emotional exhaustion and overload), and reduced personal accomplishment (PA, feelings of lack of productivity and achievement or incompetence at work). Although burnout was recognized by the World Health Organization in 2019 as a chronic disease, there remains a limited amount of research regarding this condition prior to this date [13]. Several systematic reviews and meta-analyses exist today on burnout among nurses who work during the COVID-19 period [14–27]. Generally, these reviews have presented consistent evidence that burnout is highly prevalent in the nurses' population. Numerous risk factors for increased burnout among nurses have been identified, such as younger age, increased perceived threat of COVID-19, working in a high-risk environment, longer working time in quarantine areas, increased workload, working in hospitals with inadequate and insufficient material and human resources, lower level of specialized training, and decreased social support [15]. Burnout has a wide range of detrimental consequences for nurses, organizations, and patients, including more frequent problems with cognitive functions and sleep, reduced job performance, poor patient safety and quality of care, medication errors, and higher intentions to leave the job [28, 29]. Hence, the need for a clearer understanding of this condition is indisputable.

The present research was motivated by the presence of several knowledge gaps that still need to be filled in this field. First, the vast majority of previous systematic reviews did not exclusively focus on the nurses' population, but rather included studies performed among a mixed sample of healthcare workers, including doctors, nurses, and others [16, 18–20, 23, 24, 27, 30]. This precludes drawing a clear overview of the burnout problem among the specific group of nursing staff, which has many peculiarities relative to other medical staff such as more proximity to affected cases [31] and more time spent with patients in charge [32]. Second, most of the reviews available have included studies that used multiple measures of burnout [15–19, 23, 26], which might contribute to high heterogeneity of findings. Focusing on a single burnout measure, the most commonly used and the one considered as "gold standard", could help address this issue. Another important gap in the literature yet to be addressed is that the most updated systematic review available on the topic involved studies published until February 2023 [30]. Important studies have been

published since then [33–39], which highlights the need for a more updated meta-analysis to summarize the burgeoning research on burnout among nurses during COVID-19, and to further explore its potential related factors.

To fill the gaps identified, the current review was designed to give an updated overview on the prevalence and correlates of burnout among nurses working during the pandemic in different parts of the world. This would help inform prevention and intervention efforts designed to mitigate burnout, enhance the psychological resilience, and overall well-being of nurses during epidemics and pandemics. In particular, our review aimed to: (1) estimate the global prevalence rates of burnout among nurses working in different departments and various fields during COVID-19, and (2) perform subgroup analyses to determine whether burnout levels are different for different age subgroups of nurses, as well as across various countries' incomes and cultural contexts (Western vs. non-Western).

Methods

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol [40]. All data used in this study were extracted from individual studies.

Selected sample and sample type

This review utilized the Population, Intervention, Comparison, and Outcome (PICO) framework to define the research question. The identified exposure was the nurse status, while the chosen problem was burnout. For the purpose of this review, a nurse was defined as any individual engaged in nursing care, including general nurses, nurse specialists, and advanced practice nurses. The concept of burnout was adopted from the definition by Maslach and Jackson [12], which describes it as a condition arising from "chronic emotional and interpersonal stressors at work". " Comparative analyses were conducted across subgroups based on age, country income, and cultural background. The primary outcome measured was the prevalence of total burnout. The systematic review protocol was pre-registered on the Open Science Framework (OSF) platform (https://osf.io/nhjdk). All references were managed using EndNote 20.

Studies inclusion and exclusion criteria

The inclusion and exclusion criteria for study selection in this systematic review were structured using the PICO framework. The PICO components were defined as follows: P (Population) refers to the study population, I (Intervention/Exposure) represents the exposure (in this case, COVID-19), and O (Outcome) corresponds to the variable being measured (burnout). The C component (Comparison) was not applicable to this review, as no comparison group was included [41]. Based on these criteria, articles were selected if they assessed burnout prevalence among nurses in practice at the time of the assessment during the COVID-19 pandemic and were published between January 2020 and September 15, 2024. Studies were deemed eligible for meta-analysis if they reported the prevalence of total burnout measured using the Maslach Burnout Inventory (MBI), either within the paper or its supplementary material. Only peer-reviewed articles written in English and directly addressing the research question were included. Eligible study designs included original articles such as cross-sectional studies, cohort studies, and case–control studies. Additionally, short communications (i.e., brief reports of research findings) and letters containing the necessary data were also considered. The exclusion criteria were as follows:

1. Studies that grouped nurses with other healthcare professionals without providing subgroup analyses specific to nurses.
2. Studies using tools other than the MBI to measure burnout.
3. Studies reporting prevalence rates of outcomes unrelated to burnout.
4. Studies with missing data on burnout prevalence or where relevant data were available only in the abstract, even after contacting the authors.
5. Qualitative studies, study protocols, reviews, editorials, and case reports.

Literature database searches

Several electronic databases were searched, between January 2020 and September 15, 2024, for relevant studies, namely MEDLINE, Web of Science, Embase, Scopus, ScienceDirect, ProQuest, APA PsycINFO, Google Scholar, and EBSCOhost Research Platform. The search terms were chosen using cross-matched keyword combinations based on keyword phrases and Medical Subject Headings (MeSH). To create a [Title/ Abstract] search, the Boolean logic operators ([AND] between lists) and ([OR] within lists) were used. Two lists were used. List A consisted of the following: nurse(s) [OR] nursing worker(s) [OR] nurse practitioner(s) [OR] nursing workforce [OR] professional nursing [OR] nursing staff [OR] hospital staff nurse(s). List B consisted of the following: burnout [OR] professional burnout [OR] burnout syndrome [OR] emotional exhaustion [OR] depersonalization [OR] (reduced) personal accomplishment [OR] burning out [OR] burning syndrome [OR] Maslach Burnout Inventory [OR] MBI. Initially, the search started in MEDLINE using

the following master syntax: ((nurse[Title/Abstract]) OR (nurse practitioner[Title/ Abstract]) OR (nursing worker[Title/Abstract]) OR (professional nursing[Title/Abstract]) OR (nursing staff[Title/Abstract]) OR (nursing workforce[Title/Abstract]) OR (hospital staff nurse[Title/Abstract])) AND ((burnout[Title/Abstract]) OR (professional burnout[Title/Abstract]) OR (burnout syndrome[Title/Abstract]) OR (burning out[Title/Abstract]) OR (burning syndrome[Title/Abstract]) OR (emotional exhaustion[Title/Abstract]), OR (Maslach Burnout Inventory[Title/Abstract]), OR (MBI[Title/Abstract])). Then, changes in the search syntax were performed according to the database used. Afterwards, two reviewers with expertise in systematic reviews and this research topic area identified other possible relevant studies that were missing from the initial search. To achieve this, earlier systematic reviews of published publications as well as the reference lists of the studies included were manually searched to enhance the likelihood of finding any eligible studies. In our selection process, we followed the PRISMA flow diagram as represented in Fig. 1. Initially, we screened the titles and abstracts of papers identified through our database search. Papers that aligned with our eligibility criteria or required a closer look for inclusion/exclusion decisions were shortlisted.

