

Review article

Night-shift work, sleep disturbance, and obesity risk: A review of epidemiological evidence and biological mechanisms in Thailand

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Abstract

Obesity is a major global public health challenge and an important risk factor for non-communicable diseases (NCDs), including cardiovascular disease, type 2 diabetes mellitus, and metabolic syndrome. Increasing evidence suggests that night-shift work and sleep disturbance may contribute to obesity through circadian disruption, hormonal dysregulation, metabolic impairment, and behavioral changes. These issues are becoming increasingly relevant in Thailand due to rapid urbanization and expansion of shift-based labor systems. This narrative review aimed to synthesize current epidemiological evidence and biological mechanisms linking night-shift work, sleep disturbance, and obesity risk, with particular emphasis on the Thai context. A structured narrative review was conducted using PubMed, Scopus, Google Scholar, and Thai Journals Online (ThaiJO). The literature search was performed between August and October 2025 and included studies published between January 2000 and October 2025. Search terms related to night-shift work, sleep disturbance, circadian disruption, obesity, metabolic syndrome, and Thailand were applied. Of approximately 120 initially identified articles, 24 studies met the predefined inclusion criteria and were included in the final review. Evidence was synthesized narratively due to heterogeneity in study designs and outcome measures. Current evidence consistently indicates that night-shift workers are at increased risk of overweight, abdominal obesity, metabolic syndrome, and impaired glucose metabolism compared with day workers. Meta-analyses report that night-shift workers have approximately a 23% higher risk of overweight or obesity and a 35% greater likelihood of abdominal obesity. Biological evidence suggests that sleep deprivation and circadian misalignment alter appetite-regulating hormones, impair insulin sensitivity, and disrupt energy metabolism. Thai studies, although limited, demonstrate similar patterns, particularly among healthcare workers and individuals with metabolic disease exposed to irregular work schedules. Night-shift work and sleep disturbance appear to be important occupational determinants of obesity and metabolic dysfunction. Circadian disruption, hormonal alterations, and behavioral adaptations may collectively contribute to increased obesity risk among shift-working populations. Integrating sleep health and occupational considerations into obesity prevention and public health strategies may help reduce the growing burden of obesity and related NCDs, particularly in rapidly developing countries such as Thailand.

Keywords: Night-shift work, Sleep disturbance, Obesity, Circadian rhythm, Occupational health

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Introduction

Obesity has become a major global public health challenge, with prevalence increasing substantially over recent decades. Excess body weight is a major risk factor for non-communicable diseases (NCDs), including cardiovascular disease, type 2 diabetes mellitus, hypertension, and certain cancers, contributing significantly to global morbidity and mortality (World Health Organization [WHO], 2025). Rising obesity prevalence has been linked to complex interactions among dietary transition, sedentary lifestyles, urbanization, and socioeconomic change. In Thailand, obesity prevalence has increased markedly alongside rapid economic development and urban expansion. Data from the Thai National Health Examination Surveys demonstrated that obesity prevalence among Thai adults increased from 13.0% in men and 23.3% in women in 1991 to 22.4% and 34.3%, respectively, by 2004 (Aekplakom et al., 2009). More recent evidence continues to indicate substantial levels of overweight and obesity among Thai populations, reflecting the growing national burden of obesity-related diseases (Sakboonyarat et al., 2020).

Beyond traditional lifestyle determinants, increasing attention has been directed toward the role of sleep and circadian regulation in metabolic health. Sleep is essential for appetite regulation, glucose metabolism, hormonal balance, and energy homeostasis. Experimental studies have shown that sleep restriction increases ghrelin levels while reducing leptin signaling, thereby promoting hunger and increased caloric intake (Leproult & Cauter, 2010). In addition, insufficient sleep has been associated with impaired insulin sensitivity and increased susceptibility to obesity and metabolic dysfunction (Papatriantafyllou et al., 2022). Sleep disturbance may also contribute to behavioral changes associated with weight gain, including reduced physical activity, fatigue, and irregular eating patterns.

Night-shift work represents one of the most important occupational sources of chronic sleep disturbance and circadian disruption in modern societies. Increasing reliance on 24-hour service systems in healthcare, transportation, manufacturing, and hospitality sectors has substantially increased exposure to irregular work schedules. Individuals working night shifts

frequently experience circadian misalignment, shortened sleep duration, and poor sleep quality, all of which may adversely affect metabolic regulation. Epidemiological evidence consistently indicates that shift workers have higher prevalence of overweight and obesity compared with daytime workers. A meta-analysis by Sun et al. (2018) reported that night-shift workers had approximately a 23% higher risk of overweight or obesity and a 35% greater likelihood of abdominal obesity than non-shift workers. Similarly, systematic reviews have demonstrated significant associations between short sleep duration, increased body mass index (BMI), and metabolic syndrome (Itani et al., 2017). Collectively, these findings suggest that sleep disturbance contributes to obesity through both physiological and behavioral pathways.

