SHIFT WORK SLEEP DISORDER

Dara House

*Eastern New Mexico University, Portales, New Mexico, **USA***

ABSTRACT

Shift work is associated with sleepiness and sleep disorders. Circadian rhythms are vital to sleep and health. Disruption in the circadian rhythms cause shift work sleep disorder. Many studies have been published to examine the impact of shift work sleep disorder on health and wellbeing. This paper is a literature review of shift work sleep disorder, associated health risks, and pharmacological and non-pharmacological interventions.

Keywords: *circadian rhythm shift work sleep disorder, health risks of shift work sleep disorder, pharmacological and non- pharmacological interventions for shift work sleep disorder*

INTRODUCTION

Many Americans work a job that extends beyond the typical workday. Shift work has been associated with many illnesses. The impact of shift work can range from sleepiness and insomnia to an increased risk for cardiovascular disease, cancer, metabolic disorders, and mental health disorders. This paper will discuss shift work sleep disorder, circadian rhythms, risk factors of shift work and possible treatments.

CIRCADIAN RHYTHM AND SHIFT WORK

Life has a twenty-four-hour rhythm where environmental factors such as temperature and light fluctuate with a daily predictable sequence. Most organisms have evolved circadian rhythms. Most cells in the body have a molecular clock and are maintained in synchrony by a master pacemaker in the hypothalamus (Jagannath, Taylor, Wakaf, Vasudevan, & Foster, 2017). Shift work increases the amount of exposure to light. The embedded exposure to light at night suppresses the nocturnal hormone melatonin. This causes a disruption in the circadian rhythm. Disruption of this circadian rhythm is problematic and can present itself in various symptoms. Shift work has been defined as work schedules that extend beyond the typical hours and comprise early work, compressed work weeks with 12 hour shifts and night work. It is estimated that 10% of night and rotating shift workers have sleep disorders. Typically, these disorders are characterized by excessive sleepiness and sleep disruption for at least a month (Boivin & Boudreau, 2014). Individuals differ regarding tolerance of shift work. It seems that some individuals have developed rituals and routines that enable them to be successful

at shift work for extended periods. However, many individuals suffer from various symptoms of shift work disorder.

SHIFT WORK SLEEP DISORDER

Many shift workers struggle with excessive sleepiness. For individuals who suffer from shift work sleep disorder this is an ongoing problem that consistently causes symptoms and interferes with work or family life. Shift work sleep disorder is a circadian rhythm sleep disorder characterized by excessive sleepiness, insomnia, or both because of shift work. (Wickwire, Geiger-Brown, Scharf, & Drake, 2017). Shift work sleep disorder can be caused by night shifts, rotating shifts, or even early morning shifts. It can cause chronic sleep deprivation. Long term sleep deprivation has been discussed as a sleep debt in which a person can never seem to catch up on needed sleep. Individuals that suffer from shift work sleep disorder exhibit some or all the following symptoms: insomnia, excessive sleepiness, sleep that feels unrefreshing, difficulty concentrating, lack of energy, irritability, depression, and difficulty with personal relationships (Wickwire et al., 2017). Sleep deprivation due to shift work is related to the interruption of the sleep/ wake cycle associated with the modified activity and rest pattern. Shift and night workers are constantly having to adjust sleep patterns to meet the needs of their shifts. This shifting of schedules over time leads to persistent sleep disturbances (Costa, 2015). This chronic shifting of sleep and lack of sleep can have serious implications for health.

RISK FACTORS

Shift work sleep disorder has many implications for health. Many studies have been done to find correlations between shift work and cognition, weight, glucose, metabolism, cardiovascular disease, anxiety, depression, and cancer. Many factors must be considered including years of shift work, the age of the person and shift work tolerance. A recent study examined the association of night shift work history and age when night shift work was performed with cancer and cardiovascular disease risk factors among women in a Nurses' Health Study (NHS). This study calculated age -adjusted and socioeconomic status – adjusted means and percentages for cancer and cardiovascular risk factors in 2009 across categories of night shift history. Multivariable-adjusted logistics were used to estimate odds ratios and the associations were further examined by age. The results were that ever night shift workers had increased odds of obesity, higher caffeine and caloric intake and shorter sleep durations compared to never night shift workers. It was suggested that night shift work before age 25 was associated with fewer risk factors compared to night shift work at older ages. The results indicate that night shift work may contribute to an adverse chronic risk disease risk profile (Ramin et al., 2015). Health consequences of shift work is concerning for the individual and the professions that rely on shift workers to function at high levels. Shift workers are more likely to suffer from circadian disruption. This

disruption has been associated with increased risk for metabolic syndrome, diabetes, cardiovascular disease, and cancer (Figuerio & White, 2013).