Measures and outcomes

The population sample size and event rate were reported from each study. The primary outcome of this review represents burnout in nurses as defined using pre-established cut-offs of the continuous measures (based either on total MBI scores, on the three sub-scores [EE, DP, PA], or both). Secondary outcome variables consisted of comparisons of the prevalence of burnout according to nurses' age, country income (lower-middle versus upper-middle versus high), and culture (Western versus non-Western); each research's title, abstract, and full text were independently checked for eligibility. Next, two independent members of the team conducted initial data extraction and quality assessment for each study included. If any research posed a disagreement about its suitability, the senior reviewer and expert clinician led a discussion among the researchers to reach a

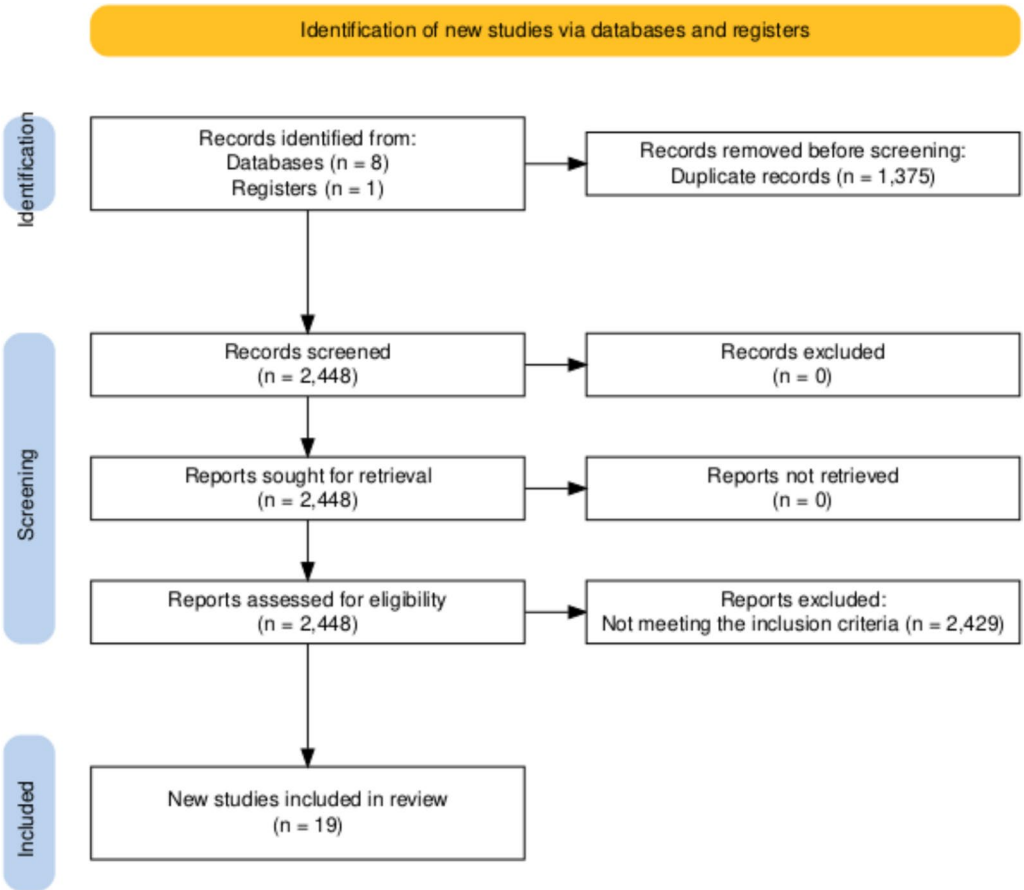

Fig. 1 PRISMA flowchart of the included studies

consensus for inclusion or exclusion. Authors responsible for correspondence of research papers with any missing information were contacted by email for additional information on unpublished data. Variables gathered from each research included the first author's name, publication year, country, country income (lower-middle versus upper-middle versus high), culture (Western, non-Western), sample size, nurses' demographic information (age), the prevalence of burnout (total, EE, DP, and PA), and MBI total scores and sub-scores (mean ± standard deviation). Country income was defined based on the World Bank Classification for the 2023 fiscal year [42].

Quality assessment

The NOS (Newcastle–Ottawa Scale) [43] was used to evaluate the quality of each study included. According to the NOS checklist, three factors were assessed: participant selection, results and statistics, and comparisons. Each study can be rated from 1 to 10, with a maximum rating score of 9 for cohort and cross-sectional studies and 10 for case–control studies. Studies scoring > 8 were considered of good quality with low risk of bias, scores of 5–7 were considered of moderate quality with moderate risk of bias, and scores of 0–4 were considered low quality with high risk of bias [44].

Data analysis and synthesis

In this systematic review, we calculated the odds ratio (OR) to assess the likelihood of total burnout among nurses across the included studies. To provide a more detailed analysis, we conducted subgroup evaluations to examine variations in burnout prevalence based on economic classification, geographical region, and the age of the nurses. These subgroup analyses were designed to identify potential patterns or disparities in burnout rates across different contexts and demographics.

All statistical analyses were performed using RevMan software, which enabled precise and reliable meta-analytic computations. A random-effects model was employed to account for variability across studies, recognizing differences in study populations, methodologies, and settings. This model allowed us to generate findings that are more generalizable and reflective of the inherent diversity in the data. Results were presented with 95% confidence intervals (CI), ensuring the transparency and precision of the effect estimates. By incorporating these analyses, we aimed to deliver a comprehensive understanding of the factors influencing burnout among nurses.

Risk of bias assessment

In evaluating the validity of the included studies, we employed a risk of bias assessment for our meta-analysis. Two authors independently undertook the task of extracting data from each study to ensure a comprehensive and unbiased approach. In cases of any discrepancies, a thorough discussion among all authors was done to reach a consensus on the classification of risk of bias. To guide our assessment, we referred to the Cochrane Collaboration Risk of Bias tool, whereby we examined various domains, including selection bias, performance bias, and reporting bias. Each study was categorized into one of three classifications: low risk of bias, high risk of bias, or unclear risk of bias. The risk of bias for each included study was reported directly on the forest plots for all analyses, providing a clear visual representation of study quality alongside the effect estimates. This process not only enhanced the transparency and reliability of our meta-analysis, but also provided a good foundation for interpreting the validity and quality of the included studies in our systematic review.

Results

Studies included in this meta-analysis are summarized in Table 1.

Total burnout

The forest plot provides a comprehensive analysis of the total burnout among nurses during the COVID 19 pandemic across 18 studies. The overall odds ratio (OR) is calculated at 2.17, with a 95% confidence interval (CI) ranging from 2.04 to 2.30, indicating that individuals in the experimental group are more than twice as likely to report burnout compared to the control group. This finding clearly shows that nurses experiencing high levels of burnout during COVID-19 were significantly more prevalent across the included studies than those who did not experience burnout, underscoring the widespread impact of the pandemic on nurses' mental health. The test for overall effect yields a Z statistic of 25.92 with a p-value less than 0.00001, strongly suggesting that the observed effect is statistically significant.

The heterogeneity among the studies is substantial, with an I^2 statistic of 99%, indicating significant variability in study outcomes that could stem from differences in populations, study designs, or interventions. The risk of bias assessment also provides a nuanced view, with various studies showing mixed levels of bias across different categories, including sample representativeness and ascertainment of outcomes.