The relationship between sleep disturbance and obesity has been extensively investigated in Western populations; however, its implications are increasingly relevant in rapidly developing countries such as Thailand. Urbanization, occupational transition, and expansion of a 24-hour economy have increased the demand for shift-based labor within the Thai workforce. Consequently, a growing proportion of workers are exposed to chronic circadian disruption and irregular sleep schedules that may contribute to long-term metabolic risk. Emerging evidence from Thailand suggests that occupational factors may contribute substantially to obesity and metabolic disorders. Studies among Thai healthcare workers and night-shift workers with type 2 diabetes mellitus have reported higher prevalence of obesity, increased caloric intake, and poorer glycemic control among individuals exposed to irregular work schedules (Intarakamhang et al., 2023; Manodpitipong et al., 2017).

Despite increasing recognition of the association between sleep disturbance and obesity, several important knowledge gaps remain. First, most epidemiological evidence regarding shift work and obesity has been derived from North American and European populations, whereas evidence from Southeast Asia remains comparatively limited (Sun et al., 2018). Second, previous reviews have often focused either on epidemiological associations or biological mechanisms

independently, resulting in limited integration of these perspectives within a single review (Papatriantafyllou et al., 2022; Leproult & Cauter, 2010). Third, although Thailand has experienced increasing obesity prevalence alongside expansion of shift-based occupations, there remains limited Thailand-focused evidence synthesizing how night-shift work and sleep disturbance contribute to obesity risk. Furthermore, evidence regarding vulnerable occupational groups, particularly healthcare workers, remains fragmented.

To our knowledge, no previous review has comprehensively integrated epidemiological evidence and biological mechanisms linking night-shift work, sleep disturbance, and obesity risk specifically within the Thai context. Therefore, this narrative review aims to examine current epidemiological evidence and biological mechanisms associated with night-shift work, sleep disturbance, and obesity risk, with particular emphasis on Thailand. This review also discusses occupational health implications and identifies future research directions relevant to obesity prevention and metabolic health promotion in shift-working populations.

Objectives

This review aims to synthesize current evidence on the relationship between night-shift work, sleep disturbance, and obesity risk. Specifically, the objectives of this review are to:

1. Examine epidemiological evidence linking night-shift work with overweight and obesity.
2. Summarize the biological mechanisms through which sleep deprivation and circadian disruption contribute to metabolic dysregulation and weight gain.
3. Review available evidence regarding obesity and sleep disturbance among night-shift workers in Thailand.
4. Identify research gaps and discuss implications for occupational health policies and obesity prevention strategies.

Methods

This study was conducted as a narrative review to synthesize current evidence regarding the relationship between night-shift work, sleep disturbance, and obesity

risk, with particular emphasis on epidemiological evidence and biological mechanisms relevant to the Thai context. A narrative review approach was selected because the topic encompasses diverse evidence from occupational health, sleep medicine, endocrinology, epidemiology, and public health research. Although this review was not designed as a formal systematic review or meta-analysis, structured methodological procedures were implemented to enhance transparency, reproducibility, and consistency in the literature selection and synthesis process.

A structured literature search was conducted between August and October 2025 using electronic databases including PubMed, Scopus, Google Scholar, and Thai Journals Online (ThaiJO). Studies published between January 2000 and October 2025 were considered for inclusion. The search strategy incorporated combinations of keywords and Medical Subject Headings (MeSH) related to night-shift work, sleep disturbance, circadian disruption, obesity, metabolic disorders, and Thailand. Search terms included “night-shift work,” “shift work,” “sleep disturbance,” “circadian disruption,” “obesity,” “body mass index,” “metabolic syndrome,” and “Thailand.” Boolean operators such as “AND” and “OR” were used to refine the search strategy. An example search strategy applied in PubMed was: (“night-shift work” OR “shift work”) AND (“sleep disturbance” OR “circadian disruption”) AND (“obesity” OR “body mass index” OR “metabolic syndrome”) AND (“Thailand” OR “Thai population”). Reference lists of relevant studies were also manually screened to identify additional articles. The initial search identified approximately 120 articles potentially relevant to the review topic.

Studies were included if they examined associations between shift work, sleep disturbance, circadian disruption, and obesity-related outcomes among adult or working-age populations. Original research articles and review studies published in English or Thai were considered eligible. Obesity-related outcomes included body mass index (BMI), overweight, obesity prevalence, abdominal obesity, and metabolic syndrome. Conference abstracts, editorials, commentaries, unpublished manuscripts,

pediatric studies, and articles lacking sufficient methodological information were excluded.

The literature screening process was conducted independently by two reviewers. Titles and abstracts were initially screened for relevance, followed by full-text review based on predefined inclusion and exclusion criteria. Disagreements regarding study eligibility or interpretation were resolved through discussion and consensus to minimize selection bias and improve consistency in article selection. Following screening and eligibility assessment, 24 studies were included in the final narrative synthesis.

Relevant data from included studies were extracted and synthesized narratively. Extracted information included study characteristics, country and population, study design, exposure to shift work or sleep disturbance, obesity-related outcomes, and principal findings. The evidence was organized thematically to summarize epidemiological trends, biological mechanisms, circadian disruption pathways, and occupational health implications associated with obesity risk among night-shift workers. Due to heterogeneity in study designs, exposure definitions, and outcome measurements, quantitative meta-analysis was not performed.