CARDIOVASCULAR DISEASE

A recent study examined the association between lifetime exposure to shift work and blood pressure and heart rate variability. This study evaluated male shift workers using principal component analysis. The variables were weight, body mass index, waist circumference, neck circumference, hip circumference, body fat mass, glucose, body fat percentage, systolic blood pressure, diastolic blood pressure and heart rate variables. Using linear regression models, the lifetime shift work exposure was associated with each principal component. The results suggest that shift work promotes unfavorable changes in autonomic cardiac control related to a decrease in parasympathetic modulation and an increase in blood pressure (Souza et al., 2015). Other studies have also linked shift work and an increase risk for weight gain and metabolic syndrome which are recognized risk factors for diabetes.

CORTISOL

Cortisol is an important hormone. It is released in response to stress and low blood -glucose concentration. Circadian rhythms can impact cortisol release. A recent study found significant differences in salivary secretion cortisol patterns. This study concluded that night shift workers take at least four days to adjust their circadian rhythms of cortisol secretions. In additions, nurses changing form night shift to other shifts should be allowed more than two days off in a row to regulate their cortisol patterns (Niu et al., 2015)

DIABETES

Several studies have examined shift work and increased fasting glucose levels. Many studies discuss an association with night shift and poor sleep, weight gain and metabolic syndrome which are recognized risk factors for diabetes. A Danish study found a direct association with shift work and diabetes risk. This study followed 28,731 female nurses over a period of 10 years. Baseline data was collected. Nurses reported their shift, diabetes prevalence and lifestyle data. The researchers analyzed the association between working time and diabetes incidences using a Cox proportional hazards model adjusted for diabetes risk factors, separately with and without adjustment for body mass index which might be an intermediate variable. The results confirmed that Danish nurses working night and evening shifts have an increased risk for diabetes with the highest risk associated with current night shift work (Hansen, Stayner, Hansen, & Anderson). This data reinforces the impact of shift work and fasting glucose, increased weight gain, and diabetes. It provides more evidence that extended shift work can have a negative impact on health.

CANCER

Several studies have examined the link between shift work and various forms of cancer. One hypothesis is that exposure to light at night suppresses the nocturnal hormone melatonin which causes circadian disruption. This disruption causes a misalignment between internal and external night and between cells and organs. This has been suggested as a main mechanism involved in carcinogenesis. A 2007 study by the International Agency for Research on Cancer classified shift work that involves circadian disruption as probably carcinogenic to humans based on limited evidence from eight epidemiologic studies on breast cancer (Stayner & Demers, 2017). An American study included 1101 women over 5 years. This study found evidences suggesting an association between shift work and ovarian cancer (Parveen, Cushing-Haugen, Wicklund, Doherty, & Rossing, 2013). Most studies that link cancer to shift work have been predominantly female subjects. This could be due to the larger number of female to male nurses. Overall there is a tendency for increased risk of cancer in shift workers. Further studies are needed to validate the correlation exact correlation between night shift work and specific cancers.

