PUBLIC HEALTH

Cite as: Archiv EuroMedica. 2026. 16; 2. DOI 10.35630/2026/16/Iss.2.1

Received 18 February 2026;
Accepted 19 April 2026;
Published 25 April 2026

NIGHT AND SHIFT WORK – A REVIEW OF THE IMPACT ON PHYSICAL AND MENTAL HEALTH

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1. ABSTRACT

BACKGROUND

Shift and night work are essential for the functioning of modern societies but are associated with significant disruption of the circadian rhythm. This disruption has been linked to a wide range of adverse health outcomes affecting mental, physical, and endocrine function. Despite growing evidence, the multidomain consequences of shift work remain insufficiently recognized in clinical and occupational practice, and no integrative synthesis has yet examined these effects with particular emphasis on healthcare professionals.

AIMS

This review aimed to provide a comprehensive and updated synthesis of the adverse health effects of night and shift work, to identify specific risk domains, and to summarize evidence-based preventive strategies applicable in occupational settings.

METHODS

A narrative review of the literature was conducted using PubMed, Google Scholar, and ResearchGate. Publications from 2010 to 2026 were included. Eligible study types comprised meta-analyses, systematic reviews, cohort studies, and case-control studies reporting on health outcomes associated with night or shift work schedules.

RESULTS

Shift workers demonstrate significantly higher rates of depression, anxiety, suicidal ideation, and cognitive decline. Approximately 30% develop shift work disorder. Cardiometabolic consequences include hypertension, cardiovascular events, obesity, dyslipidemia, type 2 diabetes, and metabolic syndrome. Endocrine disruptions affect melatonin,

cortisol, thyroid, and sex hormones, contributing to menstrual irregularities, earlier menopause, and increased miscarriage risk.

CONCLUSIONS

Shift work exerts substantial multidomain negative effects on health. Targeted preventive interventions, including light therapy, structured sleep and meal schedules, and psychological support, are warranted, particularly in healthcare professionals and other vulnerable populations.

Keywords: shift work; circadian rhythm; sleep deprivation; depression; anxiety disorders; cardiovascular diseases; metabolic syndrome; hypertension; healthcare personnel

2. INTRODUCTION

Shift work and night work are indispensable components of modern 24-hour economies and are essential for maintaining critical infrastructure, healthcare systems, and emergency services such as the police and fire brigades [1, 2]. Despite their organizational necessity, exposure to non-standard working hours leads to significant disruption of the circadian rhythm, with wide-ranging consequences for sleep, endocrine regulation, psychological wellbeing, and cardiometabolic health [3, 4]. The scale of this problem is substantial: shift workers represent a large and growing proportion of the global workforce, yet the full scope of health risks associated with their working conditions remains insufficiently recognized in both research and clinical practice.

Previous studies have documented individual health consequences of shift work, such as sleep deprivation, fatigue, or increased rates of depression. However, the existing literature remains fragmented, with most reviews focusing on isolated outcomes or specific occupational groups, and few providing an integrated, cross-disciplinary synthesis of the simultaneous effects of circadian misalignment on mental, physical, and hormonal health. Furthermore, no comprehensive narrative review has yet examined these multidomain consequences with particular emphasis on healthcare professionals — a group uniquely exposed to long working hours, repeated night duties, and high levels of occupational stress.

The scientific novelty of this work lies in its integrative approach, combining and synthesizing current evidence across mental health, cardiometabolic risk, sleep disorders, and endocrine disturbances within a single narrative framework, seeking to provide a more precise and clinically useful characterization of the specific risk domains associated with shift and night work, rather than treating it as a uniform, undifferentiated exposure. This revive is justified by the absence of unified, clinically, oriented synthesis that integrates the multidimensional and interacting health effects of shift work – especially in healthcare workers – whereas existing literature is fragmented, single domain and poorly translated into practice.

