Journal of Primary Care & Community Health
Volume 15: 1–18

DOI: 10.1177/21501319241273242
journals.sagepub.com/home/jpc
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Suicide in Healthcare Workers: An Umbrella Review of Prevalence, Causes, and Preventive Strategies

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Abstract

Background: The medical profession faces a critical challenge with the mental health of its practitioners, leading to an alarming increase in suicide rates among healthcare workers (HCW). Factors such as the culture of perfectionism, excessive workloads, and stigma against seeking help exacerbate this issue. This umbrella review synthesizes the existing literature on HCW suicide, exploring the prevalence, causes, and potential preventive strategies. **Methods:** This study conducted a search of the literature from PubMed/Medline, Scopus, Web of Science, Cochrane Library, PsycINFO, and Google Scholar until April 2, 2024. The non-exhaustive search terms used were "doctor suicide," "physician suicide," "medical professional suicide," "suicide in healthcare," "healthcare worker suicide prevention," and "causes of healthcare worker suicide." Hand-searches were also conducted. Of the 487 studies initially identified, a total of 10 systematic reviews/meta-analyses were included. **Results:** This umbrella review collates findings from 400 primary clinical studies conducted between the years 2004 and 2023. With a focus on mental health factors contributing to suicide in HCW, there are regional and specialty-specific variations in stress prevalence in the populace. Further, anesthesiologists and psychiatrics depicted higher rates of burnout compared to other HCW; causative factors such as seeking perfection and challenging work-life balance were key when assessing suicidal behaviors in these groups. Job demand level was found to correlate directly with suicidal thoughts, specifically among psychiatric ward HCW, where access to drugs and sharp instruments is readily available. In specific contexts, female HCWs showed a standardized mortality ratio (SMR), indicating that the rate of suicide was higher among them as compared to the general female population. Interventions such as cognitive behavioral therapy (CBT) and mindfulness were effective in decreasing depression, psychological distress, and anxiety in several included studies. This umbrella review also identified major obstacles to seeking help, including stigma and the fear of professional consequences. **Conclusion:** To reduce suicide rates among HCWs, it is the need of the hour to implement evidence-based interventions and create supportive work environments that encourage mutual care for each other's emotional health. Further research is necessary to determine the effectiveness of various measures in preventing suicide among HCW.

Keywords

healthcare worker suicide, mental health, preventive strategies, umbrella review, work-related stress, burnout, stigma, cognitive behavioral therapy, workplace support

Dates received: 17 April 2024; revised: 14 July 2024; accepted: 17 July 2024.

Introduction

The medical profession is known for its vital role in healthcare, but it is also facing a major problem: the mental health of its workers. This has contributed to a surge in suicides among healthcare workers (HCWs), with an estimated 300 to 400 physicians dying by suicide every year.[1] Meta-analytical studies demonstrates that male doctors are about 40% more likely to commit suicide than men in general, while female doctors are at even greater risk, 70% higher for males and 250% to 400% higher for females compared with their non-medical peers.[2-4] The COVID-19 pandemic has only worsened this situation across different medical specialties and worldwide health systems.[5,6]

Perfectionist tendencies within medicine create a culture where doctors avoid seeking help for mental health problems out of fear being judged or having confidentiality breached which could negatively impact their careers.[7-9] In addition to this stigma, excessive workloads (on average physicians work 10 h more per week than other professionals) create stress and prevent quality family time.[10] Furthermore administrative burdens coupled with a focus on billing over patient care exacerbate these issues.[10]

HCWs experience a higher prevalence of mental illnesses compared to the general population. While HCWs share many of the same mental health challenges, including mood disorders, substance use disorders, and personality disorders, the unique stressors associated with their profession contribute to increased rates of these conditions. Some key statistics are that around 28% residents display depressive symptoms while approximately 42% experience anxiety and depression during their training years.[13,14] Because they have medical knowledge about drugs and so forth, they can use more lethal suicide methods; indeed, substantial number of them employ high-lethality psychotropics for self-harm purposes.[11,12]

The mental wellbeing of HCWs affects not only themselves but also those they care for, as it can lead to burnout, resulting in errors in treatment and a reduction in the quality of service delivery, thereby risking patients' lives.[15] Burnout syndrome costs US healthcare system $4.6 billion annually due to high turnover among HCWs coupled with reduced clinical hours worked.[16] This burnout-depression cycle heightens patient dissatisfaction thus worsening health workers' morale even further.[15,17]

An umbrella review (also known as an overview of reviews) is a method that summarizes evidence from multiple systematic reviews and meta-analyses on a given topic. It is useful when there are many systematic review or scoping review type papers available because it provides a higher-level synthesis and broader summary than single studies. In this case the umbrella review seeks to synthesize findings from different types of publications about contributors of suicide among HCW as well as reporting preventive strategies; it also seeks to highlight the need for urgent action by stakeholders globally.

Methods

Search Strategy

The umbrella review followed the PRISMA 2020 guidelines and the JBI methodology for umbrella reviews. We conducted a comprehensive search across different databases such as PubMed, Scopus, Web of Science, Cochrane Library, and Google Scholar, from their inception until April 2, 2024 to find all relevant studies. To manage and organize citations, EndNote X9 (Clarivate Analytics) was used.

Our selection of databases was strategic in order to cover a broad range of literature related to our topic. We chose PubMed/MEDLINE because it covers most biomedical literature comprehensively thereby ensuring no important study is missed out. PsycINFO was included to cover literature on psychological aspects of HCW mental health and suicide which is an important component of our review. Scopus was chosen due to its wide coverage across various scientific disciplines including health sciences hence giving a holistic view of the research landscape. The Cochrane Library was considered necessary since it contains systematic reviews and evidence-based interventions targeting HCW suicide prevention. Web of Science provided access to many scholarly articles as well as facilitating citation analysis while Google Scholar acted as an additional tool that allowed inclusion of gray literature and other resources not indexed in the primary databases.

The search was deliberately set to encompass literature published up until April 2, 2024, with no limitations on the inception. There were no language restrictions; non-English

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language studies were considered too. The document types included in our umbrella review were limited to systematic reviews and meta-analyses. This criterion facilitated a concentrated examination of evidence on the prevalence, causes, and preventive strategies for HCW suicide, thereby excluding primary studies, case reports, editorials, and commentary articles from our analysis.

Study Selection

Of the 487 studies identified from the databases, 32 duplicates were removed. Of these, 455 were screened using titles/abstracts. Post initial screening, 22 studies were sought for retrieval and full text eligibility. Finally, 10 studies were included in the umbrella review (Figure 1).

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were demarcated to ensure relevant collection of literature for our umbrella review on HCW suicide.