The methodological quality and potential sources of bias within the included literature were also considered during evidence synthesis. Particular attention was given to study design, exposure assessment methods, obesity classification criteria, and potential confounding factors such as dietary behavior, physical activity, and socioeconomic status. Many included studies relied on self-reported sleep duration and work schedules, which may introduce recall and reporting bias. In addition, the predominance of cross-sectional studies limited causal interpretation. Although a formal quantitative risk-of-bias assessment tool was not applied due to the narrative nature of the review, interpretation of findings considered the methodological strengths and limitations of the included studies.

Global Obesity Epidemiology

Obesity has become a major global public health challenge, with prevalence increasing substantially

over the past several decades. Rising body mass index (BMI) has been observed in both high-income and low- and middle-income countries, driven largely by urbanization, increased consumption of energy-dense foods, reduced physical activity, and sedentary lifestyles (WHO, 2025; World Obesity Federation, 2024). As a result, obesity is now a major contributor to non-communicable diseases (NCDs), including cardiovascular disease, type 2 diabetes mellitus, and certain cancers. Large epidemiological studies indicate that obesity prevalence has risen continuously since the 1990s and now exceeds underweight prevalence in many regions worldwide (NCD Risk Factor Collaboration [NCD-RisC], 2024). High BMI also contributes substantially to disability-adjusted life years (DALYs) and premature mortality through its association with metabolic and cardiovascular diseases (Institute for Health Metrics and Evaluation [IHME], 2019).

Similar trends have been observed in Southeast Asia, including Thailand. National Health Examination Survey (NHES) data demonstrated that obesity prevalence among Thai adults increased from 13.0% to 22.4% among men and from 23.3% to 34.3% among women between 1991 and 2004 (Aekplakorn et al., 2009). More recent studies continue to report high levels of overweight and obesity across Thai populations, highlighting the growing national burden of obesity-related diseases (Jitnarin et al., 2011; Sakboonyarat et al., 2020). Rapid urbanization, dietary transition, and increasingly sedentary lifestyles may further contribute to obesity risk in Thailand. High BMI has also become a major contributor to cardiovascular disease, hypertension, and diabetes within the Thai population (IHME, 2019).

In addition to lifestyle factors, increasing attention has been directed toward occupational determinants of obesity. Expansion of shift-based labor in healthcare, manufacturing, transportation, and service industries has increased exposure to irregular work schedules and sleep disruption. Emerging evidence suggests that circadian disruption and poor sleep may contribute to obesity through both metabolic and behavioral pathways. Studies among Thai healthcare

workers have reported high prevalence rates of overweight and obesity, potentially associated with night-shift schedules and sleep deprivation (Intarakamhang et al., 2023). Collectively, these findings suggest that obesity is a multifactorial condition influenced not only by diet and physical activity, but also by occupational and sleep-related factors, particularly in rapidly developing countries such as Thailand. Key epidemiological and mechanistic studies examining the relationship between night-shift work, sleep disturbance, and obesity risk are summarized in Table 1.

Obesity Trends in Thailand

Thailand has experienced a substantial increase in obesity prevalence over recent decades, reflecting rapid socioeconomic development, urbanization, and lifestyle transition. Data from the National Health Examination Surveys (NHES) demonstrated that obesity prevalence among Thai adults increased from 13.0% in men and 23.3% in women in 1991 to 22.4% and 34.3%, respectively, by 2004 (Aekplakorn et al., 2009). More recent studies continue to report high prevalence of overweight and obesity across Thai populations, with some groups reporting obesity prevalence exceeding one-third of adults (Jitnarin et al., 2011; Sakboonyarat et al., 2020). High body mass index (BMI) also contributes substantially to disability-adjusted life years (DALYs) in Thailand, particularly through cardiovascular disease, hypertension, and type 2 diabetes mellitus (IHME, 2019).

The increasing prevalence of obesity in Thailand likely reflects broader socioeconomic and occupational transitions accompanying rapid urbanization and modernization. Increased consumption of energy-dense foods, reduced physical activity, sedentary occupations, and changing dietary behaviors may collectively contribute to rising metabolic risk among Thai populations. In addition, expansion of healthcare, transportation, manufacturing, and service industries operating within a 24-hour economy has increased exposure to shift-based labor, irregular work schedules, and chronic sleep disruption. These occupational changes may further exacerbate obesity risk through circadian misalignment, irregular eating patterns, reduced sleep duration, and

limited opportunities for physical activity.

Emerging evidence suggests that occupational and sleep-related factors may contribute substantially to metabolic health in Thailand. Studies among Thai healthcare workers have reported high prevalence rates of overweight and obesity, potentially associated with night-shift work, work-related stress, and lifestyle irregularities (Intarakamhang et al., 2023). Similarly, night-shift workers with metabolic disease have demonstrated higher caloric intake, increased BMI, and poorer glycemic control compared with day workers (Manodpitipong et al., 2017). These findings suggest that obesity in Thailand should be viewed not only as a consequence of individual lifestyle behaviors, but also as a multifactorial public health problem influenced by occupational, environmental, and sleep-related determinants.

