

Impact of Shift Work on Excessive Daytime Sleepiness among Healthcare Shift Workers

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Abstract

Background: The circadian rhythm can be disturbed by the shift work system, which leads to daily sleepiness, and a *higher risk of serious health problems*. Many healthcare workers are shift workers. Being drowsy when one is not expected to be drowsy is called Excessive daytime sleepiness (EDS). EDS is associated with poor sleep hygiene, workspace errors, a lack of productivity, and lack of concentration, which are significant safety concerns and a higher risk of occupational accidents among nightshift workers. This study aims to review the original studies on the association of shift work with excessive daytime sleepiness among healthcare shift workers.

Methods: This article is a literature review consisting of journal articles. Articles were searched in the following databases: PubMed, Scientific Scholar, Google Scholar, and EBSCO. The search terms used were 'shift work', 'Excessive daytime sleepiness', and 'Limitations included 'English language', 'published between 2013-2023', and 'shift workers'.

Results: Based on eleven articles that were analyzed, shift work and excessive daytime sleepiness are directly related to each other among shift workers. There are factors that cause EDS, including lack of sleep duration and sleep quality, as well as several comorbidities, and the impact of EDS.

Keywords: shift work, excessive daytime sleepiness, healthcare shift workers

Abstrak

Latar Belakang: Irama sirkadian dapat terganggu akibat sistem kerja shift, yang mengakibatkan rasa kantuk di siang hari, dan risiko masalah kesehatan serius yang lebih tinggi. Mengantuk ketika seseorang tidak diharapkan mengantuk disebut kantuk berlebihan di siang hari (EDS) yang disebabkan oleh kuantitas atau kualitas tidur yang tidak normal. EDS dikaitkan dengan kurangnya produktivitas, kecelakaan kerja, dan kurangnya konsentrasi yang merupakan masalah kesehatan dan keselamatan serta risiko kecelakaan kerja yang lebih tinggi di antara pekerja shift malam. Tujuan dari penelitian ini adalah untuk meninjau beberapa hasil studi tentang hubungan kerja shift dengan kantuk berlebihan di siang hari pada pekerja shift.

Metode: Artikel ini merupakan literatur review yang terdiri dari review artikel jurnal. Artikel dicari di database berikut: PubMed, Scientific Scholar, Google Scholar, dan EBSCO. Kata kunci pencarian yang digunakan adalah 'kerja shift', 'Kantuk berlebihan di siang hari', dan 'Keterbatasan termasuk 'bahasa Inggris', 'diterbitkan antara 2013-2023', dan 'pekerja shift'.

Hasil: Berdasarkan sebelas artikel yang dianalisis, kerja shift dan kantuk berlebihan di siang hari berhubungan langsung dengan pekerja shift. Terdapat faktor yang menyebabkan EDS, diantaranya kurangnya durasi tidur dan kualitas tidur, serta beberapa komorbiditas, dan dampak yang ditimbulkan EDS.

Kata kunci: kerja shift, mengantuk yang berlebihan di siang hari, pekerja kesehatan yang bekerja shift.

Introduction

A previous study that explains that EDS has the potential to become a safety issue. Shiftwork requires a sleep-wake schedule that regularly conflicts with the natural periods that supposedly should be used for sleep according to their biological rhythm. In many parts of the world, 20% of the employed population works shifts.¹ Shift work is very common in the healthcare sector, in which shift workers.^{2,3} Sleepiness is a health problem at the workplace that is often overlooked. Previous studies explained that the prevalence of sleep disorders in shift work is estimated to be 20%-30% among shift workers. Among healthcare workers, Adane et al 2022 it was showed that the prevalence of shift-work sleep disorder was 33,67%.⁴