Inclusion criteria. Our review included studies that employed a systematic approach to search, appraise, and synthesize research literature addressing specific questions related to HCW suicide. This encompassed reviews focusing on its prevalence, causes, or preventive strategies, providing a comprehensive overview of the existing evidence. Also included were meta-analytical studies that offered a quantitative evaluation of the overall impact of specific interventions or exposures on HCW suicide. These studies needed to statistically report results from several independent studies found within systematic reviews that addressed the same research question.

Exclusion criteria. Excluded from our analysis were all forms of primary research studies, such as randomized controlled trials (RCTs), cohort studies, case-control studies, cross-sectional studies, and qualitative studies. We also excluded literature reviews that lacked a systematic methodology for searching and synthesizing evidence. Articles that primarily expressed personal opinions or perspectives without a basis in a systematic review of literature, as well as descriptions of individual cases or a series of cases, were not included because they do not offer a comprehensive synthesis of the topic. Additionally, conference abstracts and presentations were excluded due to them preliminary nature.

Data Extraction and Synthesis

Data extraction and synthesis were performed using a shared spreadsheet to organize and systematically analyze the collected data across specified domains. The extracted data fields included study ID, authors and year, study location, number of primary studies included, review type, study population, intervention(s) or exposure(s), comparator(s) or control(s), and outcome(s). Additionally, information on key findings regarding prevalence, causes, and preventive strategies; evaluated preventive strategies; identified risk factors; and the effectiveness of interventions was documented.

Given the variability in measurement tools used across studies to assess mental health and suicidality, we conducted a detailed segregation at the study level during the synthesis process. This involved synthesizing the primary clinical studies within the included reviews, focusing particularly on the prevalence rates, which were reported using various measures such as proportions, percentages, odds ratios (OR/aOR), or other relevant statistical measures. We utilized the study's reported measures/scales to maintain consistency with the original research contexts. Most prevalence rates were accompanied by 95% confidence intervals (CI), providing a precise statistical context to the reported findings.

In order to understand how different measurement tools and databases influence our findings on this topic we did narrative synthesis with detailed thematic analysis so that everything is covered comprehensively. This involved identifying causes of suicides and reported preventive measures; looking at geographical location, medical specialty, and healthcare settings where these were found different; stating what variations occurred between them in terms of prevalence rates or risk factors (if any) based on available data sources; describing why some had higher/lower rates compared with others given same levels etcetera.

Quality Assessment

AMSTAR-2 checklist was used for quality assessment purposes so that methodological deficiencies could be identified within selected studies along with possible biases they might have introduced into our review. This particular instrument is recommended when appraising systematic reviews that include both randomized and non-randomized healthcare intervention trials. The checklist has 16 items covering critical and non-critical areas such as adequacy of literature searches, rationale behind excluded studies, assessment of bias within individual studies, suitability of meta-analytical methods used, consideration of risk of bias when interpreting results, evaluation of publication bias and transparency about funding sources for included studies.

Every systematic review and meta-analysis were evaluated against AMSTAR-2 criteria to determine their overall quality while paying attention to elements which may skew findings in an umbrella review like ours. Studies were categorized into high, moderate, low, or critically low quality based on how well they followed AMSTAR-2

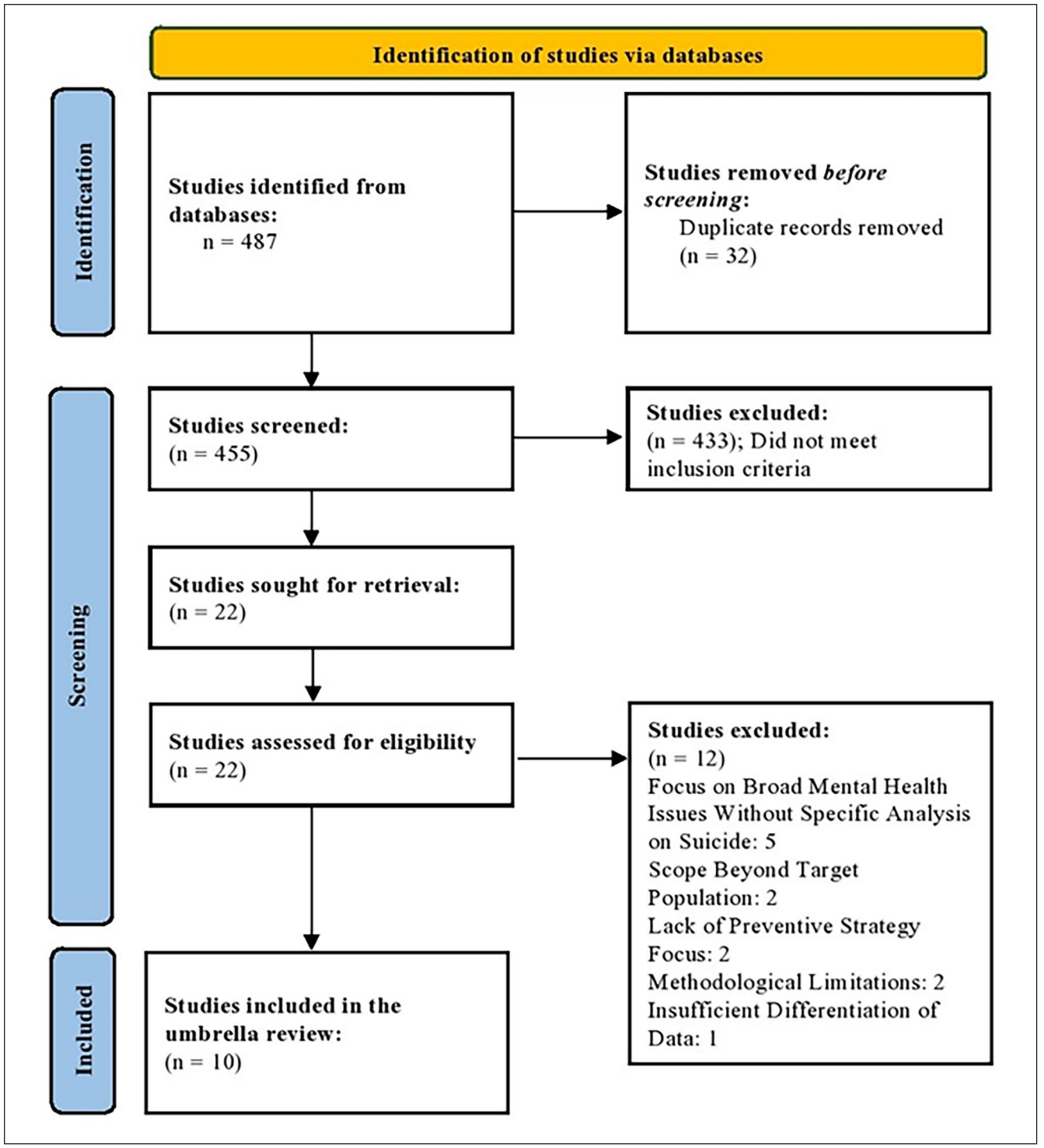

Figure 1. PRISMA flowchart depicting the study selection process.

recommendations. Such classification helped us examine the strength of evidence upon which our conclusions rested thus ensuring that only reliable methodologically sound studies formed part of it.