Night and shift work also remain a significantly underestimated occupational health risk, even among physicians and other healthcare professionals who are themselves frequently subject to such schedules. While doctors may be broadly aware that night work can be harmful, this awareness is often limited to general concepts such as fatigue or reduced alertness and does not extend to a detailed understanding of the specific mental, cardiometabolic, endocrine, and reproductive risks associated with long-term circadian disruption. As a result, shift work–related health problems may go unrecognized in everyday clinical practice, and preventive strategies are frequently implemented in a nonspecific or fragmented manner. A clearer and more precise characterization of the individual risk domains is therefore necessary not only to better protect shift workers, but also to equip physicians with the knowledge needed to identify high-risk individuals and apply targeted, evidence-based preventive measures.

3. AIMS

The aim of this review is to provide a comprehensive and updated synthesis of the adverse health effects of night and shift work, with particular emphasis on healthcare professionals. The specific research objectives are:

1. to identify the main mechanisms linking shift work with adverse health outcomes across multiple physiological domains;
2. to evaluate the magnitude of risk in the areas of mental health, sleep, cardiometabolic function, and endocrine regulation;
3. to summarize evidence-based preventive and mitigation strategies applicable in occupational settings;
4. to highlight remaining research gaps, particularly regarding vulnerable populations such as women, pregnant workers, and long-term night shift employees.

4. METHODOLOGY

This article is a narrative review of the literature. It was conducted in order to collect and summarise the potential negative effects of shift work, with particular emphasis on risks related to mental health, hormonal changes and metabolic alterations. The research was based on publications available in Google Scholar, PubMed and ResearchGate. Publications from 2010 to 2026 were taken into account. The search terms used were: "night shifts" OR "night work" OR "shift work" AND ("health risk" OR "mental health" OR "depression" OR "cardiac risk" OR "metabolic risk" OR "sleep deprivation" OR "thyroid hormones" OR "melatonin excretion" OR "sex hormone levels" OR "prolactin levels" OR "sleep therapy").

Inclusion criteria were meta-analyses, systematic reviews, cohort studies, case–control studies and international or national guidelines reporting on the risks and health effects of night and shift work schedules. Exclusion criteria were single case reports, conference abstracts, non-peer-reviewed articles and publications without an association with night or shift work schedules. The initial search yielded 214 records. After removal of duplicates and application of the inclusion and exclusion criteria, 51 studies were retained for analysis.

Studies were categorised according to the type of risk assessed, including mental health problems, sleep deprivation, risk of metabolic changes and cardiovascular diseases, as well as endocrinological effects. This methodology ensures transparency of the study selection process and allows reproducibility of the review.

5. RESULTS

MENTAL HEALTH

Shift work is associated with deterioration in mental health status [5-7]. Meta-analyses of observational studies have demonstrated that night work is significantly associated with an increased risk of depression (OR/RR 1.43; 95% CI 1.24–1.64; I^2 = 78.0) [8]. In addition, women appear to be more affected by the risk of depression than men [5]. However, there is evidence suggesting that not only night work, but all forms of shift work are associated with an increased risk of depression (HR 1.22; 95% CI 1.12–1.33; $p < 0.001$) and anxiety (HR 1.16; 95% CI 1.04–1.28; $p < 0.001$). The risk was positively associated with the frequency of shift work exposure [9].

An association has also been demonstrated between long working hours (exceeding 55 hours per week) combined with shift work and suicidal ideation. In contrast to depression, this association was not sex-dependent [10]. Studies conducted among healthcare workers have further shown an increased tendency towards the use of substances such as tobacco and alcohol, with a higher prevalence observed among women compared to men [11].

Shift workers also exhibit a 1.5-fold increased risk (OR 1.56; 95% CI 1.08–2.24; $p = 0.01$), compared with day workers, of developing chronic pain or opioid use disorder. Occasional night workers demonstrated a similarly elevated risk (OR 1.57; 95% CI 1.06–2.34; $p = 0.02$); however, after adjustment for chronotype, insomnia and baseline sleep duration, these differences were no longer statistically significant [12].