Collectively, current evidence indicates that ongoing urbanization and expansion of shift-based labor may further increase metabolic risk within the Thai workforce. These trends highlight the importance of incorporating occupational health and sleep-related considerations into obesity prevention and non-communicable disease (NCD) control strategies in Thailand.

Night-Shift Work as a Risk Factor

Night-shift work is increasingly recognized as an important occupational determinant of obesity and metabolic disorders. Working during nighttime hours disrupts circadian rhythms and often leads to chronic sleep restriction and circadian misalignment, conditions associated with increased body mass index (BMI), impaired glucose metabolism, and elevated risk of obesity-related diseases (Brum et al., 2020; Scheer et al., 2009). As healthcare, transportation, manufacturing, and service industries increasingly operate on a 24-hour basis, exposure to shift-based work schedules has become more common worldwide.

Epidemiological evidence consistently supports the association between shift work and obesity. Meta-analyses have shown that night-shift workers have approximately a 23% higher risk of overweight or obesity and a 35% greater likelihood of abdominal obesity compared with day workers (Sun et al., 2018).

Longitudinal studies further suggest that prolonged exposure to shift work is associated with progressive weight gain and increased BMI over time (Drongelen et al., 2011). In addition, systematic reviews have linked shift work with metabolic syndrome, type 2 diabetes mellitus, and cardiovascular disease (Gan et al., 2015; Wang et al., 2011). Collectively, these findings suggest that irregular work schedules may contribute substantially to metabolic dysregulation and obesity risk.

Sleep disruption appears to play a central role in this relationship. Meta-analyses have demonstrated that short sleep duration is significantly associated with increased obesity risk in both children and adults (Cappuccio et al., 2008). Night-shift workers frequently experience irregular sleep timing, insufficient sleep, and poor sleep quality, which may contribute to metabolic imbalance and weight gain. However, some studies have reported weaker associations after adjustment for lifestyle and socioeconomic factors, suggesting that diet quality, physical activity, occupational environments, and duration of shift-work exposure may partially influence observed outcomes. Individual susceptibility may also vary according to chronotype and adaptation to circadian disruption. Furthermore, social jetlag, defined as misalignment between biological and social timing, has also been associated with increased obesity risk (Roenneberg et al., 2012).

Biological evidence further supports these epidemiological observations. Experimental studies have shown that sleep deprivation and circadian misalignment alter appetite-regulating hormones by increasing ghrelin and decreasing leptin levels, thereby promoting hunger and increased caloric intake (Leproult & Cauter, 2010). Sleep restriction has also been associated with impaired insulin sensitivity and altered glucose metabolism, contributing to metabolic dysfunction (Papatriantafyllou et al., 2022). Occupational studies provide additional real-world evidence; for example, night-shift workers with type 2 diabetes have demonstrated higher caloric intake, increased BMI, and poorer glycemic control compared with day workers (Manodpitipong et al., 2017).

Overall, current evidence suggests that night-shift work contributes to obesity through complex

interactions among circadian disruption, sleep deprivation, hormonal dysregulation, metabolic impairment, and behavioral factors. Nevertheless, variability across studies indicates that the relationship may differ according to occupational setting, lifestyle behaviors, duration of shift-work exposure, and individual susceptibility. These findings highlight the importance of considering occupational and sleep-related determinants in obesity prevention and metabolic health strategies, particularly in rapidly developing countries with expanding shift-based labor systems such as Thailand.

Biological Mechanisms

The relationship between night-shift work, sleep disturbance, and obesity is mediated through multiple interconnected physiological and behavioral pathways. Circadian disruption, hormonal dysregulation, metabolic impairment, and behavioral adaptations collectively contribute to altered energy balance and increased obesity risk among individuals exposed to irregular work schedules. These mechanisms provide biological plausibility for epidemiological evidence linking shift work and sleep disturbance with increased body mass index (BMI) and metabolic disorders (Brum et al., 2020; Sun et al., 2018; Wang et al., 2011).

Circadian Disruption

Circadian rhythms regulate essential physiological processes, including sleep-wake cycles, hormone secretion, glucose metabolism, and energy homeostasis. Night-shift work disrupts synchronization between endogenous circadian clocks and environmental cues such as the light-dark cycle, leading to circadian misalignment. Individuals working during nighttime hours and sleeping during the day may therefore experience impaired metabolic regulation (Brum et al., 2020; Scheer et al., 2009). Experimental studies have shown that circadian disruption adversely affects glucose tolerance, insulin sensitivity, and blood pressure regulation (Scheer et al., 2009). Observational evidence further indicates that individuals experiencing social jetlag, defined as misalignment between biological and social time, have higher BMI and increased obesity risk (Roenneberg et al., 2012). However, susceptibility to

circadian disruption may vary among individuals, as chronotype appears to influence adaptation to night-shift schedules.