Ethical Approval and Funding Role

While an ethical approval as sought, it was not deemed necessary due to the secondary nature of data collection. No funding was obtained for this study.

Table 1. Characteristics of the Included Reviews as per the PICO-Framework.

ID	Authors and year	Study location	Number of primary studies included	Type of review	Study Population	Interventions	Exposures	Comparators	Outcomes
1	Ryan et al. (2023)	18 from USA, 4 from Japan, 3 each from China/ France/Turkey, 2 each from Finland/UK/Italy, 1 each from Netherlands/ Egypt/Brazil/ Hong Kong/ Lebanon/Pakistan/Malaysia/ India/Israel/Canada/Austria/ Germany/Romania/ Mexico/ Lithuania/Denmark	61	Systematic Review	-Study populations were well-defined, covering various specialties and physician grades -Some studies did not specify grade or specialty but included all physicians -One study focused on consultant physicians; others on residents, interns, or trainees -Specialties covered: Internal Medicine, Psychiatry, Orthopedics, Obstetrics and Gynecology, Pediatrics, Oncology, General Surgery, Family Medicine/General Practice, Emergency Medicine, Intensive Care, Plastic Surgery, Anesthesia, Vascular Surgery, and Neurology	-Work condition improvements -Relationship building -Cultural changes -Boundaries assertion -Time for non-clinical activities -Support and supervision -Mentorship -Addressing stigma -Acknowledging workplace distress -Encouraging self-care	-Occupational stress -Burnout -Work conditions -Relationships -Cultural factors -Physician responsibility for self-care	-Pediatric residents with control group -Multivariate analysis for confounders	Relationship between physician burnout and depression, anxiety, suicidality, and substance abuse
2	Plunkett et al. (2021)	Various-Europe, North America, South America, Asia, and Australia	54	Systematic Review	-Anesthetists, including both those in training and those who have completed training, as well as anesthetist spouses -The review covers studies that include a range of specializations within anesthesiology such as general anesthesia and surgical oncology	N/A	-Access to lethal means -Isolation -Stressful working conditions -Use of anesthetic drugs (eg, propofol)	-General population and other medical professionals	Suicide rates, Prevalence of suicidal ideation, Effectiveness of preventive strategies, Methods of suicide among anesthetists
3	Dong et al. (2020)	12 from USA, 5 from UK, 3 from Finland, 3 from Norway, 2 from Sweden, 2 from Hungary, 1 each from Australia, Belgium, Saudi Arabia, Italy, Hong Kong, Japan, Canada, and Brazil	35	Systematic Review and Meta-Analysis	-The studies included both cross-sectional and cohort designs, with sample sizes ranging from 56 to 7,926 physicians -The age of participants varied, with mean ages reported between 29 and 56 years -Male representation among the study populations ranged from 0 to 86.8%	None	-Factors associated with suicide -Suicide-related behaviors	No specific comparators mentioned	Prevalence of suicidal ideation, Suicide plans, Suicide attempts among physicians over various time frames (lifetime, 1-year, 6-month, 3-month, and 1-month)
4	Duarte et al. (2020)	26 from USA, 2 each from England and Australia, and 1 each from Estonia, Finland, England and Wales, and Brazil	32	Systematic Review and Meta-Analysis	-Participants were physicians, with some studies specifically targeting female and male physicians separately -Specializations, if mentioned, included psychiatry, anesthesiology, radiology, rehabilitation medicine, community health, general practice, and surgery	NR	-Career-associated factors -Mental health challenges (eg, depression, substance abuse) -Professional stressors	Non-physician occupations (teachers, academics, veterinarians, dentists, pharmacists, and nurses) or the general population	Suicide rates, Prevalence of psychiatric comorbidities, Demographic risk factors, Career-associated factors, Suicide methods among physicians

(continued)

Table 1. (continued)

ID	Authors and year	Study location	Number of primary studies included	Type of review	Study Population	Interventions	Exposures	Comparators	Outcomes
5	Dutheil et al. (2019)	25 from USA, 5 from Finland, 4 from Norway, 3 from Sweden, 2 from Australia, 2 from Great Britain, 2 from Danish, 2 from Taiwan, 1 from Germany, 1 from South Africa, Italy, Quebec, Iceland, England and Wales, Japan, Estonia, Denmark, Belgium, Netherlands, Brazil, Island (Iceland), and China each	61	Systematic Review and Meta-Analysis	55 physicians, 4 dental surgeons, 4 nurses, and 2 other healthcare workers	None	-Professional factors -Occupational stressors	General population benchmarks and specific demographic or professional subgroups	Deaths by suicide, Suicide attempts, Suicidal ideation, Standardized Mortality Ratios for suicide, Percentages of suicide by specialty, Numbers of physicians who died by suicide among all physician deaths
6	Petrie et al. (2019)	5 from USA, 2 from Australia, 1 from Spain	8	Systematic Review and Meta-Analysis	-Primary healthcare professionals including physicians, nurses, social workers, and clinical psychologists -General practitioners attending professional development courses/experiencing current psychological distress -Medical interns entering internship year across various specialties -Working female healthcare practitioners who are mothers -Anesthesiology residents in their first to third year	-Group interventions (CBT, mindfulness) -Individual interventions (CBT, mindfulness) -Face-to-face or online delivery	NR	Waitlist controls, no interventions, attention-control groups	Mood disturbance, Depression, Psychological distress, Suicidal ideation, Anxiety
7	Oskrochi et al. (2015)	44 from USA, 6 from UK, 5 from Canada, 4 from Australia, 3 from Germany, 2 from Spain, 1 each from Switzerland/ Croatia/ Saudi Arabia/ Lithuania/ Serbia/ Thailand/ Japan	71	Systemic Review	-The primary focus of the paper was on surgeons; 15 studies involved surgeons who completed their training; 13 studies focused on surgeons in training; 29 studies did not differentiate the training status of the surgeons; 5 studies did not report on the training status; 2 studies included surgeon spouses -A multispecialty approach was taken in 33 studies -Specialties covered included: Orthopedics in 11 studies; Obstetrics and Gynecology in 8 studies; ENT (Ear, Nose, and Throat) in 4 studies; Surgical oncology in 3 studies; General surgery also in 3 studies; Vascular surgery and Ophthalmology each in 2 studies; Colorectal surgery in 2 studies; Urology, Transplant, and Cardiac surgery were each the focus of 1 study	N/A	-Burnout -Psychiatric distress -Depression -Substance use -Family stressors -Financial concerns -Career satisfaction	Non-surgeon physicians, General practitioners, Hospital practitioners, General population, Non-surgical doctors, Medical interns, General population	Burnout, Psychiatric morbidity, Depression, Suicidal ideation rates among surgeons