The heterogeneity of the studies is considerable, as reflected by an I^2 statistic of 99%, indicating substantial variability in the results. This variability may stem from differences in the populations studied, outcome assessment, and study methodologies. The risk of bias assessment shows mixed results across the studies, with many

Table 1 Summary of studies included in the systematic review on the prevalence of burnout among nurses

Study number	Author, year and reference	Country	Design	Sample	The definition criteria for Burnout	Quality score
1	Almeida et al., 2023 [39]	Portugal	Cross-sectional	• Sample size: 29 • Female: 79.3%		5
2	Andlib et al., 2022 [45]	Pakistan	Cross-sectional	• Sample size: 288 • Female: 76.7% • Age: 27.7 years • Married: 40.3% • Mean number of years of work experience: 4.8 • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 100%	EE: low (0–16), moderate (17–26), and high (≥ 27) DP: low (0–6), moderate (7–12), and high (≥ 13) PA: low (0–31), moderate (32–38), and high (≥ 39) Overall burnout: high scores in EE or DP domains	8
3	Bisesti et al., 2021 [46]	Italy	Cross-sectional	• Sample size: 105 • Female: 61.9% • Age: 39 years	High burnout if EE ≥ 24, DP ≥ 9 and PA ≥ 37	7
4	Bruyneel et al., 2021 [47]	Belgium	Cross-sectional	• Sample size: 1135 • Female: 78% • Age: 36.9 years • Mean number of years of work experience: 13.9 • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 96.38%	EE: low 0–18, moderate 19–26, and high > 26 DP: low 0–5, moderate 6–9, high > 9 PA: low > 39, moderate 34–39, high 0–33 An individual with a high risk in at least one of the three dimensions can be considered to be at risk of burnout	8
5	Butera et al., 2021 [48]	Belgium	Cross-sectional	• Sample size: 1616 • Female: 76.5% • Age: 36.91 years	Risk of burnout: a person at high risk in at least one of the 3 dimensions: EE ≥ 27, DP ≥ 10, PA ≤ 33	8
6	Guixia et al., 2020 [49]	China	Cross-sectional	• Sample size: 92 • Female: 91.3% • Age: 30.6 years • Mean number of years of work experience: 9 • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 36.95%	Total score of MBI: non-burnout (below 50), mild burnout (50 to 75), moderate burnout (76 to 100) and severe burnout (above 100)	7
7	El-Hegawy et al., 2023 [38]	Egypt	Cross-sectional	• Sample size: 250 • Female: 84% • Age: 39.8 years • Married: 66%	EE: High (≥ 27), Moderate (19–26) and Low (0–18) DP: High (≥ 10), Moderate (6–9) and Low (0–5) PA: High (0–33), Moderate (34–39) and Low (≥ 40)	8
8	Hou et al., 2022 [50]	China	Cross-sectional	• Sample size: 512 • Female: 86.1% • Married: 55.5% • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 88.7%		8
9	Kamali et al., 2020 [51]	Iran	Cross-sectional	• Sample size: 261 • Female: 67.2% • Age: 35.9 years • Married: 28.91% • Work at a COVID-19 Ward/Direct exposure to COVID-19 patients: 15.3%	EE: high (scores > 26), medium (scores = 17–26), and low (scores < 17) DP: (scores > 12, 7–12, and < 7) were considered as high, medium, and low DP, respectively PA: the high, medium, and low PA were represented by scores > 39, 32–38, and < 32, respectively	8

Table 1 (continued)

Study number	Author, year and reference	Country	Design	Sample	The definition criteria for Burnout	Quality score
10	Moya-Salazar et al., 2023 [36]	Peru	Cross-sectional	• Sample size: 100 • Female: 78% • Age: 30 years • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 100%	MBI total scores are high from 67 to 132 points,medium from 34 to 66 points, and low from 1 to 33 points	7
11	Santos-Flores et al., 2023 [37]	Mexico	Cross-sectional	• Sample size: 73 • Female: 74% • Age: 26 years • Married: 30.1%		7
12	Serra et al., 2022 [52]	Brazil	Cross-sectional	• Sample size: 157 • Female: 80.89% • Age: 35.94 years • Married: 68.2%		8
13	Tomaszewska et al., 2022 [53]	Poland	Cross-sectional	• Sample size: 118 • Female: 94.9% • Age: 38.1 years • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 100%		7
14	Wang et al., 2024 [35]	China	Cross-sectional	• Sample size: 2210 • Female: 80.27% • Work at a COVID-19 • Ward/Direct exposure to COVID-19 patients: 100%	Scores > 26, > 9, and < 33 are indicative of clinically significant emotional exhaustion, DP, and reduced personal achievement, respectively. Being at high risk of burnout in at least one of the three domains is deemed as experiencing burnout	8
15	Wang et al., 2024 [34]	China	Cross-sectional	• Sample size: 1584 • Female: 98.1% • Married: 71.3%	Scores of 27 points, 10 points, and 15 points were used as the demarcation points of EE, DP, and PA of job burnout. The score of EE was more than 27 points, and the score of DP was more than 10 points. If the score of PA is more than 15 points, it is considered that the individual shows job burnout in the corresponding dimension	8
16	Wei et al., 2022 [54]	USA	Cross-sectional	• Sample size: 146 • Female: 88.4% • Age: 45 years	The cut-off values are based on: EE: High (> = 27); DP High (> = 10); Low (> = 40)	8
17	Zhang et al., 2021 [55]	China	Cross-sectional	• Sample size: 180 • Female: 78.3% • Married: 68.3%		7
18	Zhang et al., 2024 [33]	China	Cross-sectional	• Sample size: 616 • Female: 79.6% • Age: 28 years	A sum score of above 34 was considered as suffering from burnout	8
19	Zhou et al., 2021 [56]	China	Cross-sectional	• Sample size: 1133 • Female: 100% • Married: 53.3%	Cut-off scores for EE, DA, and PA is 25, 11, and 16, respectively. No burnout EE < 25, DA < 11, and PA < 16	8

displaying varying levels of bias, which could influence the robustness of the findings (Fig. 2).

This forest plot illustrates the odds ratios (OR) of total burnout among individuals in the experimental group compared to those in the control group across 18 studies. Each study is represented by a point estimate (blue square) and a 95% confidence interval (CI) (horizontal line).

Total burnout sub-grouped by the income classification

The forest plot presents an insightful overview of burnout prevalence among nurses, categorized by the income classification of the countries where the studies were conducted. The analysis reveals three distinct income groups: high-income, lower-middle-income, and upper-middle-income countries.

For high-income countries, the odds ratio (OR) is calculated at 3.91, with a 95% confidence interval (CI) of 3.51 to 4.34. This finding indicates that nurses in high-income countries experiencing high levels of burnout were significantly more prevalent than those without burnout across the included studies, highlighting the particularly severe impact of the pandemic on nurses in these settings. The statistical significance of this finding is robust, with a Z statistic of 25.26 and a p-value below 0.00001.

In lower-middle-income countries, the OR stands at 2.70, with a CI of 2.05–3.55. This suggests that nurses in lower-middle-income countries with high burnout levels were also significantly more prevalent compared to those without burnout, emphasizing the widespread burden of burnout in these healthcare environments. This result is supported by a Z statistic of 7.09 and a significant p-value.