Hormonal Regulation

Sleep deprivation and circadian misalignment can disrupt hormonal regulation of appetite and energy balance. Experimental studies have demonstrated that insufficient sleep increases ghrelin levels while reducing leptin signaling, thereby promoting hunger and increased caloric intake (Leproult & Cauter, 2010). Circadian disruption may also alter the timing of appetite-related hormone secretion. For example, experimental evidence suggests that circadian misalignment increases circulating acylated ghrelin concentrations, potentially enhancing hunger signals during nighttime hours (Qian et al., 2023). Population studies further support these findings, as short sleep duration has been consistently associated with increased obesity risk (Cappuccio et al., 2008). Collectively, these findings suggest that hormonal dysregulation represents an important mechanism linking sleep disturbance with weight gain and metabolic imbalance.

Metabolic Effects

Beyond hormonal alterations, sleep restriction and circadian disruption can impair metabolic regulation. Experimental studies indicate that reduced sleep duration decreases insulin sensitivity and disrupts glucose metabolism, thereby increasing susceptibility to metabolic dysfunction (Papatriantafyllou et al., 2022). Circadian misalignment has also been associated with altered lipid metabolism and reduced energy expenditure (Scheer et al., 2009). Chronic disruption of peripheral metabolic clocks in tissues such as the liver, adipose tissue, and skeletal muscle may further impair metabolic homeostasis and promote energy storage. Epidemiological evidence supports these mechanisms, as long-term shift work has been associated with increased risk of metabolic syndrome and type 2 diabetes mellitus (Gan et al., 2015; Wang et al., 2011).

Behavioral Factors

Behavioral adaptations associated with night-shift work may further exacerbate the biological effects of circadian disruption. Shift workers frequently experience irregular meal timing, nighttime eating, and increased

consumption of energy-dense foods due to limited healthy food availability during nighttime hours. Experimental and observational studies indicate that sleep restriction is associated with increased daily caloric intake, with some studies reporting an average increase of approximately 385 kcal/day during periods of insufficient sleep (Caspers et al., 2021). Fatigue related to sleep deprivation may also reduce physical activity and increase sedentary behavior. These behavioral changes interact with hormonal and metabolic alterations to create a physiological environment that favors positive energy balance and obesity development.

Overall, current evidence suggests that the relationship between night-shift work and obesity is multifactorial, involving complex interactions among circadian biology, endocrine regulation, metabolic dysfunction, and behavioral factors. Although most evidence supports a positive association between circadian disruption and obesity risk, variability across studies may reflect differences in occupational settings, duration of shift-work exposure, dietary behaviors, and individual susceptibility. Understanding these mechanisms is important for clarifying the biological basis of shift work-related metabolic risk and for informing targeted occupational health interventions aimed at reducing obesity among shift-working populations. The conceptual pathways linking night-shift work, circadian disruption, and obesity risk are summarized in Figure 2.

Evidence from Shift-Worker Studies

International Evidence

A substantial body of international research has examined the relationship between shift work and obesity, with many studies identifying shift work as an important occupational determinant of metabolic health. Large epidemiological studies and meta-analyses consistently report that individuals engaged in night-shift or rotating shift work have higher body mass index (BMI) and greater prevalence of central obesity compared with day workers. A meta-analysis by Sun et al. (2018) reported that night-shift workers had approximately a 23% higher risk of overweight or obesity and a 35%

greater likelihood of abdominal obesity than non-shift workers. Similar findings have been reported in systematic reviews linking long-term shift work with increased risk of metabolic syndrome, cardiovascular disease, and impaired glucose regulation (Boini et al., 2022; Brum et al., 2020). Collectively, these findings suggest that chronic exposure to irregular work schedules may substantially contribute to metabolic dysfunction and obesity risk.

These epidemiological findings are supported by broader evidence regarding sleep disruption and metabolic health. Chronic circadian misalignment and sleep restriction among shift workers may impair energy metabolism, appetite regulation, insulin sensitivity, and glucose homeostasis, thereby increasing susceptibility to weight gain and obesity-related disorders. Observational studies have also demonstrated that shift workers frequently exhibit altered glucose tolerance, reduced insulin sensitivity, and increased central adiposity compared with non-shift workers (Sun et al., 2018).

However, some studies have reported weaker or non-significant associations after adjustment for lifestyle and socioeconomic factors. Variability in findings may reflect differences in occupational settings, duration of shift-work exposure, dietary behaviors, physical activity, and access to healthy food during nighttime hours. Individual susceptibility may also differ according to chronotype and genetic variation in circadian clock genes, potentially influencing adaptation to night-shift schedules and metabolic responses to sleep disruption. These inconsistencies highlight the multifactorial nature of obesity risk among shift-working populations and suggest that occupational and behavioral factors may interact with biological mechanisms to influence metabolic outcomes.

Despite these variations, the overall body of international evidence supports the conclusion that shift work is associated with increased obesity risk and represents an important occupational health concern in modern societies.

Evidence from Thailand

Evidence from Thailand, although more limited, demonstrates similar patterns. Several studies have reported elevated prevalence of overweight and obesity

among occupational groups exposed to irregular work schedules, particularly healthcare workers. A cross-sectional study conducted in a Thai district hospital reported that 14.8% of healthcare personnel were overweight and 40.2% were obese, rates exceeding those observed in the general population (Intarakamhang et al., 2023). The study identified irregular eating patterns, limited opportunities for physical activity, and work-related stress as potential contributors to obesity risk.