(continued)

Table 1. (continued)

ID	Authors and year	Study location	Number of primary studies included	Type of review	Study Population	Interventions	Exposures	Comparators	Outcomes
8	Milner et al. (2013)	14 from USA, 13 from Europe, 4 from Canada, 1 each from Japan, South Korea, New Zealand, and Australia	34	Systematic Review and Meta-Analysis	Category 1 (managers, senior officials, and legislators), category 2 (professionals), category 3 (technicians and associate professionals), category 4 (clerks), category 5 (service and sales workers), category 6 (skilled agricultural and fishery workers), category 7 (craft and related trades workers), category 8 (plant and machine operators, and assemblers), and category 9 (elementary occupations). Military occupations were coded 0	N/A	-Suicide risk by occupation -Professional factors	General population, Lower-risk occupations, General working-age population	Suicide mortality, Standardized Mortality Ratios, Proportional Mortality Ratios, Odds Ratios, Objective accounts of occupation and mortality
9	Platt et al. (2010)	8 from USA, 4 from England and Wales, 2 from Australia and 1 from Scotland, Denmark, Great Britain, Norway, and Belgium	19	Systemic Review	-Age-segmented male and female veterinarians, veterinarians on active duty, and those within specific states or countries -The studies also differentiate by race and location, such as white male veterinarians and those practicing in California, Western Australia, Victoria, Illinois, Missouri, and Belgium	N/A	Suicide rates among veterinarians	Married individuals not in the top 10 occupational groups, State residents, Suicide controls, Non-veterinarians	Suicide rate and means of suicide among veterinarians
10	Schernhammer et al. (2004)	4 from Denmark, 6 from US, 2 from Finland, 3 from sweden, 5 from England and Wales, 1 from Iceland, South Africa, Estonia, Germany, and Australia each	25	Meta-Analysis	-Men and Women physicians of any age group, mainly from Northern European and North American countries -No constraints on the region of the study subjects' residence, or their age group	N/A	Suicide rates among male and female physicians	General population suicide mortality rate	Suicide rates among male and female physicians

Results

Characteristics of the Included Reviews

Table 1 lists the summary findings of the included revi ews.[2,18-26] Sample sizes ranged from 56 to 7,926 participants, indicating varied study scales from intimate to extensive populations. Participants' ages spanned from young professionals (mean age around 29) to experienced practitioners (up to mean age 56 years), encompassing a wide career spectrum. Male representation varied significantly, from none to a dominant presence (up to 86.8%), representing varied gender dynamics across the included studies. The total number of primary clinical studies included in the umbrella review was 400. The studies were published between the years 2004 and 2023, spanning 20 years in duration.

Concerning the origin of the primary clinical studies, the analysis reveals that the USA has the highest contribution with 157 entries, accounting for 51.97% of the total. Following the USA, the UK contributes 19 entries (6.25%), and Australia and Finland each contribute 9 entries (2.96%). Norway is next, with 8 entries (2.63%), closely followed by England and Wales also at 8 entries (2.63%). Canada and Germany each contribute 6 entries (1.97% and 1.64%, respectively), with Brazil adding 5 entries (1.64%). Japan has 7 entries (2.30%), Sweden 6 entries (1.97%), and Italy 4 entries (1.32%). China also contributes 4 entries (1.32%), indicating a diverse international representation. Other notable contributions include Denmark, Belgium, and Great Britain each with 3 entries (0.99%), and France, Turkey, Lithuania, and Spain each with 3 entries (0.99% and 0.66%). Lesser contributions come from the Netherlands, Hong Kong, Estonia, Taiwan, and South Africa each with 2 entries (0.66%), and a single entry (0.33%) from countries including Egypt, Lebanon, Pakistan, Malaysia, India, Israel, Austria, Romania, Mexico, Quebec, Iceland, Croatia, Serbia, Thailand, South Korea, New Zealand, and Scotland, showcasing a global concern across various regions including Europe, North America, South America, Asia, and Australia.

Umbrella Review Findings

Quality assessment. While most of the studies reviewed were conducted with stringent methodologies, it was observed that there were differences in the comprehensiveness and rigor of reporting across various AMSTAR-2 domains (Table 2).

Of all the included studies, only 2[19,23] stated their research questions fully using the PICO framework. Dutheil et al[20] and Milner et al[21] partially met this criterion while others did not express their research questions in PICO format.

All studies except Oskrochi et al[22] and Platt et al[24] indicated that they had established their review methods before conducting the review so as to ensure structured evidence synthesis.

All studies exhibited an adequate choice of study designs for inclusion and employed comprehensive literature search strategies. However, Ryan et al's[26] and Schernhammer and Colditz[2] failed to fully meet this criterion by not explaining why they chose certain study designs.

Most studies duplicated processes of study selection as well as data extraction procedures across independent reviewers, thereby heightening these activities' reliability. In addition, several studies adequately described included studies and provided a list of excluded ones with reasons for exclusion, except for Milner et al,[21] which did not report excluded studies.

The evaluation of RoB and appropriate statistical combination methods varied from 1 study to another. Petrie et al's[23] and Duarte et al's[19] analyses were outstanding for addressing RoB comprehensively. However, some investigations like Ryan et al's[26] did not consider how RoB affected their results or use suitable meta-analysis methods.

Differentiation between heterogeneity exploration versus publication bias investigation was inconsistently reported on by different authors. Duarte et al's[19] work together with Petrie et al's[23] were commendable for exhaustively looking into heterogeneity and discussing publication bias's impact on their findings.

The majority of studies mentioned their funding sources and reported conflicts of interest thereby enhancing transparency and credibility.

Study Populations

The studies represented a wide range of medical specialties including but not limited to internal medicine, psychiatry, orthopedics, obstetrics and gynecology, pediatrics, oncology, and general surgery. Participants included a mix of grades, from consultants to interns and trainees, reflecting different hierarchies and educational stages within the healthcare profession. Studies encompassed primary healthcare professionals such as nurses, social workers, and clinical psychologists, broadening the scope to multidisciplinary care teams. Specific attention was given to subgroups like anesthesiology residents, medical interns, general practitioners, and surgeons, providing insights into the unique challenges faced by these groups. The inclusion of categories beyond medical practice in comparator groups, such as managerial and legislative roles (coded categorically from 0 to 9), was key in assessing the administrative and policy factors influencing healthcare work environments. While some studies specifically targeted gender-separated groups (female and male HCW), others did not limit by region or age. A sub-focus on veterinarians, including

Table 2. AMSTAR-2 Checklist Findings.