Shift work sleep disorder is a condition triggered by circadian misalignment, resulting in insomnia and/or excessive sleepiness. Sleep deprivation due to circadian rhythm changes caused by night shift work can cause insomnia and excessive daytime sleepiness (EDS).⁴ Shift workers have a higher incidence of sleep problems and poor sleep quality than fixed day shift workers. Short or poor sleep quality could also mediate of the relationship between shift work and adverse health effects. It is known that inadequate sleep can harm diurnal functions such as individual health, psychological disorders such as mood and attention disorders, and decreased overall individual well-being.⁵

Excessive Daytime Sleepiness (EDS) is a sleeping disorder in which the patient is unable to maintain consciousness and alertness during the day complaints can occur at least three days a week or a minimum of 3 months. This is most often due to insufficient sleep, lack of sleep, quality, and quantity of sleep. Work factors that can influence include heavy workload, long working hours, shift work, and inappropriate rest hours.^{6,7} Other diseases can also be a co-factor for EDS, including, *obstructive sleep apnea (OSA)*, circadian rhythm disorders, and central disorders of hypersomnolence. Excessive sleepiness during the day is associated with co-morbidities, including sleep disturbances, metabolic syndromes such as obesity, and psychiatric disorders such as depression or burnout. Furthermore, EDS is associated with personal and occupational hazards that can impact public safety.^{7,8}

For the worker in Australia about 16% of workers regularly shiftwork patterns.⁹ In general population

samples the result of research has showed that up to 33% of US adults report excessive sleepiness.⁸ On average in a general population, the prevalence of EDS is between 2 and 37%, moreover, in a shift health workers such as nurses, and physicians, it's between 7 and 84%.⁷

Daytime sleepiness is a major determinant of drowsy driving and near-miss car accidents, Sleep deprivation due to circadian rhythm changes caused by night shift work can cause which are significant safety concerns among night shift workers.⁷ It was reported to shift health workers that EDS increased needle stick injuries, drug administration errors, difficulty concentration, and reduced service performance in patients. Among PPDS Anesthesiology (Anwari, 2021) with excessive daytime sleepiness has lower cognitive function scores and time-slower reactions than the participants' with normal daytime group sleepiness.¹⁰

Westwell et al (2021) showed that result more than 25% of nurses and midwives with shift work patterns reported daytime sleepiness, and low response rate cannot representative.^{5,11} Several studies have found a link between shift work and sleep disorders such as excessive daytime sleepiness. Tiwari et al (2021) also showed that shift work, EDS, and occupational errors are directly related to each other. Many studies have reported an association between excessive daytime sleepiness and depression, it is related to the result study by Park et al (2021) there was 29% depression among emergency medicine residents in South Korea. The relationship between EDS and shift workers who experience psychosocial stress may have the potential to experience sleep disturbances more frequently.^{2,5,7} The aim of this review is to study the impact and association of shift work on excessive daytime sleepiness among healthcare shift workers.

Methods

This type of study is a literature review or literature review using previously published research results. The literature review addresses current epidemiology, and guides on clinical assessment and testing, and the associations between shift work and excessive daytime sleepiness. For this review, we compiled recent evidence using the search term excessive daytime sleepiness. This literature review, what was done was to collect recent evidence using the search term excessive daytime sleepiness.

Data based were searched in the following databases PubMed, Scientific Scholar, Google Scholar, and EBSCO. The following search strategies were adapted for each database adapted to Medical Subject Headings (MeSH) and their specific keywords. (1) Shift work: “shift work” OR “work schedule” OR “night shift” OR “rotating shift” OR “roster” OR “healthcare shift worker” AND Sleep: “circadian” OR “sleep disorder” OR OR “sleep impairment” OR “sleep disturbance” OR “sleep disorder” OR “excessive daytime sleepiness” OR “daytime sleepiness” OR “sleep quality” OR “sleepiness” OR “shift work disorder” OR OR “sleep duration: For this study journals in English and Indonesian, journals in the 2013-2023 period, and full text form with samples of people shift worker with sleep disorders.

Use of the term ‘work’ for some databases as this refining to gain access to only shift work articles. Included studies are limited to the original study in that their method can be a randomized completed trial, case-control, cohort, or cross-sectional. The research was conducted based on the association between shift work and excessive daytime sleepiness among shift workers.