Shift work may additionally impair cognitive function. A meta-analysis demonstrated a modest association between shift work and an increased incidence of dementia (pooled hazard ratio 1.13; 95% CI 1.04–1.23; $p = 0.04$). This association was also observed among night workers with exposure exceeding one year [13].

The reviewed evidence consistently demonstrates that circadian rhythm disruption resulting from night and shift work significantly increases the risk of mental health disorders. Both depression and anxiety are more prevalent among shift workers compared with day workers, with longitudinal data confirming that this relationship intensifies with greater frequency and duration of shift work exposure [6, 46]. These findings suggest that mental health deterioration should be regarded not as an incidental consequence of shift work, but as a predictable and clinically significant outcome that warrants proactive monitoring and intervention. The key results from meta-analyses examining the relationship between shift work and mental health are summarized in Table 1.

Table 1. Main results of systematic reviews and meta-analysis focused on association between shift work and mental health.

Author, Year	Study Design	Sample Size	Population	Outcome	Effect Measure	Key Result
Torquati et al., 2019	Meta-analysis of longitudinal studies	28,431 participants	General working population	Overall mental health, depression	ES 1.28; 95% CI 1.02–1.62	Increased risk of adverse mental health

						outcomes, stronger effect in women
Zhao et al., 2019	Systematic review and meta-analysis	33 studies	Mixed populations	Mental health disorders	OR varies by shift type	Strongest association for irregular and unpredictable shift work
Harris et al., 2024	Systematic review and meta-analysis	29 cohorts	New shift workers	Sleep and mental health	Not uniform	Deterioration in sleep and increase in depression and burnout after transition
Li et al., 2023	Systematic review and meta-analysis	49,909 participants	Shift workers	Poor mental health	OR 1.15; 95% CI 1.03–1.28	Higher risk in shift workers, stronger in evening chronotype
Kim et al., 2024	Systematic review and meta-analysis	28 studies	General workforce	Suicidal ideation	OR 1.34; 95% CI 1.22–1.47	Increased risk with shift work and long working hours
Lee et al., 2017	Meta-analysis of observational studies	11 studies	General population	Depression	OR/RR 1.43; 95% CI 1.24–1.64	Significant association between night work and depression

CARDIOMETABOLIC RISK

Night shift work is associated with an increased risk of cardiovascular disease (CVD). One of the principal contributors to elevated CVD risk is arterial hypertension. Individuals engaged in rotating shift work that includes night shifts exhibit a significantly higher risk of developing hypertension, with a 34% increased likelihood compared with day workers. In contrast, rotating shift work without night shifts is associated with a 26% higher risk of hypertension [14].

Furthermore, compared with individuals working exclusively during daytime hours, permanent night workers demonstrate higher blood pressure values, with an increase in systolic blood pressure (SBP) of 2.52 mmHg and diastolic blood pressure (DBP) of 1.76 mmHg. Workers engaged in rotating shift work with night shifts show an increase in SBP of 0.65 mmHg, whereas those performing rotating shift work without night shifts exhibit an increase in SBP of 1.28 mmHg [15].

Beyond hypertension, shift and night work are associated with a 17% higher risk of experiencing any cardiovascular event compared with day work. This increased risk appears to be driven primarily by a higher incidence of fatal ischemic heart disease events (relative risk [RR] 1.27), while no significant association has been identified with mortality due to other cardiovascular conditions [16]. Additionally, each 5-year period of night shift work has been linked to a 7% increase in CVD incidence, as well as a 4% increase in CVD-related mortality [17].

Night shift work also predisposes individuals to metabolic disturbances. Disruption of the circadian rhythm leads shift workers to adopt unfavorable dietary behaviors, including skipping meals, eating at irregular times, and increased nocturnal snacking. These behaviors are associated with higher consumption of saturated fats and simple sugars, resulting in excessive caloric intake [18].