Author-year	Research question included PICO	Review methods established prior to review	Explanation of study design selection	Comprehensive literature search strategy	Study selection performed in duplicate	Data extraction performed in duplicate	List of excluded studies with *justification*	Describe studies in adequate detail	Satisfactory technique for assessing RoB	Report sources of funding	Use appropriate methods for statistical combination of results (for meta-analysis)	Assess potential impact of RoB in individual studies on the results (for meta-analysis)	Account for RoB in individual studies when interpreting results	Explanation for and discussion of heterogeneity in results	Investigate publication bias and discuss impact (for quantitative synthesis)	Reported conflict of interest
Ryan et al. (2023)	No	Yes	Yes	Yes	Partial yes	Yes	Yes	Yes	Partial yes	No	No	No	Yes	Yes	No	Yes
Plunkett et al. (2021)	No	Yes	Yes	Yes	Partial yes	Yes	Yes	Yes	Yes	No	No	Yes	yes	No	No	Yes
Dong et al. (2020)	No	Yes	Partial yes	Yes	Yes	Yes	Partial yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duarte et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Partial yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dutheil et al. (2019)	Partial yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Petrie et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oskrochi et al. (2016)	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	No	Yes
Milner et al. (2013)	Partial yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Schernhammer et al. (2004)	No	No	Yes	Yes	Partial yes	Yes	No	Partial yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Platt et al. (2010)	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes

race and location-specific subgroups, expanded the discussion to veterinary medicine, showing parallels and contrasts with human healthcare professions (Table 3).

Intervention Strategies and Exposures

Burnout and stress in the workplace. According to Ryan et al,[26] the measurement of exposure to work-related stress and burnout is complicated. The authors report that interventions can fail if they do not consider that different measures of exposure may be used at different times or by different people. They also suggest changing working conditions, transforming workplace culture, and improving interpersonal relationships in healthcare settings as ways to prevent burnout. In comparison with other health care professionals, Oskrochi et al.[22] examine burnout among surgeons and its relationship with psychiatric morbidity; career satisfaction; financial difficulties and family problems are given as examples of what might contribute toward higher rates of burnouts therefore indicating that there should be specific intervention methods for each cause.

Risk factors for suicide and prevention strategies. Plunkett et al[25] highlight the heightened risk of suicide among anesthetists, particularly because they have access to pharmaceuticals such as propofol, which can be misused for self-poisoning. The study also emphasizes the unique needs of female doctors in developing preventive strategies, noting that they face both the high risks associated with their profession and additional challenges stemming from societal gender roles outside their medical duties. Duarte et al[19] examine the broad stressors in professional life that contribute to mental health issues, including suicidality. While their analysis isn't limited to any specific occupation or demographic group, they highlight that the pressures of work, combined with inadequate training and support, could undermine wellbeing. They advocate for comprehensive systems designed to mitigate these stressors.

Methods of intervention. Petrie et al,[23] mention cognitive behavioral therapy (CBT) among other interventions effective for physicians' stress management skills acquisition and enhancement of favorable mental health outcomes although the duration/delivery format viz one-on-one/group face-to-face counseling sessions versus online modules vary widely between them.

General observations. There were no intervention-based studies or ones that explored exposure to suicide risk factors specifically within the context of mental health in Dong et al's,[18] Dutheil et al's,[20] Milner et al's,[21] Platt et al's,[24] and Schernhammer and Colditz.[2]

Comparators Across Studies

In our analysis of comparators across studies, we noticed different ways of putting burnout, psychiatric distress, and suicide risk among healthcare professionals into context.

Comparisons for burnout and psychiatric distress. Oskrochi et al. (2015) compared the frequencies of burnout among surgeons and nonsurgical physicians. They also measured psychiatric distress against general practitioners, hospital practitioners, and the general population. In addition to this, they checked depression rates between surgeons and nonsurgical doctors; appraised career satisfaction across medical specialties; evaluated financial concerns with medical interns; examined substance use among families of surgeons as compared to those with medical physicians' background.

Comparisons for suicide risk. Milner et al[21] used several sets of comparison groups in order to assess suicide risk among different categories within healthcare workforce. The groups included: male population at large and female members thereof; people engaged in occupations considered less dangerous than medicine or nursing; individuals who were within working age but not occupied. The goal was to provide a wider context for understanding suicide risk by comparing it with other risks present in various sectors that share similar demographic characteristics such as age distribution or gender composition.

Platt et al[24] specified controls such as married persons who do not belong to top 10 occupational groups at high risk for suicides; state residents who were not HCW, suicide controls matched by sex (gender) and year born. Comparisons were made against medical practitioners plus adults from certain regions matched on age; white men during specific time periods at certain locations. These served as reference points against which relative risks could be calculated while also enabling identification of factors associated with differentials in suicide rates between populations under investigation.

Schernhammer and Colditz[2] focused on comparing suicide mortality rate among physicians relative to that of the general population over same period. The comparison was done by calculating rate ratio for doctors both males and females using this reference point so as to measure how much more likely or less likely doctors are to commit suicide compared to general public.

Analytical approaches without direct comparisons. Dong et al[18] and Dutheil et al[20] conducted studies that did not involve direct comparison groups. The researchers used different approaches such as within group comparisons or other statistical methods for analyzing data.

Key Outcomes of the Included Studies

Many primary outcomes were assessed in the studies we included in this umbrella review.

Ryan et al's[26] assessed the relationship between burnout in HCW in addition to broader mental health issues such as anxiety, depression, suicidality, and substance abuse. Plunkett et al[25] assessed suicide rates in anesthesiologists with a focus on suicidal ideation prevalence, preventive strategies, and the methods of suicide. Dong et al[18] conducted an important and detailed temporal analysis focusing on physicians where they checked for suicidal ideation (SI), suicidal planning, and suicide attempts (SA) at 1-month, 3-month, 6-month, 1-year, and lifetime periods. I Duarte et al[19] studied doctors as their target pool studying for associated psychiatric comorbidities with demographic risk factors that could contribute to the risk of suicide, along with the methods used. Dutheil et al[20] focused on suicide-pertaining outcomes in HCWs. These included deaths attributed to suicide, ideation, and attempts. The authors highlighted the standardized mortality (SMR) for suicide and they found higher rates in physicians as compared to the general population.

Petrie et al studied how effective interventions were for mood disturbances, psychological distress, depression, SI, and anxiety in HCWs; they found mixed results post-intervention, but there was significant reduction in symptoms. Oskrochi et al. (2015) focused on the relationship between psychiatric morbidity, burnout, and depression; the authors specifically addressed SI rates in HCW. In 2013, Milner et al[21] studied suicide mortality in HCW; they used relative risks (RR), SMR, proportional mortality ratios (PMR), and odds ratios (OR) to determine occupation-related mortality. Platt et al[24] saw suicide rates and methods of suicide in the general population while providing insights into mirrored outcomes in HCW. Schernhammer and Colditz[2] investigated suicide rates in both male and female physicians, providing information about occupational risk factors associated with suicide in the medical field.