The search terms were as follows: “excessive daytime sleepiness,” “daytime sleepiness,” “sleep disorder” “shiftwork,” and “shift worker.”

Result

A total of 23 references were found. Of these, 12 did not match with inclusion criteria and were therefore excluded. Eleven articles were selected and retrieved, and after reading the full text, 11 were finally included.

11 studies were included in the review; 9 studies were cross-sectional 2 studies were literature review. A wide range of countries were represented, including Indonesia, Korea, Saudi Arabia, Ethiopia, Greek, US. The studies used validated questionnaires These included the Pittsburgh sleep quality index (PSQI), Epworth sleepiness scale (ESS), Standard shiftwork index (SSI), Bergen insomnia scale (BIS), Global sleep assessment questionnaire (GSAQ) and Karolinska sleepiness scale (KSS). 11 studies showed the prevalence of EDS, the associated factor, comorbid, and the impact.

Table 1. Identified articles on excessive daytime sleepiness among healthcare shift workers

Authors (year)	Sample	Sleep tool (s)	Method	Result
Song Yi Park et al (2021)	Emergency Medicine Residents	Epworth sleepiness scale (ESS) scores,	A cross-sectional study	32,4% respondents were classified as having EDS. Correlation with alcohol consumers (51,3%) and rate of depression (48,7%) was significantly higher in respondents with EDS.
Westwell et al (2021)	night shift working (NSW) nurses and midwives	Epworth sleepiness scale (ESS)	A cross-sectional study	28% nurses and midwives got daytime sleepiness defined by an ESS score >11. High Sleepiness after night shift was higher in respondent with EDS There was no significant between needle stick injuries with EDS
Tiwari et al (2021)	Healthcare professionals	Epworth sleepiness scale (ESS)	Review Literature	Shift work, EDS, and occupational errors are directly related to each other that long working hours or shift work is a major problem in health-care settings. The effect of EDS can increase the risk of drug administration error, improper operational procedure, and needlestick injuries among nurses.

Authors (year)	Sample	Sleep tool (s)	Method	Result
Alanazi et al (2022)	Healthcare worker	Epworth sleepiness scale (ESS) Pittsburgh Sleep Quality Index (PSQI)	A quantitative observational analytic cross-sectional study	There were participants with EDS 13% which were grade mild 8,9%, moderate 2,7% and severe 1,4%. The participant with anxiety 12,3% and depression was 14,4%. Sleep quality indicate poor sleep quality with PSQI score was 5.69(±3.53).
Booker et al (2018)	healthcare shift workers.	Pittsburgh sleep quality index (PSQI), Epworth sleepiness scale (ESS), Standard shiftwork index (SSI), Bergen insomnia scale (BIS), Global sleep assessment questionnaire (GSAQ) and Karolinska sleepiness scale (KSS).	A systematic review	Individual factors contributed to sleep quality in shift workers. The impact shift work was to decrease sleep quality, duration, and daytime function. About 20-30% shift workers got shift work disorder including insomnia and excessive daytime sleepiness.
Anwary et al (2021)	Program Pendidikan Dokter Spesialis (PPDS) Anestesiologi dan Terapi Intensif	Epworth sleepiness scale (ESS), Montreal Cognitive Assessment,	A numeric comparative cross-sectional study	there were 43% of respondents who experienced EDS. and in the EDS group (26.74 ± 1.096) showed lower cognitive function compared to the group. Normal Daytime Sleepiness (28.65 ± 1.191) and slower reaction time in the EDS group (337.38 ± 62.021) compared to the NDS group (298.81 ± 34.225).
Ettorre et al (2020)	Among nurses	The Italian version of the Job Content Questionnaire, Bergen Insomnia Scale and the Epworth Sleepiness Scale	A cross-sectional study	There were women with insomnia 34,3% and insomnia and ES 31,2% more than men. no relationship was found between high job strain and shift work sleep disorder. among women the level of social support was significantly and negatively associated with insomnia and daytime sleepiness