As a consequence, shift workers exhibit an elevated risk of obesity. The prevalence of obesity among night workers is 23% higher compared with day workers. Moreover, the risk of developing abdominal obesity is increased by 35% relative to the risk of other obesity phenotypes [19].

Shift work is further associated with an increased risk of dyslipidemia. Evidence suggests that shift work is linked to reduced high-density lipoprotein (HDL) cholesterol levels and elevated triglyceride concentrations, while no statistically significant changes in low-density lipoprotein (LDL) cholesterol levels have been observed [20].

In addition, shift work has been implicated in the development of type 2 diabetes mellitus. This association appears to be more pronounced in women and is evident in individuals with a body mass index BMI < 30 kg/m², whereas no significant association has been demonstrated in individuals with a BMI ≥ 30 kg/m² [21].

Collectively, these factors contribute to a substantially increased risk of metabolic syndrome among shift workers. The prevalence of metabolic syndrome in this population is significantly higher than in the general population [22].

The association between shift work and increased cardiometabolic risk is well supported in the literature. Night and shift work are linked to higher rates of cardiovascular disease morbidity and mortality, with evidence from dose-response meta-analyses of cohort studies confirming that this risk increases with greater cumulative exposure [47]. Metabolic disturbances, including dyslipidemia, insulin resistance, obesity, and metabolic syndrome, are also significantly more prevalent among shift workers, with longitudinal data indicating a clear relationship between the duration and pattern of shift work and the magnitude of metabolic risk [48]. These findings highlight the importance of treating shift work as a modifiable cardiovascular and metabolic risk factor alongside conventional risk markers.

SLEEP DEPRIVATION

Night and shift workers are inherently predisposed to sleep disturbances due to circadian misalignment associated with non-standard work schedules**.** These disturbances adversely affect not only workers' health and sleep quality but also occupational safety and overall work performance. Evidence indicates that shift workers experience more frequent nocturnal awakenings, prolonged sleep-onset latency, and poorer overall sleep quality compared with day workers [23]. In addition, shift work is associated with a reduction in total sleep duration, with sleep debt progressively accumulating as the number of night shifts increases [24].

The severity of sleep disturbances among shift workers is influenced by individual chronotype as well as the type and timing of shifts performed. Individuals with an evening chronotype tend to lose more sleep when working early morning shifts, whereas those with a morning chronotype experience greater sleep disruption and poorer sleep outcomes during night work [25]. These associations have been observed in both men and women, suggesting that the interaction between chronotype and shift schedule is a robust determinant of sleep loss and circadian disruption [26].

Disruption of the sleep–wake rhythm and prolonged exposure to night work may also impair cognitive and motor performance, thereby increasing the risk of occupational errors. A recent systematic review and meta-analysis demonstrated that night shift work among nurses is associated with significant declines in cognitive and motor functioning compared with day shifts, highlighting potential consequences for patient safety and clinical performance [27]. Furthermore, extended shift durations have been identified as an additional risk factor for errors in nursing practice. A systematic review of studies conducted in acute care settings found higher rates of errors and adverse events among nurses working shifts lasting 12 hours or longer compared with those working shorter shifts, underscoring the combined impact of shift timing and shift length on safety outcomes [28].

By definition, shift and night work disrupt the sleep–wake rhythm and may lead to the development of Shift Work Disorder (SWD). SWD is a circadian rhythm sleep disorder diagnosed based on four main criteria: (1) the presence of insomnia or excessive sleepiness temporally associated with a recurring work schedule overlapping the usual time for sleep; (2) persistence of symptoms in relation to the shift work schedule for at least one month; (3) objective evidence from sleep logs or actigraphy monitoring for a minimum of seven days demonstrating circadian misalignment and disturbed sleep timing; and (4) exclusion of other sleep, medical, neurological or mental disorders, as well as medication use or substance use disorders, as a better explanation for the symptoms [29].