For upper-middle-income countries, the OR is somewhat lower at 1.62, with a CI of 1.50–1.74. Although

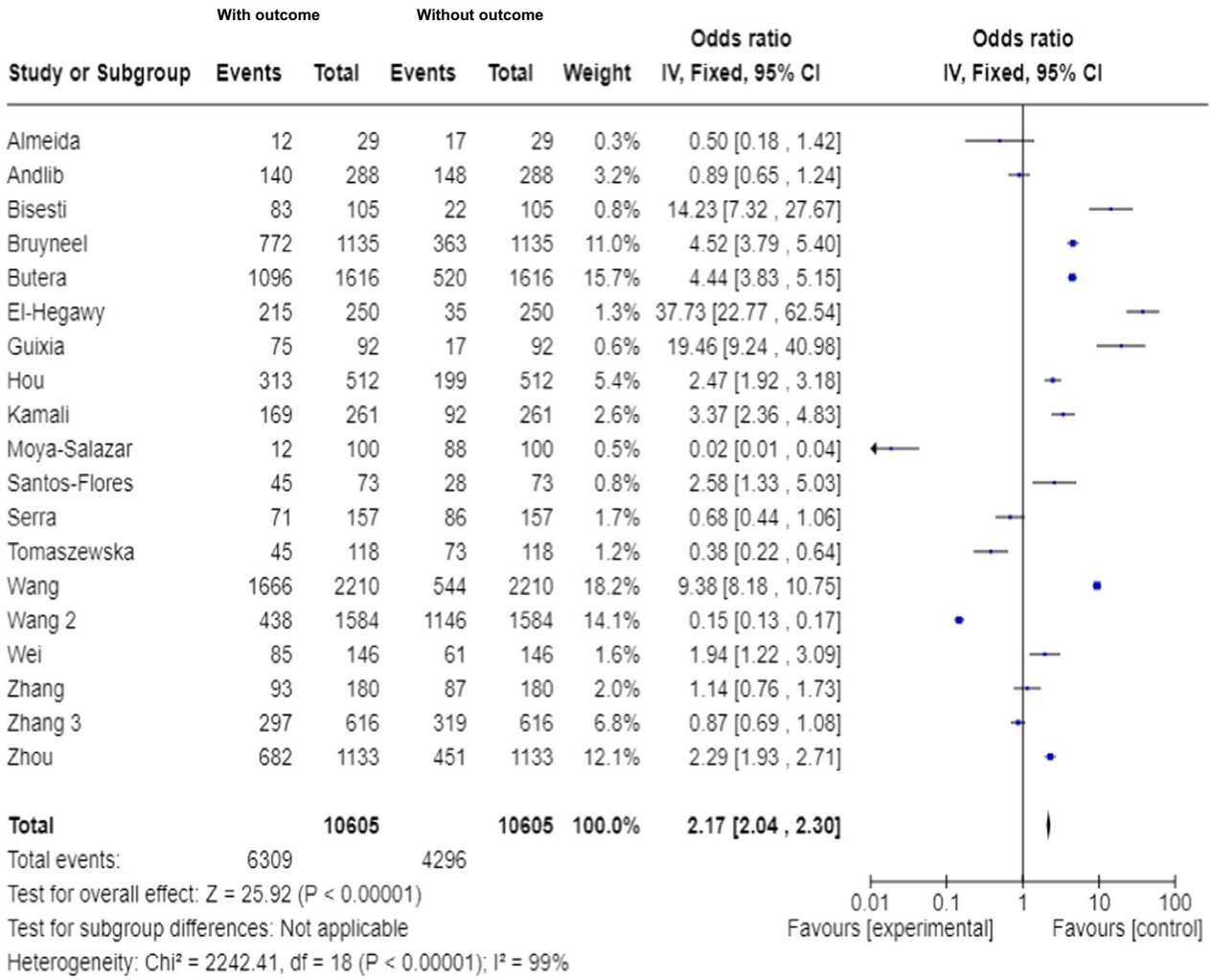

Fig. 2 Assessment of total burnout in nurses during COVID-19

nurses in these countries also experienced significantly higher burnout prevalence, the risk was less pronounced compared to the other groups, reflecting some variability in the pandemic's impact on burnout across income levels. The *Z* statistic of 12.96 further validates the statistical significance of this association.

The overall analysis demonstrates a statistically significant association between income classification and burnout levels among nurses, with higher income countries showing the most alarming rates. The high heterogeneity observed across studies, indicated by I^2 statistics near 99%, suggests considerable variability in outcomes that may be attributed to differences in country-specific healthcare systems, cultural factors, and support mechanisms for nurses. This variance underscores the necessity for tailored interventions to address burnout effectively across different income settings (Fig. 3).

This forest plot depicts the odds ratios (OR) of burnout among nurses categorized by the income classification of the countries where the studies were conducted. The plot includes three income groups: high-income, lower-middle-income, and upper-middle-income. Each study is represented by a point estimate (blue square) corresponding to the OR, along with a 95% confidence interval

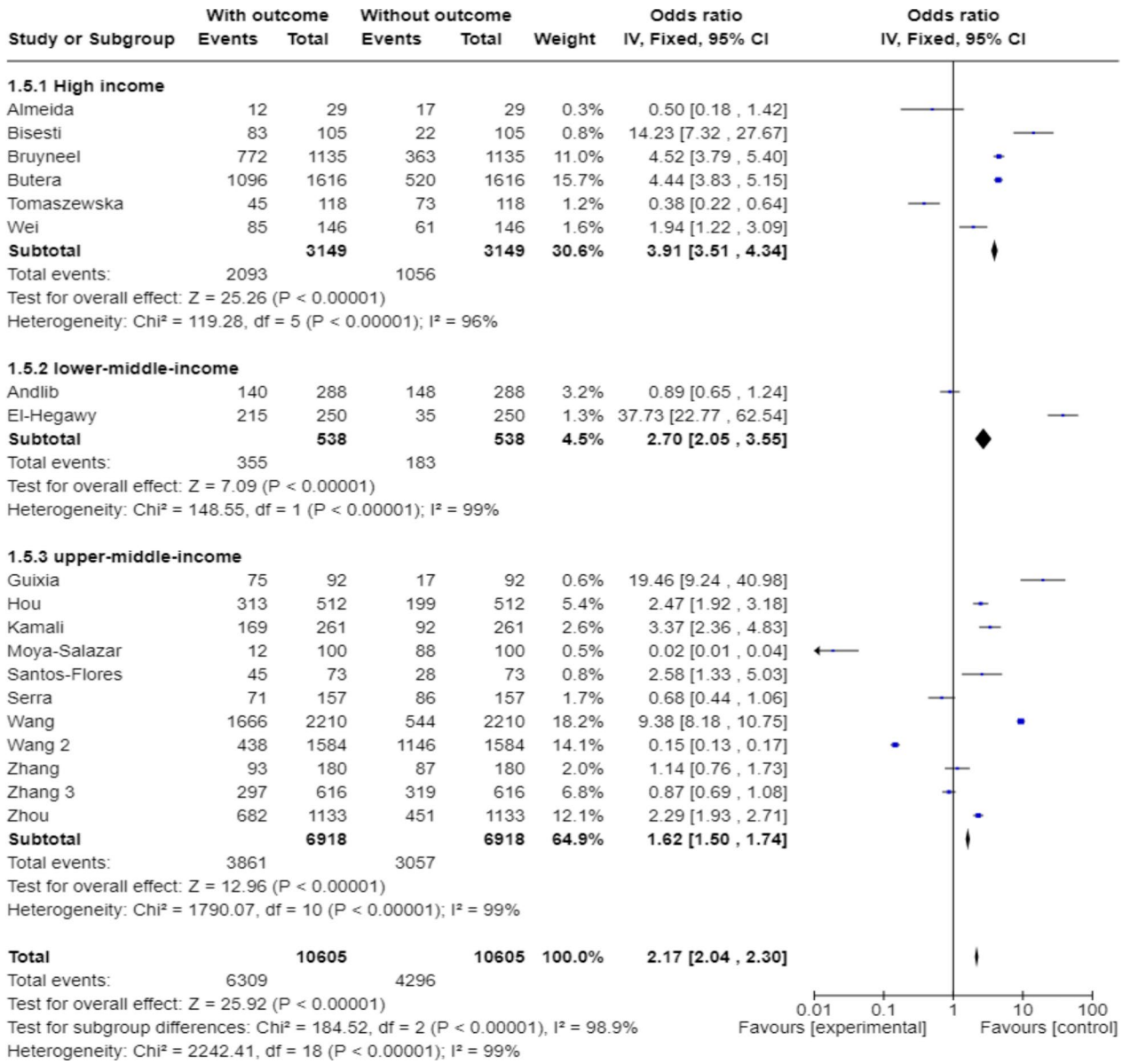

Fig. 3 Subgroup analysis of total burnout by income classification among nurses during the COVID-19 pandemic

(CI) indicated by the horizontal line. The overall effect size is highlighted, showcasing significant variations in burnout prevalence based on the income classification of the respective countries.