Prevalence, Causes, and Prevention Findings

The prevalence of mental health issues among HCW with possible relevance to suicide is presented as follows (Table 3). Plunkett et al[25] reported that suicide attempt rates in anesthesiologists was between 0.5 to 2% with higher risk of suicide among those using anesthetic drugs. Duarte et al[19] reported that the standardized mortality ratio (SMR) was 1.46 for female physicians indicating that there is higher risk of suicide in this group as compared to the general female population. Dong et al[18] reported a 17.14% lifetime prevalence of SI and a 1-month SI prevalence of SI in physician groups. Oskrochi et al. (2015) write that reported burnout fell between 12.6% and 58% across the many subspecialities they studied. Moreover, psychiatric distress had an average prevalence of 25.3%.

On reporting causes, both Ryan et al[26] and Oskrochi et al. (2015) reported that substance abuse was a concern of imminent concern in the medical community. Ryan et al[26] and Plunkett et al[25] both reported on stigma, denial of mental health symptoms and the innate concern for career as important barriers in seeking help. Ryan et al,[26] Plunkett et al,[25] and Petrie et al[23]: Emphasized stigma and self-criticism as barriers to seeking help. Plunkett et al[25] focused on specific risks in anesthesiologists such as the continual access to lethal drugs along with the high stress in the environment. In addition, both Platt et al[24] and Plunkett et al[25] reported about professional roles (ie, vets and physicians) such as being a fractionator providing knowledge or access to means of suicide being key causes. Plunkett et al[25] and Dutheil et al[20] further addressed that trying to be "perfect," coupled in with high expectations, work-life imbalance, and job insecurity as very important causes of mental health outcomes. Both Duarte et al[19] and Dutheil et al[20] saw high risks among HCW in psychiatry and anesthesiology given the stigma in trying to seek help. Dong et al[18] also saw geographic differences, with higher SI rates in Europe compared to America. In addition, they saw a downward trend in the prevalence of SI meaning that there were evolving and more accurate research methodologies being utilized. Duarte et al[19] further identified suicidality influencers, which were sex, age, race/ethnicity, interpersonal relationships and psychiatric comorbidities.

When considering prevention, only 2 out of the 10 studies included in this review focused on preventive strategies along with reporting their efficacy. First, Petrie et al[23] stated that individually-targeted intervention coupled with organizational changes such as rescheduling work hours were efficacious. They supported this by reporting that depression and psychological distress was reduced in their program. Second, Oskrochi et al. (2015) reported that stress reduction strategies are useful. This includes cognitive behavioral therapy (CBT) and mindfulness. While their interventions also aimed to reduce alcohol use and depression, insignificant findings were reported. On the whole, the interventions included (i) mental and physical relaxation techniques, (ii) organizational level changes such as alternating work schedules, and (iii) lifestyle encouragements such as promoting healthy living and work-life balance.

Discussion

The umbrella review highlights significant mental health challenges among HCWs, including burnout, psychiatric distress, and suicide risk, across various medical specialties and populations. Burnout is consistently associated with higher rates of depression, anxiety, and suicidality, with key risk factors being occupational stress, professional

Table 3. Prevalence, Causes, and Prevention Reportage in the Included Studies.

ID	Authors and year	Key findings on prevalence, causes, and strategies	Risk factors identified	Preventive strategies evaluated	Effectiveness of interventions	Authors' interpretation
1	Ryan et al. (2023)	Significant associations between burnout and depression (OR: 0.89-10.68), anxiety (r = .41-.74), and suicidality among physicians. Findings suggest measurement inconsistencies and potential biases. Most studies used the Maslach Burnout Inventory (MBI) for burnout assessment.	Mood disorders, substance misuse, barriers to seeking help, burnout	None	None	The study highlights the need for targeted interventions and policy changes to address mental health issues and suicide risk among physicians, especially focusing on the role of gender and workplace stigma.
2	Plunkett et al. (2021)	Suicidal ideation among anesthetists ranges from 3.2% to 25%, with suicide attempts between 0.5% and 2.0%. High use of anesthetic drugs like propofol noted in suicides (50% of cases). Significant OR for poisoning: 3.65, cutting and piercing: 3.18. SMR for female doctors: 2.46.	Access to lethal means, occupational stress and burnout, stigma and barriers to help-seeking, work-life imbalance, perfectionism, and history of mental health issues	None	None	The authors stress the urgent need for workplace interventions and better mental health support systems in medical settings, particularly in anesthesiology, where access to lethal means significantly elevates risk.
3	Dong et al. (2020)	Lifetime prevalence of suicidal ideation (SI) is 17.4%, with a 1-year prevalence of 8.6%. Meta-regression shows a negative association with sample size and publication year for SI prevalence.	Geographic region, sample size, and publication year	None	None	The study suggests the influence of methodological factors like sample size and study recency on reported prevalence rates, indicating potential underreporting in larger, more recent studies.
4	Duarte et al. (2020)	SMR for male physicians is 0.67, indicating a lower suicide risk compared to the general male population. For female physicians, the SMR is 1.46, suggesting a higher risk. Findings are robust as confirmed by log-transformed data.	Psychiatric illnesses, demographic factors (sex, age, race, and relationship status), and career factors	None	None	Authors interpret that female physicians face unique challenges that increase their suicide risk, highlighting the need for gender-specific preventive strategies in the medical profession.
5	Dutheil et al. (2019)	Higher suicide risk among physicians with SMRs indicating significant risk especially for female physicians. The risk varies by region and has shown a decreasing trend over time in Europe. Prevalence of physician suicides at 4% among all physician deaths.	Gender, geographic location, and medical specialization	None	None	The study underscores the critical role of geographic and gender-specific factors in addressing physician suicide, advocating for localized and targeted intervention strategies.

(continued)

Table 3. (continued)

ID	Authors and year	Key findings on prevalence, causes, and strategies	Risk factors identified	Preventive strategies evaluated	Effectiveness of interventions	Authors' interpretation
6	Petrie et al. (2019)	Individual-level interventions positively affect depression, anxiety, and suicidal ideation. Organizational approaches like adjusted work hours show modest effects on reducing burnout and stress.	Barriers to seeking help, burnout	Universal and non-universal interventions, online and face-to-face delivery	Interventions reduced symptoms of depression, distress, and anxiety.	Effective intervention strategies need to balance individual and organizational approaches to address mental health issues effectively in healthcare settings.
7	Oskrochi et al. (2015)	Burnout prevalence ranges from 12.6% to 58%, with highest rates in ObGyn and orthopedics. Depression prevalence around 33.9%. Problematic alcohol use reported in 15% to 30% of surgeons.	Substance misuse	Mindful communication, CBT, physical relaxation techniques, organizational-level changes like work schedules	Interventions did not significantly improve distress, alcohol use, or depression scores.	Authors suggest that while some interventions are available, their effectiveness remains limited, indicating a need for improved and more comprehensive approaches.
8	Milner et al. (2013)	Higher suicide risk observed in lower-skilled occupations. Health professionals more likely to overdose on drugs. Occupational skill level correlates with suicide risk.	Lower-skilled occupations and inadequate SES adjustment	None	None	The study points out the correlation between lower occupational skill levels and increased suicide risk, suggesting socioeconomic and occupational factors play critical roles.
9	Platt et al. (2010)	Common suicide methods among veterinarians include poisoning and firearms. Significantly higher suicide rates among veterinarians with RR for female veterinarians aged 16 to 64 years at 7.62.	Access to lethal drugs/means and high occupational stress	None	None	The research highlights the unique risks veterinarians face due to access to lethal means and occupational stress, suggesting the need for targeted preventive measures in veterinary settings.
10	Schernhammer et al. (2004)	Moderately higher risk of suicide among male physicians with an overall suicide rate ratio of 1.41. No significant trends observed with publication year or study quality.	Higher risk among male physicians, depression, and substance abuse	None	None	The study reiterates the consistent risk of suicide among physicians, emphasizing the need for ongoing research and targeted interventions to mitigate these risks.