Three phenotypes of SWD have been identified: insomnia-predominant, excessive sleepiness-predominant, and a mixed phenotype. Up to 30% of shift workers may present with symptoms consistent with this disorder [30]. An observational study conducted among nurses demonstrated a strong association between SWD and both depression and anxiety. Individuals at high risk of SWD exhibited significantly higher levels of depression ($M = 7.54 \pm SD\ 4.28$ vs. $M = 3.78 \pm SD\ 3.24$; $p < 0.001$) and anxiety ($M = 5.66 \pm SD\ 3.82$ vs. $M = 2.83 \pm SD\ 3.33$; $p < 0.001$) compared with those at low risk [31].

HORMONAL CHANGES

The endocrine system is regulated by the circadian rhythm in multiple tissues, and disruption of this rhythm may adversely affect hormone concentrations and lead to dysfunctional hormonal activity. Shift and night workers, due to their altered sleep–wake patterns, are particularly exposed to fluctuations in the levels of various hormones.

One such hormone is melatonin. Its main urinary metabolite, 6-sulfatoxymelatonin (aMT6s), which accurately reflects circulating melatonin levels, has been studied in nurses working night shifts and day shifts. The results demonstrated that nurses working at night had lower nocturnal aMT6s concentrations, a delayed onset of melatonin secretion, and reduced peak levels compared with day-shift nurses [32].

Hormones of the thyroid axis are also affected by circadian rhythm disruption. Night workers were found to have higher mean concentrations of thyroid-stimulating hormone (TSH) and free thyroxine (fT4) compared with day workers [33]. At the same time, they were more frequently affected by subclinical hypothyroidism [34].

Another hormone whose rhythm is disturbed by shift work is cortisol. This is largely due to increased exposure to artificial light, daytime napping, and heightened activity during the biological night. These factors lead to a gradual disruption of cortisol secretion patterns, flattening of the circadian peak, and an overall elevation of cortisol levels [35].

Hormones responsible for sexual function also respond to circadian disruption associated with shift work. Men working night shifts exhibited delayed testosterone peaks compared with day workers [36]. Additionally, their overall testosterone levels were lower than those observed in men working daytime schedules [37].

In women, changes in sex hormone levels associated with shift work are less well studied. However, menstrual cycle disturbances observed in women working night shifts suggest dysregulation of the hypothalamic–pituitary–ovarian axis. These women may experience dysmenorrhea and increased cycle irregularity [38]. Furthermore, studies have shown that women who work night shifts for many years tend to experience menopause at a younger age than women working daytime schedules [39].

Despite observed hormonal alterations, there is no strong evidence that night shift work substantially increases the risk of infertility [40]. In contrast, shift work, particularly permanent night work, has been associated with an increased risk of miscarriage of up to 50% compared with women working daytime schedules [41].

There is no clear evidence that shift work significantly disrupts prolactin concentrations. In studies of night-shift nurses, smoking and menopausal status were found to be more important factors affecting prolactin secretion rhythms than shift work itself [42].

Endocrine disruption represents another important and clinically underappreciated consequence of long-term exposure to shift work. Evidence from systematic reviews and meta-analyses indicates that night shift workers exhibit significantly lower melatonin levels compared with day workers, reflecting the suppressive effect of nocturnal light exposure on the pineal gland [49]. Thyroid function is also affected, with night workers showing altered TSH and fT4 concentrations and a higher prevalence of subclinical hypothyroidism [50]. In addition, shift work during pregnancy has been associated with an increased risk of adverse reproductive and perinatal outcomes, including preterm birth and low birth weight, further underscoring the clinical relevance of occupational circadian disruption in vulnerable populations [51].

A comprehensive overviev of the quantitative findings from systematic reviews and meta-analyses across cardiometabolic, sleep-related and endocrine domains is presented in Table 2.

Table 2. Main results of systematic reviews and meta-analysis focused on association between shift work and physical health.