Total burnout sub-grouped by the countries' geographical classification

The forest plot offers an insightful examination of burnout levels among nurses during the COVID-19 pandemic, focusing on a subgroup analysis that differentiates between Western and non-Western countries. For the non-Western group, the overall odds ratio (OR) for burnout is calculated at 1.72, with a 95% confidence interval (CI) of 1.60–1.84. This finding indicates that nurses in non-Western countries experiencing high levels of burnout were significantly more prevalent than those without burnout across the included studies, underscoring the substantial mental health burden in these regions. The test for overall effect yields a Z statistic of 14.94 with a p-value less than 0.00001, confirming the statistical significance of these results.

In contrast, the analysis of Western countries reveals a different picture, with an overall odds ratio (OR) of 3.57 and a 95% confidence interval (CI) ranging from 3.22 to 3.96. This suggests that nurses in Western countries experiencing high burnout levels were even more prevalent than those without burnout, highlighting an even greater risk of burnout among nurses in Western healthcare settings compared to non-Western regions. The test for overall effect in this group yields a Z statistic of 24.08, also with a p-value less than 0.00001, indicating a robustly significant effect.

The analysis also reveals a considerable heterogeneity among the studies, characterized by an I^2 statistic of 99% in both groups. This high degree of variability suggests that the differences in burnout rates may be influenced by various factors, including healthcare infrastructure, cultural norms regarding mental health, and the specific stressors faced by nurses in different regions.

When comparing the two groups, it becomes clear that while both Western and non-Western nurses experience significant levels of burnout, the Western group faces a markedly higher risk. The disparity in odds ratios suggests that unique cultural, structural, and resource-related factors in Western countries may exacerbate stress and burnout among nurses (Fig. 4).

This forest plot illustrates the odds ratios (OR) of burnout among nurses differentiated by the geographic classification of the countries where the studies were conducted. The plot includes two groups: Western and non-Western countries. Each study is represented by a point estimate (blue square) that corresponds to the OR, accompanied by a 95% confidence interval (CI) indicated by the horizontal line. The overall effect sizes for both subgroups are highlighted, revealing notable differences in burnout prevalence between nurses in Western and non-Western contexts.

Total burnout by age

The overall odds ratio (OR) for the total burnout is reported at 2.18 [95% CI 2.04, 2.32]. This indicates that nurses experiencing high levels of total burnout were significantly more prevalent than those without burnout across the included studies, highlighting the widespread impact of the COVID-19 pandemic on nurses' well-being. The result is statistically significant (Z statistic 23.35; $p < 0.00001$), confirming the robustness of the observed effect.

When analyzing the data by age, a notable difference emerges. In nurses aged < 30 years, the OR of 0.41 reflects a lower prevalence of total burnout among younger nurses compared to those without burnout, suggesting some resilience or protective factors in this age group. Conversely, the OR of 5.20 for nurses aged 30 years and above indicates a markedly higher prevalence of total burnout among older nurses, emphasizing that this group faced a significantly greater burden of burnout during the pandemic (Fig. 5).

This forest plot illustrates the odds ratios (OR) of total burnout levels among nurses differentiated by age. The plot includes two groups: 30 years or more vs less than 30 years. Each study is represented by a point estimate (blue square) corresponding to the OR, along with a 95% confidence interval (CI) indicated by the horizontal line. The overall effect size is highlighted, showcasing significant variations in the feeling of total burnout in nurses between those aged 30 years and more vs those aged less than 30 years.

Discussion

This systematic review was conducted to provide solid evidence on burnout as assessed using the MBI questionnaire among nursing staff in different parts of the world after the occurrence of the COVID-19 pandemic. In our review, 19 studies were included to calculate pooled prevalence rates of total burnout in the nurse population during COVID-19. The sample sizes in the studies included varied from 29 in [39] to 2210 in [35]. Among the 19 studies to estimate overall burnout prevalence, seven were from China, two from Belgium, and the rest were from diverse countries, including Brazil, Egypt, Italy, Iran, Mexico, Pakistan, Peru, Poland, and Portugal. Data from the 19 studies indicated an overall burnout prevalence rate of 59.5%, highlighting a substantial burden on nurses during the pandemic. These rates support our hypothesis that nurses suffered from burnout during