Additional Thai studies examining metabolic outcomes among night-shift workers have reported comparable findings. Manodpitipong et al. (2017) found that individuals with type 2 diabetes mellitus working night shifts had higher caloric intake, increased BMI, and poorer glycemic control compared with day workers. These findings suggest that irregular work schedules may exacerbate metabolic dysregulation, particularly among individuals with preexisting metabolic conditions.

Nevertheless, evidence from Thailand remains limited. Most available studies are cross-sectional and focus on specific occupational groups, limiting causal interpretation and generalizability to the broader workforce. Furthermore, few Thai studies have comprehensively examined the combined effects of shift schedules, sleep duration, dietary behaviors, and physical activity on metabolic health. The limited availability of longitudinal and population-based studies highlights an important research gap in understanding the long-term metabolic consequences of shift work within the Thai context.

Overall, evidence from both international and Thai studies suggests that night-shift work contributes to obesity risk through complex interactions among circadian disruption, metabolic dysfunction, and behavioral adaptations. These findings emphasize the importance of considering occupational and sleep-related determinants in obesity prevention and workplace health strategies, particularly in countries experiencing rapid economic and occupational transitions such as Thailand.

Public Health Implications

The growing evidence linking night-shift work, sleep disturbance, and obesity has important implications

for public health and occupational health policy. Obesity is a major contributor to the global burden of non-communicable diseases (NCDs), including cardiovascular disease, type 2 diabetes mellitus, and metabolic syndrome (WHO, 2025). As modern economies increasingly rely on 24-hour service systems, a growing proportion of workers are exposed to irregular schedules and chronic sleep disruption, making shift workers an emerging high-risk population for obesity and metabolic disorders (Brum et al., 2020; Sun et al., 2018).

In Thailand, obesity prevalence has increased steadily alongside urbanization, dietary transition, sedentary lifestyles, and changing occupational environments (Aekplakorn et al., 2009; Sakboonyarat et al., 2020). Evidence synthesized in this review suggests that sleep disruption and circadian misalignment associated with night-shift work may further contribute to metabolic risk. These findings highlight the importance of incorporating sleep health and occupational factors into national obesity prevention and NCD control strategies.

Workplace interventions may represent an important approach to reducing obesity risk among shift-working populations. Night-shift workers frequently experience irregular meal timing, increased nighttime caloric intake, reduced physical activity, and chronic fatigue, all of which may contribute to positive energy balance and metabolic dysfunction (Intarakamhang et al., 2023; Manodpitipong et al., 2017). Potential interventions could include improved shift scheduling, limitations on consecutive night shifts, access to healthy food during nighttime hours, opportunities for physical activity, and education regarding sleep hygiene and healthy lifestyle behaviors.

Targeted screening programs may also benefit high-risk occupational groups, particularly healthcare workers who are routinely exposed to rotating and night-shift schedules. Routine screening for obesity, metabolic syndrome, and sleep disorders may facilitate early detection and intervention among vulnerable workers. However, the effectiveness of workplace interventions may vary across occupational settings and socioeconomic conditions, highlighting the need for context-specific prevention strategies.

Overall, the evidence suggests that obesity prevention should extend beyond traditional lifestyle

approaches to include occupational and sleep-related determinants of metabolic health. As Thailand continues to expand sectors dependent on shift-based labor and a 24-hour economy, integrating occupational health considerations into national public health policies may help reduce the long-term burden of obesity and related NCDs.

Discussion

This review synthesized current epidemiological evidence and biological mechanisms linking night-shift work, sleep disturbance, and obesity risk, with particular emphasis on the Thai context. Overall, the evidence suggests that night-shift work is an important occupational determinant of obesity and metabolic dysfunction. Epidemiological, experimental, and occupational studies consistently indicate that chronic circadian disruption and insufficient sleep may contribute to increased body mass index (BMI), impaired glucose metabolism, and elevated risk of metabolic disorders. These findings highlight the growing importance of occupational and sleep-related determinants alongside traditional contributors to obesity such as diet and physical inactivity.

Current epidemiological evidence consistently demonstrates that shift workers are at greater risk of overweight and obesity than day workers. Meta-analyses have reported that night-shift workers have approximately a 23% higher risk of overweight or obesity and a substantially greater likelihood of abdominal obesity compared with non-shift workers (Sun et al., 2018). Similar associations have been reported between short sleep duration, increased BMI, and metabolic syndrome (Itani et al., 2017). Collectively, these findings suggest that chronic circadian disruption may amplify metabolic vulnerability associated with modern occupational environments. However, the magnitude of these associations varies across studies. Some investigations have reported weaker or non-significant associations after adjustment for lifestyle and socioeconomic factors, suggesting that obesity risk among shift workers is influenced by interactions among occupational stress, dietary behavior, physical activity, sleep patterns, and individual susceptibility.