Author, Year	Study Design	Sample Size	Population	Outcome	Effect Measure	Key Result
Gamboa Madeira et al., 2021	Systematic review and meta-analysis	46,345 shift workers vs 70,907 controls	General workforce	Blood pressure, hypertension	SBP +2.52 mmHg; DBP +1.76 mmHg	Night work associated with higher blood pressure and hypertension risk

Xi et al., 2025	Systematic review and dose-response meta-analysis	23 cohort studies	General population	Cardiovascular disease	RR 1.13; mortality RR 1.27	Increased risk of CVD events and mortality, risk rises with duration
Sun et al., 2018	Meta-analysis	28 studies	General population	Obesity	OR 1.23; abdominal obesity OR 1.35	Higher prevalence of obesity, especially abdominal type
Dutheil et al., 2020	Systematic review and meta-analysis	197,063 participants	General workforce	Dyslipidemia	HDL −0.08; TG +0.09	Reduced HDL and increased triglycerides in shift workers
Xie et al., 2024	Meta-analysis of cohort studies	10 cohort studies	Adults	Type 2 diabetes	HR 1.28 in women	Increased diabetes risk, sex-specific effect observed
Wang et al., 2021	Systematic review and meta-analysis	274,263 participants	General population	Metabolic syndrome	OR 1.35	Higher prevalence of metabolic syndrome in shift workers
Pallesen et al., 2021	Systematic review and meta-analysis	29 studies	Shift workers	Shift Work Disorder	Prevalence 26.5%	High prevalence with substantial heterogeneity
Luo et al., 2023	Systematic review and meta-analysis	7 studies	General workforce	Thyroid function	TSH ↑; fT4 ↑	Altered thyroid hormone levels in shift workers
Chang et al., 2021	Meta-analysis	14 studies	Women	Menstrual disorders	OR increased	Higher risk of menstrual irregularity and dysmenorrhea
Hu et al., 2023	Meta-analysis	195,538 women	Female workers	Reproductive outcomes	OR increased	Increased risk of menstrual disorders and early menopause
Bonde et al., 2013	Systematic review and meta-analysis	30 studies	Pregnant workers	Miscarriage	RR 1.51	Increased miscarriage risk in night workers

WHAT CAN BE DONE TO LOWER THE RISK?

Shift work leads to multiple disturbances of physiological homeostasis and increases the risk of numerous serious diseases. Nevertheless, in many workplaces such as hospitals or factories, night work is unavoidable. Therefore, several strategies aimed at mitigating the negative effects of shift work should be considered.

A substantial proportion of the adverse consequences associated with night shift work result from significant sleep deprivation. Several approaches have been proposed to improve sleep regulation, particularly in night shift workers. Among these, light therapy appears to be the most effective intervention [43]. Pharmacological approaches, cognitive behavioral therapy (CBT), and aromatherapy have also shown some effectiveness; however, the results have generally been less promising [44].

Psychological support provided by employers may reduce both sleep disturbances and the risk of developing mental health disorders. Additionally, the provision of extra days off has been shown to alleviate mental health problems. Adherence to a structured meal schedule allows for better control of caloric intake and consequently reduces the risk of overweight and obesity [45], which are important risk factors for cardiovascular events. Furthermore, night shift work should be avoided during pregnancy, particularly during the first trimester.

6. DISCUSSION

The findings of this narrative review indicate that night and shift work constitute a relevant and multidimensional occupational health risk. The available evidence consistently shows that circadian misalignment associated with non-standard working hours affects several physiological systems simultaneously, contributing to adverse outcomes in mental health, sleep regulation, cardiometabolic status, and endocrine balance [1, 2, 5]. These consequences likely interact with one another, creating a cumulative burden in which sleep deprivation, hormonal disruption, psychological strain, and metabolic disturbances mutually reinforce their negative effects.