Authors (year)	Sample	Sleep tool (s)	Method	Result
Alshahrani et al (2017)	Healthcare worker (shift workers and non-shift workers)	Epworth sleepiness scale (ESS) Pittsburgh Sleep Quality Index (PSQI)	A cross-sectional study	The result showed that among healthcare professionals shift work is associated with poor sleep quality but not excessive daytime sleepiness. But the score PSQI and ESS higher than non shift work healthcare professional.
Yi Park et al (2022)	Emergency physicians	Epworth sleepiness scale (ESS)	retrospectively analyzed the Korean Emergency Physicians Survey (KEPS) data	The result showed that among emergency physicians in Korea about three times (30,7%) higher than the general population
Alexandropoulou (2019)	Nurses	Epworth sleepiness scale (ESS) the Greek version of the Berlin Questionnaire (BQ)	cross-sectional study	The Nurses was found high risk OSA about 20% and EDS 28%. Nurses with night shift had significant obesity that linked to OSAS and EDS.
Adane et al (2021)	Healthcare workers at public hospitals	Shift-work sleep disorder (SWSD): Insomnia Severity Index (ISI): Epworth Sleepiness Scale (ESS):	cross-sectional study	The prevalence of shift-work sleep disorder was 33.67% (95%CI; 29.17%- 38.45%). 67.3% insomnia, and 76% excessive daytime sleepiness with ESS score above 11. The related factors including Being married, frequency of shift, number of night shifts per month, missing naps, short sleep time, smoking cigarettes, khat chewing, and drinking alcohol

Discussion

Shift work requires a regular sleep-wake schedule that goes against nature, endogenous Sleep rhythms, and circadian rhythms. It affects the health of workers negatively short sleep, fatigue and sleepiness, lack of psychosocial well-being, and lack of energy were associated with an increased risk for excessive daytime sleepiness (EDS). Alshahrani et al (2021) reported shift work in healthcare professionals is associated with circadian rhythm sleep-wake disorders which result in poor sleep quality, short sleep duration, and long sleep latency. This can cause excessive daytime sleepiness.^{8,12,13}

The level of fatigue differs between medical workers who work night shifts and indirectly correlated to circadian rhythm misalignment.¹⁴ Alanazi et al (2022) reported that poor sleep quality due to excessive daytime sleepiness was significantly higher among the healthcare shift worker than the non-shift work. EDS has a negative impact on the workers' health status both physical and psychological disturbances. Cardiovascular disease, obesity, metabolic syndrome, and diabetes mellitus, mood disorders including depression, cancer, and impairment in cognitive function are all potential consequences of disrupting the natural circadian rhythm. Furthermore, the lack of sleep quality among health worker also has negative impacts on work-related,

such as lack of work productivity, decrease concentration and potential accidents in the workplace.^{8,12,13}

This review identified shift work's impact on healthcare shift workers. It's related to Westwell et al (2021), Tiwari et al (2021), and Booker et al (2018) showed the impact of shift work on excessive daytime sleepiness. Generally, healthcare workers make up the largest proportion of shift workers because in hospitals they have to serve patients 24 hours, and high tension workload.^{4,5,9}

Employees working in shifts, particularly during night shifts, will shift their sleep schedule to the daytime and work during the night. This can disrupt the circadian rhythm within the body, which is responsible for regulating sleep-wake cycles. The consequence is a disturbance in the internal regulation of sleep, which can impact the overall regulatory system and the health status of the workers. These health disruptions will subsequently affect their performance. Workers in healthcare facilities require a high level of focus because work related with patients. If healthcare workers experience sleep disturbances, it can decrease their concentration, resulting in detrimental effects for both the workers and the patients. Adane et al (2021) showed that implementing a two-shift schedule, incorporating napping periods, and decreasing substance use could potentially alleviate shift-work sleep disorder.^{4,7,12,15}