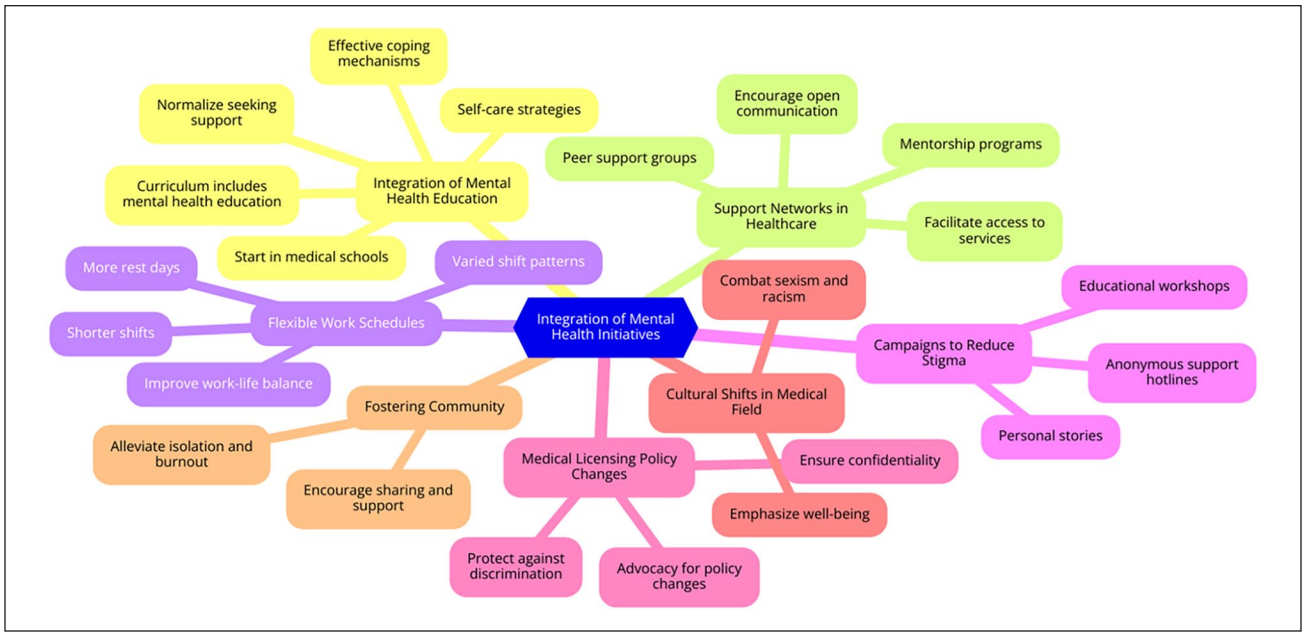

Figure 2. Strategies for enhancing mental health of HCW in healthcare settings.

pressures, and access to lethal means, particularly among anesthetists. Preventive strategies like CBT, mindfulness, and organizational changes showed mixed effectiveness in reducing mental distress symptoms. The global representation of studies highlights the widespread nature of these challenges, emphasizing the need for targeted interventions tailored to the specific needs of different healthcare populations. Comprehensive support systems and workplace modifications are crucial for mitigating these mental health risks and improving overall well-being among HCWs.

Counseling and psychotherapy effectively address depression and anxiety, while web-based CBT reduces suicidal thoughts among medical interns.[27] Mindfulness training diminishes burnout and enhances well-being.[27,28] Physical activity improves depression and fosters meaningful interpersonal interactions. Organizational strategies such as improving the learning environment, ongoing education, and deploying screening tools are effective in identifying at-risk individuals and improving mental quality-of-life metrics.[27] The urgency of these interventions is emphasized by prevalent mental health concerns, including depression, anxiety, and high suicide rates among HCWs. Enhancing their mental health can lead to improved patient care and lower burnout rates.[27,28] Al-Humadi et al[6] in 2021 and Sareen et al[29] in 2005 further establish the connection between pre-existing and current mental health issues, stressing early identification and treatment as key to supporting HCW mental health.

Barriers such as stigma and concerns about professional repercussions hinder HCWs from seeking help. Some medical professionals are reluctant to seek help due to fears of stigma, credentialing issues, and potential discrimination.[8,30] Strategies to destigmatize mental health concerns, improve access to care, and cultivate a supportive workplace are critical. Efforts by institutions to prevent physician suicide and promote a culture of care are crucial.[8,31] Advocating for policy changes with regulatory bodies to prevent discrimination during credentialing is vital.[8]

Our findings of SI and completed suicides among healthcare professionals are significant. Shanafelt et al[30] in 2021 reported a higher rate of suicidal ideation among healthcare professionals compared to the general population, with a 7.1% rate of SI within a year among HCWs, compared to 4.3% in the general workforce. Notable disparities existed in the risk of completed suicide between female nurses and female HCWs, with nurses experiencing a substantially higher rate.[32]

Braquehais et al[12] identified an increased risk of suicide attempts among female HCWs, noting that those who had recently attempted suicide were more likely to complete the act compared to nurses, for whom no such correlation was observed. Risk factors for SI among HCWs included gender, age, marital status, and parenthood, with unmarried and childless individuals showing higher susceptibility.[30] Age and marital status did not significantly correlate with SI among nurses.[12]

HCWs with suicidal ideation were less inclined to seek professional help compared to those without such thoughts.[30] No significant differences related to medical specialties or work hours were found, but a positive correlation was observed between emotional exhaustion, burnout, higher

education, and suicidal ideation among HCWs. HCWs worked significantly more hours per month than individuals in other professions, impacting their family time.[33] A Taiwanese study highlighted that nurses experienced the highest burnout rates due to close patient care, long shifts, lack of autonomy, and household chores for female nurses.[34]