Biological evidence further supports the relationship between night-shift work and obesity. Experimental studies have demonstrated that sleep restriction and circadian misalignment alter appetite-regulating hormones by increasing ghrelin and decreasing leptin levels, thereby promoting hunger and increased caloric intake (Leproult & Cauter, 2010). Sleep deprivation has also been associated with impaired insulin sensitivity and disrupted glucose metabolism (Papatriantafyllou et al., 2022). In addition, behavioral adaptations commonly observed among shift workers—including nighttime eating, irregular meal timing, reduced physical activity, and chronic fatigue—may further exacerbate metabolic dysfunction. Taken together, these findings suggest that obesity among shift-working populations should not be viewed solely as a consequence of individual lifestyle behavior, but rather as the result of complex interactions among circadian biology, endocrine regulation, occupational schedules, and environmental influences.

The findings of this review are particularly relevant to Thailand, where obesity prevalence has increased substantially alongside rapid urbanization, dietary transition, and expansion of service-oriented industries operating within a 24-hour economy (Aekplakorn et al., 2009; Sakboonyarat et al., 2020). Increasing reliance on shift-based labor in healthcare, transportation, manufacturing, and service sectors may further increase exposure to chronic sleep disruption and circadian misalignment within the Thai workforce. Evidence from Thai studies, although limited, demonstrates similar patterns to international findings. Studies among Thai healthcare workers and night-shift workers with type 2 diabetes mellitus have reported higher BMI, increased caloric intake, and poorer glycemic control among individuals exposed to irregular work schedules (Intarakamhang et al., 2023; Manodpitipong et al., 2017). These findings suggest that occupational and sleep-related determinants may contribute substantially to metabolic risk in Thailand.

Nevertheless, several important limitations within the current literature should be acknowledged. Much of the available evidence originates from Western

populations, potentially limiting generalizability to Southeast Asian settings. In addition, many included studies were observational or cross-sectional, restricting causal interpretation. Heterogeneity in definitions of shift work, duration of exposure, sleep measurements, and obesity classification criteria may also contribute to variability in findings across studies. Furthermore, many studies relied on self-reported sleep duration and lifestyle behaviors, which may introduce recall and reporting bias.

These limitations highlight the need for more longitudinal and population-based studies examining the long-term metabolic consequences of shift work within Thai and Southeast Asian populations.

The findings of this review have important public health and occupational health implications. As modern economies increasingly depend on shift-based labor and 24-hour service systems, a growing proportion of workers may be exposed to chronic circadian disruption and sleep deprivation. Workplace interventions—including optimized shift scheduling, limitation of consecutive night shifts, sleep health education, access to healthy food during nighttime hours, and opportunities for physical activity—may help reduce obesity risk among shift-working populations. In addition, targeted screening programs for obesity, metabolic syndrome, and sleep disorders may facilitate early identification of high-risk occupational groups, particularly healthcare workers routinely exposed to rotating and night-shift schedules.

Future research should prioritize longitudinal studies examining the combined effects of shift schedules, sleep patterns, dietary behavior, occupational stress, and physical activity on metabolic health. Studies incorporating objective sleep measurements, wearable monitoring technologies, and circadian-based interventions may provide more comprehensive understanding of shift work-related metabolic risk. Further evidence from Thailand and other Southeast Asian populations is particularly important for developing context-specific prevention strategies and occupational health policies.

Overall, the current evidence suggests that night-shift work and sleep disturbance are important but often underrecognized contributors to obesity risk.

Through interactions among circadian disruption, hormonal dysregulation, metabolic impairment, and behavioral adaptations, irregular work schedules may contribute substantially to the growing burden of obesity and related non-communicable diseases. Integrating sleep health and occupational considerations into obesity prevention strategies may therefore be essential for improving long-term metabolic health outcomes among shift-working populations.

Conclusion

This review synthesized current epidemiological evidence and biological mechanisms linking night-shift work, sleep disturbance, and obesity risk, with particular emphasis on the Thai context. Overall, the evidence suggests that night-shift work is an important occupational determinant of obesity and metabolic dysfunction. Circadian disruption, sleep deprivation, hormonal dysregulation, metabolic

impairment, and behavioral changes collectively contribute to increased obesity risk among shift-working populations.

Evidence from both international and Thai studies indicates that individuals exposed to night-shift schedules are at greater risk of overweight, abdominal obesity, and metabolic disorders. In Thailand, increasing urbanization and expansion of shift-based labor may further contribute to obesity and related non-communicable diseases. However, current evidence in Thailand remains limited and is largely based on cross-sectional studies.

Overall, these findings highlight the importance of incorporating sleep health and occupational factors into obesity prevention and public health strategies. Further longitudinal and population-based studies are needed to better understand the long-term metabolic effects of shift work and to inform effective workplace interventions for reducing obesity risk among shift-working populations.