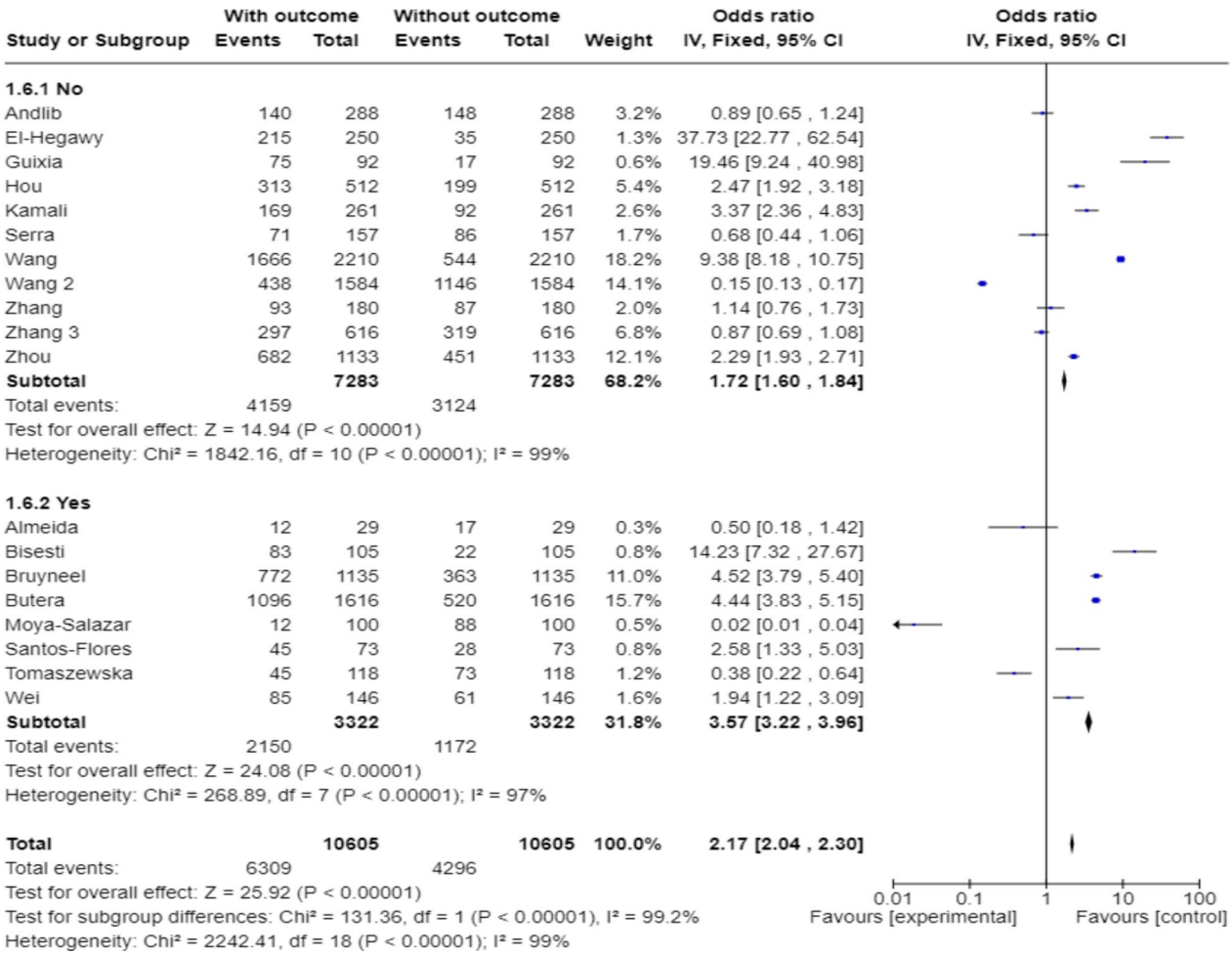

Fig. 4 Subgroup analysis of total burnout by geographic classification among nurses during the COVID-19 pandemic

COVID-19, and that this issue is worthy of attention and consideration. Regarding subgroup analysis of total burnout by nurses' characteristics, our results demonstrated that nurses working in higher income countries reported significantly higher prevalence rates of burnout relative to those working in low- and lower-to-middle-income countries. As for comparisons across cultural background, results showed that nurses working in a Western context exhibited significantly higher risk for overall burnout compared to those working in a non-Western context. Finally, comparisons across age groups noted significantly higher levels of burnout among nurses aged 30 years and above compared to those aged < 30 years.

The prevalence of burnout among nurses

Our review offers an up-to-date synthesis of the current evidence on this topic. It includes studies published until September 2024, hence resulting in 13 additional studies relative to the meta-analysis by Galanis et al. [15] and 7 more studies compared to the meta-analysis by Toscano et al. [25] For more homogeneity in the studies included and in investigated rates of burnout prevalence, using the MBI tool to measure the overall burnout and the three dimensions of burnout syndrome is considered an inclusion criterion in our review. Of note, MBI is one of the most widely used tools and is regarded as the gold standard for assessing burnout based on self-reporting and a Likert-type scale among healthcare workers [57, 58]. The scores for each of the three subscales are not combined into a total score but are rather considered separately. High levels of overall burnout are indicated by a combination of reduced PA, together with high levels of DP and EE [59].

Before any comparisons can be made with the results of previous surveys, it should be noted that literature on burnout is subject to inconsistencies in how to define burnout and wide methodological discrepancies between studies in how to assess the construct. Indeed, there is a large variability in how the burnout syndrome is conceptualized. Besides, a wide array of types of measurements

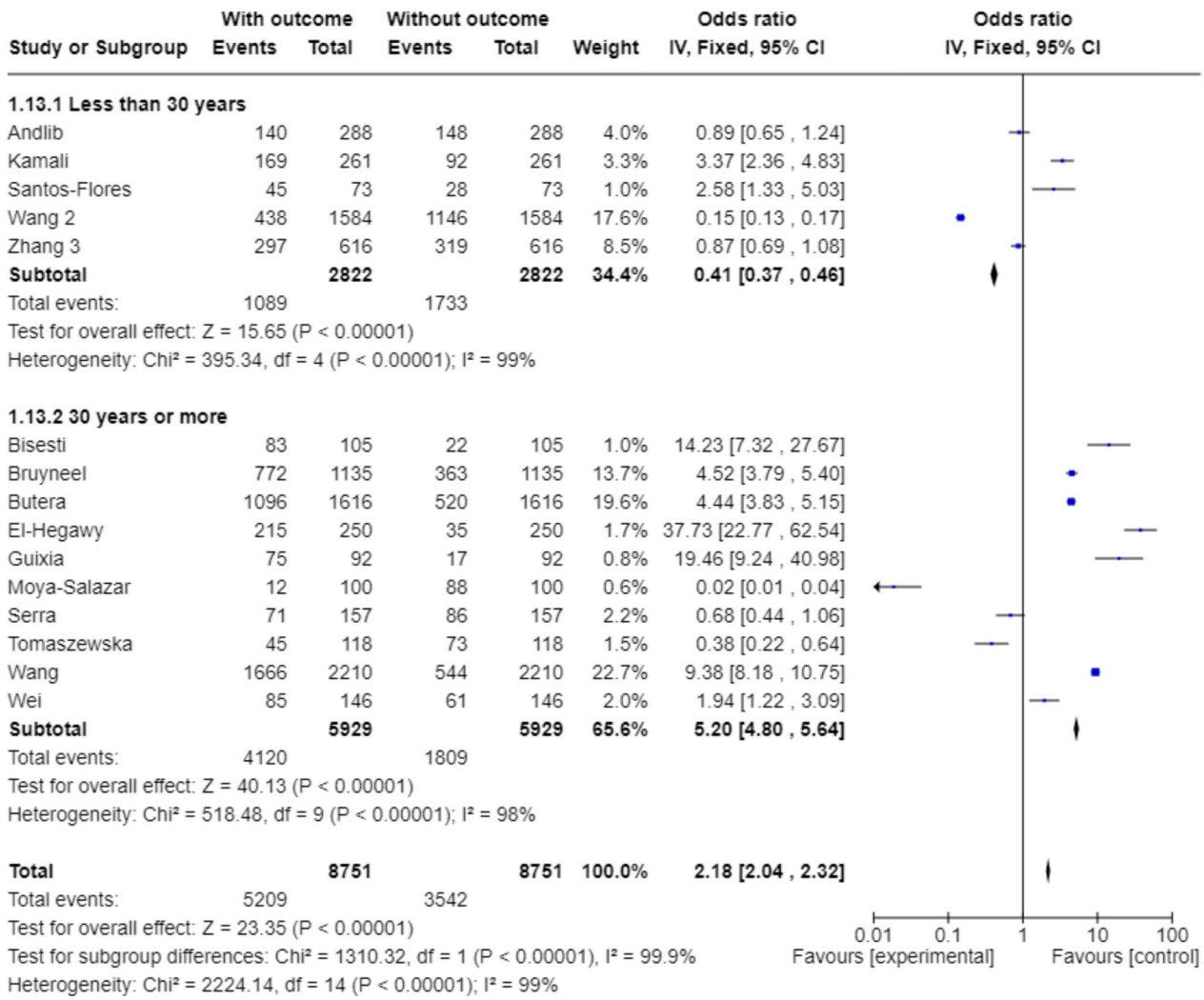

Fig. 5 Subgroup analysis of the total burnout feeling by age among nurses during the COVID-19 pandemic

with different assessment criteria (e.g., various cut-off points when using the same measure) are adopted [19]. This lack of standardization of the definition and assessment of burnout renders comparison of findings difficult because of a high degree of heterogeneity in previous studies [19].