Common diagnoses among HCWs who committed suicide included affective and personality disorders, with no significant differences between physicians and other HCWs.[12] Suicide means often involved readily accessible substances, reflecting HCWs' medical knowledge and drug availability. Antidepressants, benzodiazepines, barbiturates, opiates, and amphetamines were commonly used in suicides.[35,36] Psychotropic drugs were preferred for poisoning, with physicians often requiring multiple triggers before attempting suicide, unlike nurses who might attempt following a single trigger.[12]

HCW well-being is closely tied to their work environment. Physician burnout is significantly influenced by work-related stressors such as excessive workload, long hours, lack of control, and administrative tasks.[10,37] Extended work hours, nights, and weekends on call exacerbate stress and burnout.[30,38] Sleep deprivation from prolonged work hours increases irritability and dissatisfaction in physician-patient relationships, contributing to stress, burnout, and depression.[39] Physicians working over 80 h per week report more medical errors compared to those working fewer hours.[40]

Despite work-hour restrictions intended to benefit patients, they may increase stress for HCWs by hindering ongoing care, negatively impacting both patients and job satisfaction.[41] Dissatisfaction among HCWs is linked to increased suicidal ideation.[30] However, HCWs maintain adequate job satisfaction when they have higher autonomy in their roles.[42] Bureaucratic regulations and increasing medical documentation demands impair this autonomy, leading to stress and burnout.[43,44]

Support within the workplace from colleagues, management, or access to professional resources plays a crucial role in mitigating these issues. Colleagues who share duties and provide emotional support, along with encouraging management that promotes open communication, are critical for fostering a positive work environment.[45,46] The absence of such supportive environments can lead to emotional fatigue and burnout.[47]

The repercussions of HCW burnout extend beyond individual well-being, impacting healthcare organizations' functionality, diminishing the quality of patient care, inducing job dissatisfaction, and disrupting work-life balance.[48] Improving the work environment in practical and achievable ways can significantly reduce burnout among physicians, lower the risk of suicide, and enhance the quality of care provided to patients.[49] Addressing the root causes of physician burnout and implementing realistic strategies to improve their work environment and well-being is essential.

Addressing the rising physician suicides and mental health concerns among medical professionals requires individual and community-level interventions. Long work hours, chronic sleep deprivation, patient burden, and the profession's competitiveness contribute to emotional tolls, leading to burnout, depression, and suicide.[30] Traits like perfectionism, self-sacrifice, and impulsivity exacerbate physicians' vulnerability.[50] Fostering a culture where physicians can express vulnerabilities without fear of judgment is crucial, reducing stigma around mental health.

Educational reforms should start early, emphasizing counseling, therapy, and self-awareness for medical students, extending into residency with support mechanisms.[51] Improved physician mental health enhances patient care quality; a stress-free physician is more precise, empathetic, and efficient.

Better interpersonal relationships among physicians, nurses, and administrative staff create camaraderie and trust. Shared spaces for open discussions can combat isolation and impostor syndrome, fostering a supportive work environment.[45] Education for healthcare leaders on mental illness screening and supportive practices is essential, without equating these conditions to physician impairment.[51] Reforms should include work schedule adjustments, reduced workloads, periodic wellbeing evaluations, and flexible licensure requirements for those with mental health issues.[9]

Aid and rehabilitation for physicians with substance use disorders are crucial, with policies protecting their licensure and job opportunities during recovery.[52] Ensuring family support and healthy domestic dynamics also impacts mental health positively. Implementing these reforms could significantly reduce physician suicide rates and safeguard their well-being.

Limitations and Recommendations

There are certain limitations that must be addressed. At first, the study design involves collecting data from already conducted systematic reviews and meta-analyses. This may lead to biases in findings wherein positive outcomes only are reported in the literature. Negative findings or inconclusive ones may be inadvertently omitted. We included HCW from any discipline and did not include any geographical restrictions, therefore there is an inherent variability in the study design and population under review. This may lead to limited generalizability. Furthermore, we did not include any language limitations in order to ensure that our review did not create additional biases, but this may lead to challenges as far as cultural interpretation and accurate translation is considered of the mental health factors in different contexts—this is important when considering the consistency in data. We did not include grey literature, and this

may lead to incomplete synthesis of data due to the lack of inclusion of unpublished studies.

There are various recommendations for reducing suicide rates among HCW and improving their mental well-being.

There are 7 key areas of focus as far as the recommendations for curbing suicide in HCW is concerned. These include (i) integration of mental health education, (ii) enhancing support networks in healthcare settings, (iii) implementation of flexible work schedules, (iv) reduction of stigma surrounding mental health issues in HCW, (v) reevaluation of medical licensing policies where seeking mental health care does not jeopardize obtaining licensing, (vi) cultural shifts in the medical field where HCWs' mental well-being is emphasized in unison with clinical skills, and lastly (vii) building a community where HCW are supported—which can reduce isolation and burnout (Figure 2).

Implications for Primary Care and Community Health

There are various implications of this umbrella review for primary care/community health settings. At the center stage is a multidisciplinary approach, given the HCWs of different needs of individuals from backgrounds such as nursing, social work, and others. The prevalence we have identified of mental health issues such as depression, anxiety, and stress all the more highlight that we need targeted interventions that are tailored to differential professional groups and also based on demographics. It is also the need of the hour that workplace conditions account for increased burnout by incorporating relative freedom to optimize self work schedules. It would also be required that regular mental health screenings be incorporated in primary care settings for the healthcare provider to ensure that early interventions are in place. These should be considered together with the option of counseling services and educational programs that can help in reducing stress while inculcating the notion of self care among HCWs. Finally, we find that community health administrators must continuously assess and adapt workplace health policies to ensure that they are relevant as strategies that have worked in the past may not necessarily work in the now or in the future.

Conclusion

This umbrella review focuses on a very critical but often overlooked issues of mental well-being in HCW and the rising suicide rates. There are strenuous demands of HCW and we have seen that these were brought to light during the COVID-19 pandemic more than ever before. The roles carry societal stigma against seeking mental health support and the incredible challenges of handling personal and professional lives further add fuel to the fire. This umbrella review provides a concrete understanding of the quality of information available in current literature, the prevalence, risk factors, and preventive strategies that are key in regulating a healthy HCW pool globally. It is important to keep in mind that for healthcare systems to work and to deliver optical care, the mental health of HCW should be a topmost priority. Therefore, immediate actions are much needed, which may be conducted by applying evidence-based interventional strategies while also advocating for policy reforms. While there are various confounders in the real world, it is important to try to cultivate an environment that promotes mental health awareness, where colleagues may become aware of suicidal ideation, and where healthcare centers join hands in decreasing stigma tied to seeking professional help. Other strategies include offering more flexible working hours to HCW from all walks of life while also striving to creating an organizational level balance. It is also imperative for more research to be conducted in this area where systematic changes in healthcare settings can be critically studied to see emergent and efficacious strategies. Prioritizing the mental health of HCWs is vital not only for lowering their risk of suicide but also for enhancing the quality of care they provide to their patients.

Author's Note

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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