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Table 1 Summary of Studies Examining Night-Shift Work, Sleep Disturbance, and Obesity Risk

Author (Year)	Country/Population	Study Design	Exposure Assessed	Outcome Measures	Main Findings
Aekplakorn et al. (2009)	Thailand / General population	National survey	Lifestyle and obesity trends	Obesity prevalence	Obesity prevalence among Thai adults increased substantially between 1991 and 2004.
Brum et al. (2020)	International evidence	Narrative review	Shift work and circadian disruption	Metabolic outcomes	Circadian disruption and sleep disturbance were associated with obesity and metabolic dysfunction.
Cappuccio et al. (2008)	Multiple countries	Meta-analysis	Short sleep duration	Obesity risk	Short sleep duration was significantly associated with increased obesity risk.
Papatriantafyllou et al. (2022)	International evidence	Review study	Sleep deprivation	Insulin sensitivity and metabolic function	Sleep restriction impaired glucose metabolism and insulin sensitivity.
Gan et al. (2015)	Multiple countries	Meta-analysis	Shift work	Type 2 diabetes mellitus	Shift work was associated with increased risk of diabetes mellitus.
Intarakamhang et al. (2023)	Thailand / Healthcare workers	Cross-sectional study	Occupational and lifestyle factors	Overweight and obesity prevalence	High prevalence of overweight and obesity was reported among Thai healthcare personnel.
Itani et al. (2017)	Multiple countries	Systematic review and meta-analysis	Short sleep duration	BMI and obesity	Insufficient sleep was associated with increased BMI and obesity risk.
Jitnarin et al. (2011)	Thailand / Adults	Epidemiologic al study	Lifestyle factors	Overweight and obesity prevalence	High prevalence of overweight and obesity was observed among Thai adults.
Leproult & Cauter (2010)	United States / Adults	Experimental study	Sleep restriction	Appetite-regulating hormones	Sleep deprivation increased ghrelin and reduced leptin levels, promoting hunger and caloric intake.
Manodpitipong et al. (2017)	Thailand / Patients with type 2 diabetes	Cross-sectional study	Night-shift work	BMI, caloric intake, glycemic control	Night-shift workers demonstrated higher BMI, increased caloric intake, and poorer glycemic control than day workers.
Roenneberg et al. (2012)	International population	Observational study	Social jetlag	BMI and obesity risk	Social jetlag was associated with increased BMI and obesity risk.
Sakboonyarat et al. (2020)	Thailand / General population	Epidemiologic al study	Lifestyle and obesity trends	Obesity prevalence	Obesity prevalence remained high among Thai populations and contributed to increasing NCD burden.
Scheer et al. (2009)	United States / Adults	Experimental study	Circadian misalignment	Glucose metabolism and insulin sensitivity	Circadian disruption impaired metabolic regulation and glucose tolerance.
Sun et al. (2018)	Multiple countries / Shift workers	Meta-analysis	Night-shift work	Overweight, obesity, abdominal obesity	Night-shift workers had higher risk of overweight and abdominal obesity compared with day workers.
Drongelen et al. (2011)	Multiple countries	Systematic review	Long-term shift work	BMI and weight gain	Prolonged shift work exposure was associated with progressive weight gain and increased BMI.
Wang et al. (2011)	Multiple countries	Meta-analysis	Shift work	Cardiometabolic disorders	Shift work was associated with metabolic syndrome and cardiovascular disease risk.

PRISMA Flow Diagram

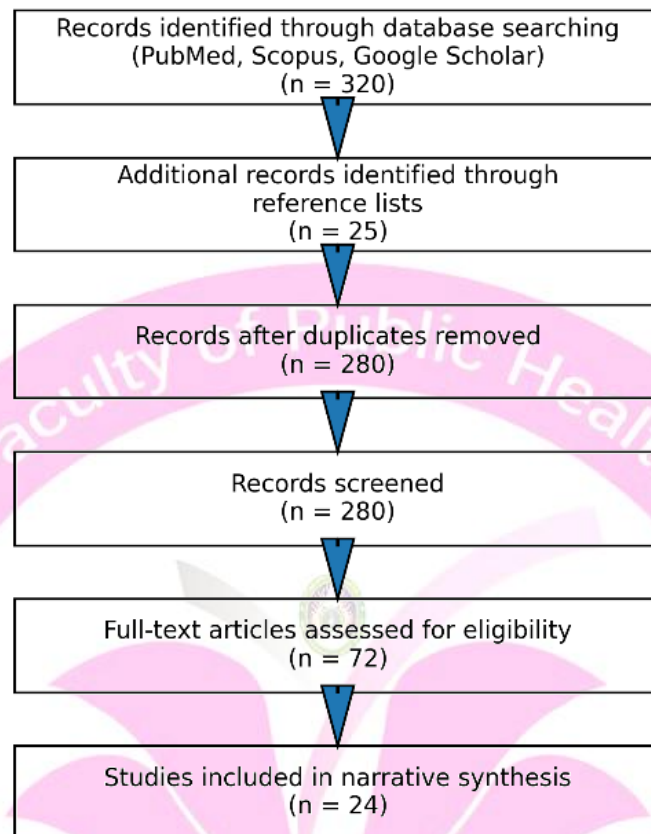


Figure 1 PRISMA flow diagram illustrating the number of records identified, screened, assessed for eligibility, and included in the final review



Figure 2 Conceptual framework illustrating the pathways linking night-shift work, circadian disruption, and obesity risk