EMPLOYEE PERFORMANCE AND WELLBEING

Employers want highly functioning employees. Organizations have studied the impact of shift work and its impact on performance and wellbeing. For this discussion performance will be discussed as job performance and safety. Wellbeing will be discussed as burnout, job satisfaction and intent to leave the job. A variety of shift work characteristics are associated with compromised employee's performance and wellbeing. Working rotating shifts was associated with worse job performance outcomes. It seems that fixed nights allowed employees to resynchronize. However, job satisfaction of employees working straight nights was reduced (Dall'Ora, Bell, Recio-Saucedo, & Grifiths,2016). Fatigue is a strong indicator of decreased job performance. Shift workers tend to have global fatigue. This leads to the hypothesis that shift work results in decreased job performance. Wellbeing can be linked to sleep. Studies have indicated that shift work sleep disorder can be a precursor for depression and anxiety. Analysis revealed that individuals who are highly sleep reactive have a high probability of developing shift work sleep disorder. Those individuals who developed shift work sleep disorder have increased risk for anxiety and depression symptoms (Kalmbach, Pillai, Cheng, Arnedt, & Drake, 2015). From the literature it can be concluded that shift work has a negative impact on both employee wellbeing and performance.

SOLUTIONS

While there is no clear answer to solve the problems of shift work and shift work sleep disorder, there are preventative and corrective actions that can be taken. Timely breaks have had a positive impact on employee fatigue and alertness (Dall'Ora et al.,) Organizations must recognize individuals who are at risk for shift work sleep disorder. One option is to consider shifting schedules for individuals

who are exhibiting signs of shift work sleep disorder. Education on countermeasures such as light therapy, melatonin or modafinil, napping and self-care can also be effective.

NON -PHARMACOLOGICAL INTERVENTIONS

Nurses fatigue especially on night shift can interfere with quality of life and job performance. A pilot study was designed to explore the relationship of night shift napping on fatigue. In this study, night shift nurses completed the Brief Fatigue Inventory and a demographic information sheet. Comparisons were made between nurses who napped during their night shift with nurses who did not nap. Napping on night shift has the benefit of increasing psychomotor performance, brain function, energy, and mood. However, researchers found that sleep inertia after a nap can pose safety issues. This state of impaired cognition after a nap is brief. Based on this study, further investigation is needed. There were no statistically significant differences in global fatigue (Neville & Velmer, 2017). Countermeasures to mitigate fatigue is recommended. Countermeasures can include light therapy, pharmacological treatment, and cognitive behavioral therapies. Light therapy has been studied as an intervention for reducing sleepiness at work and improving the length and quality of sleep. A recent study reviewed 17 relevant studies which categorized three types of interventions: (1) various exposure to light,(2) opportunities for napping and (3)therapies such as physical education and sleep education. This study concluded that there is too much uncertainty to determine if non-pharmacological interventions can improve shift work sleep disorder. The recommendation is for more specific studies with better designs to find conclusive evidence regarding non-pharmacological interventions and shift work sleep disorder (Slanger et al., 2016). Treatment options are being investigated to improve the quality of life for shift workers.

PHARMACOLOGICAL INTERVENTIONS

Pharmacological treatments for shift work sleep disorder are limited. Melatonin has long been recognized as a treatment option. Melatonin is characterized as an output of the circadian clock and can be used to modify the phase of the clock which presumably acts via the melatonin receptors (Jagannath et al., 2017). A recent study examined the effects of melatonin, zopiclone and modafinil on sleep length, quality of sleep, alertness and sleepiness or fatigue at work. It was found that melatonin (1-10 mg) after a night shift may increase sleep length during daytime sleep. The hypnotic medication zopiclone did not result in significantly longer daytime sleep length compared to placebo. Armodafinil and modafinil were found to reduce sleepiness and increase alertness during the shift. Both medications have side effects of headache, nausea, and increased blood pressure. Overall people who take melatonin may sleep longer during the daytime after night shift and side effects are rare. Hypnotics showed no significant benefit. Modafinil and armodafinil have a small reduction in sleepiness and an increase in

alertness but have significant side effects (Liira et al., 2014). More studies are needed for conclusive evidence on the current pharmacological interventions.

CONCLUSION

Shift work results in sleep-wake disturbances. These disturbances can have a big impact on sleep length, quality of sleep and fatigue. Shift work sleep disorder impacts many shift workers. The impact of shift work sleep disorder has major health risks. Job satisfaction and overall well being are also impacted by shift work sleep disorder. Many studies have been done to find effective interventions for shift work sleep disorder. Overall melatonin taken after a night shift had the most impact on sleep between shifts. Light therapy, napping and sleep education are promising non-pharmacological interventions.

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