Several researchers have researched factors related to the incidence of EDS. Song Yi Park et al (2021) showed that smoking, regular night snack habits, monthly night-shift days, poor sleep quality, and health perspectives were associated with an increased risk for EDS. Gandhi et al (2021) showed the factors related to EDS, This factors such as age, gender, BMI, use of sleeping pills and having children under 4 years in the household. It's related with Alexandroupoulou et al (2019) that Nurses with obesity can increase the risk of OSA, and OSA is associated with EDS.^{16,17} Ahn et al (2021) also showed that there were significant differences in break time, the schedule worked irregularly, night shift, on-call assignment, subjective sleep quality, physical and mental health were a significant factors for determining daytime sleepiness. Overall, the personality factor and several occupational and health-related factors were significantly associated with higher levels of daytime sleepiness.^{2,8,17,18}

Excessive daytime sleepiness can have negative impacts that occur in life or the workplace. Dysfunction diurnal such as mood, attentiveness, and overall well-being of the individual and their job. Tiwari et al (2021)

and Gandhi et Al (2021) showed effect of EDS that is strongly associated with all the adverse safety outcomes reported occupational like drug administration errors, needlestick injuries, and operational errors which further affects patient safety. Moreover risk of having had a near-miss car accident, low work performance, and a poor relationships.^{7,8,19}

Excessive daytime sleepiness has co-morbidities including dysfunction of neuropsychological, causing a higher risk of car accident, medical accident, metabolic disease, and cardiovascular disease.^{15,20,21} Many studies have reported an association between sleepiness and physical health such as depression related to Song Yi Park et al (2021) showed 48,7% of emergency medicine residents with EDS got the symptom of depression.²² Song Yi Park et al (2021) in another study showed that the prevalence of EDS with depression among emergency physicians in Korea is about 51,9%, the significant factors associated with developing EDS were depression and monthly night-shift days.^{2,22} Tiwari et al (2021) documented in a study that increased irritability, depression, and reduced motivation. Previous studies, conducted among resident physicians reported that protracted shift work hours cause EDS associated with fatigue.^{7,18} In Indonesia, Anwary et al (2021) conducted a study about the impact of EDS on Program Pendidikan Dokter Spesialis (PPDS) Anestesiologi dan Terapi Intensif showed doctor with EDS has lower cognitive function and slower reaction time.¹⁰

Hayley et al (2014) reported that the association between EDS and metabolic syndrome. EDS has been shown to be associated with diabetes among women aged >50 years. EDS were classified as being centrally obese and associated with high fasting plasma glucose, low high-density lipoprotein-cholesterol, and hyperinsulinemia.²³ Yu et al (2015) found that there was Excessive daytime sleepiness may be related to the extent of adiposity, the distribution of adiposity, or metabolic. The association between obstructive sleep apnea and the visceral fat level was particularly strong in subjects with excessive daytime sleepiness or short sleep duration. physical and mental health correlates of EDS in shift workers.

In this study, there are limitations including the restricted availability of sources. The reviewed subjects of healthcare professionals are also limited. Furthermore, the inclusion and exclusion criteria are broad, which may introduce bias.

Conclusion

It can be concluded from the above-reviewed literature that shift work is a major problem in healthcare settings, especially sleep health. Excessive daytime sleepiness is a potentially hazardous condition with varied etiologies such as lack of sleep, disordered breathing, circadian rhythm disorders, and central disorders, there was an associated factor that increases the risk of EDS among healthcare professionals, including physical and mental factor such as smoking, regular night snack habits, monthly night-shift days, poor sleep quality, age, gender, BMI, use of sleeping pills and having children. Besides, the healthcare shift workers who were attending a higher number of on-call/overnight work were at higher risk of an increased EDS. EDS has an impact on low work performance, poor relations, and dysfunction of neuropsychological, causing a higher risk of car accidents, medical accidents, metabolic diseases, and cardiovascular disease. Therefore, as a healthcare must have a responsibility to be aware of the effects of sleepiness and take steps to limit those effects.

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