The higher burnout rates found in our review compared with previous ones could have several reasons, including the fact that only nurses were included in our review (not the whole healthcare worker population), and the small sample sizes involved in previous reviews (6 studies in [15] and 12 studies in [25]). Another plausible explanation for the high pooled prevalence of burnout dimensions in the current systematic review is that it included studies published until 2024, which implies a longer duration of exposure to stressful work conditions, dealing with a higher rate of infected cases, and experiencing different changes in healthcare systems over the different COVID-19 waves. In support of this assumption, a systematic review and meta-analysis conducted later during the pandemic, and presenting a synthesis of nine cross-sectional studies and 16810 nurses, found a pooled prevalence of moderate-to-high levels of EE (as assessed using the MBI) of 48.9% [14].

Factors associated with burnout among nurses

Beyond the prevalence of total burnout and its three components among nurses, the current review highlights three key factors that could modify the prevalence of this mental health problem in the nurses' population, namely age, country income, and cultural background. There have been only limited studies exploring risk factors for nurses' burnout during COVID-19 [15]. Sociodemographic factors were among the important determinants affecting nurses' burnout levels. In particular, younger age was found to increase nurses' burnout in some

previous studies [60–62]. A scoping review by Toscano et al. [25] reported that younger age was linked to greater burnout among healthcare workers in 7 studies out of the 69 included. However, the same authors indicated that other studies' findings concerning the effect of an older age were unclear and mixed. Particularly, burnout was shown to be more frequent among older healthcare workers in three studies, whereas older age was related to reduced PA in one study and to lower burnout in three other studies [25]. A rapid systematic review by Hur et al. [17] having nurses as the only target population, showed that age was connected to burnout in five studies. Specifically, an age younger than 30 years in the EE burnout dimension was associated with higher burnout [17]. Here again, inconsistent findings were reported in one study, which found no significant association between burnout and age [63]. Nurses of younger age can be more prone to burnout for many reasons, including the fact that they are more likely to have young children and to be preoccupied by the high risk of infecting them. Accordingly, previous research showed that nurses with a higher number of children were at higher risk for burnout [64], and that healthcare workers with small children endorsed more elevated levels of perceived stress [65]. In addition, younger age is often associated with fewer years of work experience and a reduced ability to quickly adapt to new challenges at work, which may contribute to higher levels of burnout among nurses [47]. However, these explanations can only be confirmed with reviews taking into account confounders such as number of children and number of years of work experience. In light of these observations, it is clear that more attention should be drawn toward burnout prevention specifically among younger nurses who appear to be more at risk.

Our meta-analysis found that both country income levels and culture significantly contributed to prevalence rates of burnout among nurses globally. In particular, our findings showed that nurses from high-income countries and a Western cultural background reported significantly higher prevalence rates of burnout relative to those from low- to middle-income countries and non-Western cultures. It is worth noting that, given that many previous reviews included highly heterogeneous studies with largely varying assessment methods of the prevalence of burnout, an aggregation of the data to make cross-country comparisons was not possible [25]. The comparison of prevalence rates of burnout between various geographical regions during the pre-pandemic era has shown significant differences, where the Southeast Asia and Pacific region presented the highest burnout symptoms prevalence among nurses (13.68%), followed by Latin America and the Caribbean (10.51%) North America (10.27%), Europe and Central Asia (10.06%), sub-Saharan Africa (8.94%), whereas the Middle East and North Africa presented the lowest prevalence rates of burnout (4.68%) [66].

A comparative review by Rizzo et al. [22] showed that studies performed during the pandemic were not proportionally distributed across the different continents, as they were mostly performed in Asia (four countries), followed by Europe (three countries) and North America (one country), whereas those carried out before the pandemic emerged were mostly from Europe (eight countries), followed by Asia (three countries) and others. A comparison across countries of burnout prevalence rates among nurses showed a remarkable increase in burnout, particularly high EE and, DP levels, among nurses in Asian countries; whereas levels of burnout remained consistent before and during the pandemic in European countries [22]. As for North America, while there has been a diminished research attention on burnout during COVID-19, studies available indicated similar patterns of heightened scores in DP and EE and more research showing decreased scores in PA during the pandemic [22]. A systematic review analyzing seven papers exclusively focused on nurses indicated that levels of prevalence were moderate in China, whereas high levels were observed in Iran and Istanbul [26]

Several factors come into play when comparing levels of burnout among nurses across their different countries of origin. The first factor is the degree of preparedness (actual or perceived) at both the hospital and country levels (such as the availability of personal protective equipment) which was found to be associated with lower fear of infection and lower burnout risk [67–69]. Another factor is communication and increased appreciation from hospital management, which was found to be linked to lower levels of burnout [70]. Contrarily, a lack of ethical climate [71] as well as a lack of protocols and institutional communication [72] were shown to create a climate of uncertainty and to increased burnout. A pandemic generates a wide variety of working conditions in the different countries and settings, according to the various phases of the pandemic and the various social, economic, health, and organizational conditions [73]. These varying conditions can differently affect nurses' mental health. Therefore, given the complex determinants of burnout and the dynamic pandemic landscape, a question may arise concerning whether all burnout cases reported as attributable to COVID-19 are actually so, or whether some of them occurred prior to the pandemic and were due to the country's local healthcare system activity problems. Since there is scarce data available on the role of country characteristics as risk factors for burnout among nurses during the COVID-19 pandemic, additional research is warranted to infer valid findings.

Strengths and limitations of the study

Our review makes a significant contribution to existing knowledge in many ways, expanding understanding of the prevalence and correlates of burnout among nurses during the pandemic and driving progress in this critical field. There were several strengths to the present study that warrant mentioning. One strength is that this systematic review has one of the highest numbers of studies included on burnout using a sample of exclusively nurses working during COVID-19, which might significantly enhance our study's statistical power. Indeed, in our review, a total of 19 studies (10605 participating nurses) were included in the final analyses, which represents one of the largest pools of nurse populations working across the literature. Most of the previous reviews focusing on the same topic and adopting the same approach included a limited number of studies, as they searched a small number of electronic databases [30], which may limit the generalizability of their results. In addition, only studies that used the MBI tool to assess burnout among nurses were selected for this review, which might substantially decrease heterogeneity of burnout prevalence estimates. The MBI was selected because it is the most commonly used measure of burnout across studies. To further increase homogeneity of findings, our review focused solely on the nurses' population. In fact, diverse samples of healthcare workers in the included studies could restrict researchers, readers, and the larger scientific community from understanding the extent of the burnout problem or psychological phenomena that compose it (DP, EE, and lack of PA) and their related factors in the specific nurses' group. Another important strength of this review is the use of a comprehensive search strategy via multiple databases, in order to ensure its rigor and make sure that all relevant articles for our research question can be located. To achieve this, reference lists of relevant papers were screened, and key journals in the field were manually browsed to make sure no relevant articles were missed.

However, alongside these strengths, it is essential to acknowledge certain limitations, which could offer fruitful directions for future research. First, all the studies included in this review had a cross-sectional design and adopted a snowball or convenience sampling approach to collect data, which makes any conclusions about causality tentative, and the impact of the COVID-19 pandemic could not be disentangled from that of other possible causal factors of burnout. Only research with rigorous analytic methodologies that provide longitudinal evidence supporting the significant increase in burnout during the pandemic are capable of ascertaining causality. However, due to the abrupt, unexpected emergence of COVID-19, it was impossible to prepare longitudinal studies with an experimental pre- and post-design capable of demonstrating patterns of development of burnout symptoms. Another possibility would be to utilize data from repeated cross-sectional studies to analyze changes in burnout among nurses over time (before, during, and after the end of COVID-19). Additionally, the studies included adopted a snowball or convenience sampling approach to collect data, which can possibly contribute to biases influencing findings. There is also a possibility that highly burned-out nurses were not selected by the studies included in our review, as they are likely to either be non-responders or to have left the industry, and be thus less represented in the prevalence studies [74].