Sleep disturbances and mental health consequences are among the earliest and most consistently reported effects of shift work. The association between shift work and depression, anxiety, and suicidal ideation suggests that the impact of circadian disruption extends well beyond fatigue [6, 8, 10]. Both depression and anxiety are more prevalent among shift workers, with longitudinal data confirming that this relationship intensifies with greater frequency and duration of exposure [6, 46]. These findings are especially relevant in healthcare workers, in whom high workload and repeated night duties may further amplify psychological vulnerability [5, 11]. Approximately 30% of shift workers develop shift work disorder, and the progressive accumulation of sleep debt increases the risk of cognitive impairment and occupational errors [23, 27 - 29].

Shift work is also associated with substantially increased cardiometabolic risk. Dose-response meta-analyses confirm that the risk of cardiovascular disease morbidity and mortality increases with greater cumulative exposure to night work [17, 47]. Metabolic disturbances, including obesity, dyslipidemia, type 2 diabetes, and metabolic syndrome, are significantly more prevalent among shift workers, with the magnitude of risk increasing with the duration and irregularity of shift patterns [21, 22, 48]. These findings support recognizing shift work as a modifiable cardiometabolic risk factor alongside conventional markers.

Endocrine disruption represents a further clinically underappreciated consequence of shift work. Reduced melatonin levels, altered TSH and fT4 concentrations, disrupted cortisol rhythms, and changes in sex hormone secretion indicate that endocrine pathways are a plausible biological mechanism linking circadian misalignment with long-term disease risk [32, 33, 35, 49, 50]. In women, associations with menstrual irregularities, earlier menopause, and increased miscarriage risk are of particular clinical importance [38, 39, 41, 51].

In line with the growing positive trend toward personalized medicine, clinicians should increasingly evaluate patients not merely through the lens of their diagnoses, but rather as a whole, taking into account their lifestyle and individual predispositions. Night and shift work, as a significant determinant of lifestyle, should accordingly be considered as part of this holistic assessment. In this context, it may be warranted to consider modifications to established treatment regimens for conditions such as arterial hypertension or insomnia — modifications that could involve the selection of pharmacological agents tailored to the patient's occupational schedule, or the adjustment of dosing timing to better align with their working and sleep patterns.

Night work remains an underestimated risk factor in both clinical and occupational practice. Awareness among physicians is often limited to general consequences such as fatigue, while knowledge of specific risk domains remains insufficient to support targeted prevention and early identification of vulnerable workers [5, 7]. This review aims to contribute to closing that gap.

As a narrative review, this work has inherent methodological limitations, including heterogeneity across included studies and the observational nature of most available evidence, which precludes definitive causal conclusions. Future research should prioritize identifying the most harmful shift patterns, vulnerable subgroups, and effective preventive

interventions, with particular attention to chronotype, sex-specific effects, and the role of psychosocial stress [25, 26, 43 - 45]

7. CONCLUSION

Shift and night work are associated with significant adverse effects on mental health, sleep quality, cardiometabolic status, and endocrine function. The evidence summarized in this review indicates that circadian disruption is a key mechanism underlying these associations and may contribute to both short-term impairment and long-term disease risk. Healthcare workers constitute a particularly vulnerable group due to frequent exposure to repeated night shifts, long working hours, and high occupational stress.

These findings support the view that night work should be treated as an important and still insufficiently recognized occupational risk factor. Better understanding of the specific health consequences of shift work may improve prevention, support earlier recognition of complications, and enable more targeted interventions in occupational and clinical practice.

8. DISCLOSURE

AUTHORS' CONTRIBUTIONS

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All authors have read and agreed with the published version of the manuscript.

9. USE OF ARTIFICIAL INTELLIGENCE:

The authors declare that no artificial intelligence tools were used in the generation, writing, editing, or revision of this manuscript. All content was created solely by the authors.

10. FUNDING

The article did not receive any funding.

11. CONFLICT OF INTEREST

Authors declare no conflicts of interest.

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