Also, as our review included only studies that used the MBI, this approach could preclude considering methodologically sound papers that used standardized and valid instruments to assess burnout, other than the MBI. In addition, previous authors raised concerns regarding the validity and applicability of the MBI outside of the American context in which the scale was originally developed [75]. It is important that readers bear this in mind, as the current meta-analysis included studies from a wide variety of geographic, cultural, and linguistic contexts.

Moreover, the survey data based on the MBI and analyzed in this review is self-reported in nature, and remains inherently subjective. While the MBI aligns with the World Health Organization's definition of burnout, and is generally considered the "gold standard" for the assessment of job burnout, various other measurements have also been found to be valid and reliable tools to evaluate the multifaceted and complex construct of burnout among nurses [76]. At the same time, however, the problem that may arise when many measures are adopted is the heterogeneity of findings [77]. This is especially true knowing that some tools substantially differ in items content and focus. For instance, large variations in burnout prevalence have been reported across studies using the Copenhagen Burnout Inventory (53.0%) and those using Mini-Z Burnout Assessment (22.0%) [78].

Furthermore, in our review, we could only perform group comparisons by age, country income, and culture. Nurses are often exposed in the course of their normal work activities to multiple occupational stressors that keep exerting their detrimental influence during the pandemic. It would be, for example, highly relevant to further explore how nurses' subjective experiences can be impacted by factors that have been previously reported to affect the risk of burnout in this population, such as increased work demands, the direct exposure to COVID-19 affected patients, the number of patients served, teamwork, stress, negative affect, and social variables [79]. However, most of the research performed during pandemic times often covers a limited number of variables

and omits considering all the relevant factors that could potentially be involved. Therefore, we could not analyze these important factors because of the lack of enough data. Further research is required to focus on examining more risk factors and their effects on burnout and its subdomains.

A limitation to this review is also the exclusion of papers that did not contain the prevalence rates of overall burnout and/or its three domains, which could possibly have affected some aspects of our results. Moreover, although several important and most used databases were searched, there is a possibility that some articles (e.g., in grey literature) may be omitted. Also, only English articles were included, which could have resulted in relevant articles in languages other than English being overlooked. Furthermore, the studies reviewed showed mixed results regarding risk of bias assessment, with many of them displaying different levels of bias, which could question the robustness of findings obtained. Finally, most of the included studies were conducted in Asia (i.e., China = 7 studies) and Europe (i.e., Belgium = 2 studies, Italy = 1 study, Poland = 1 study, and Portugal = 1 study). The under-representation of the other parts of the world, such as (sub-Saharan) Africa, could limit the applicability and generalizability of findings to the broader nurses' population around the world.

Practical implications and future perspectives

Our study revealed that high levels of overall burnout affected more than one in two nurses (59.5%). Because nurses are directly involved in the care and treatment of patients as the frontline healthcare workers, they play a key role in the health-systems response to COVID-19 [80]. Based on the current findings, there appears a great need to reduce nurses' burnout and enhance their psychological health. Policymakers, health care organizations, and governments should act to adequately prepare health care systems for a better response against epidemics and pandemics, and avoid potential mental health issues among nurses in the future. Several strategies could be implemented to address the mental health effects of COVID-19 on nurses, including screening for burnout symptoms and early supportive interventions for those who manifest high levels of burnout. The measures that could be introduced involve sufficient personal protective equipment, designated rest periods, social support through hospital support groups, and immediate access to mental health care services for all nurses [81].

In general, previous literature has shown that multilevel interventions for promoting nurses' mental health at work are anticipated to have greater effectiveness than single-level interventions [82, 83]. At the organizational level, healthcare policymakers should aid in providing support for nurses at the workplace, such as empowering self-help groups, offering access to resources for psychological support, and allowing for clear communication of changes [84]. Nurse managers need to make additional efforts by paying attention to nursing staff's demands, personal well-being, and occupational development. Other organizational strategies could involve a structured reward system, such as the improvement of nurses' appreciation, recognition, and salaries, as well as the provision of learning opportunities and career development plans to enhance their readiness for future challenging crisis scenarios [14]. However, individual interventions accompanied by institutional measures are unlikely to be successful in preventing the emergence of burnout unless established jointly with multiple other workplace health programs for enhancing nurses' coping with work-related stressors [85, 86]. Such interventions might include interventions at the individual level, such as appropriate rest and sleep in between shifts and work duties, psychoeducation, improving problem-solving skills, a correct emotional balance, a balanced diet, maintaining regular exercise, and maintaining social relationships [87]. For better efficiency and accessibility, a multi-disciplinary approach incorporating different healthcare professionals, such as psychiatrists and psychologists, would help nurses better cope with and manage stress at the workplace. Peer-defusing training has also been recommended as a promising way for creating a space for verbalization and integration of work and life experiences among nurses [88].

The identification of factors significantly associated with burnout can help in the planning of public health policies and comprehensive programs to prevent its emergence or exacerbation for nurses who are at increased risk to develop this disorder during crisis periods. As nurses who are younger in age were found to be more likely to experience greater burnout, thus underscoring the need for targeted interventions that pay particular attention to supporting younger nurses. Besides, given that significant differences in burnout levels have been observed depending on countries income levels and cultural contexts, interventions should be tailored to the local conditions in the specific healthcare organization and country. Indeed, country-specific differences, including the large variability in the approach taken by each country when dealing with the pandemic, could have led to an altered effect on nurses' work conditions and mental health.

Our review also holds some initial implications for future research directions. Researchers are encouraged to conduct further studies on the prevalence and correlates of burnout among nurses, particularly in under-represented countries and regions. Specifically,

longitudinal research should examine the long-lasting consequences of the pandemic on nurse burnout. Beyond monitoring and managing nurses ' burnout outcomes [89–92], the different stakeholders relevant for the healthcare sector need also to perform scientifically sound interventional studies aimed at mitigating the long-term effects of burnout on nurses. Indeed, conducting more research during the pre-, intra-, and post-pandemic periods might offer accurate and relevant information enabling the selection of interventions that can be most beneficial for the mental health and resilience of nurses [93].

Conclusion

Our review provides additional support to the evidence that nurses' burnout is highly prevalent and represents one of the biggest problems facing healthcare systems worldwide. Nurses' burnout can affect the quality of health services during a pandemic; thus, its mitigation through the implementation of prevention and intervention policies is a pressing need and should be given the highest priority. COVID-19 has offered an unprecedented opportunity to develop mental health promotion and prevention interventions that could fill critical gaps in mental health resources and care for the nursing staff. Because of the detrimental impact of burnout on nurses, nursing care for patients, and the whole healthcare organization, the findings underscore the need for organizational strategies to mitigate burnout among nurses, especially during crises times such as the COVID-19 pandemic. This review also encourages further research into efficient evidence-based interventions to support nurses and combat burnout in the nursing profession.

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FFR and SH designed the study; SAB and FFR extracted the data; FFR and SH drafted the manuscript; SH carried out the analysis and interpreted the results; FH and SO reviewed the paper for intellectual content; all authors reviewed the final manuscript and gave their consent.

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Data availability
The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Declarations

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Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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