

Sleep and Shift Work Sleep Disorders

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Abstract: Shift work is one of the more apparent and dramatic components of the work environment. It has been clearly linked to a series of acute and chronic effects on the organism, most of them related to the circadian rhythmicity of the body. (1) Many industrialized countries adopted shift work with a view to optimize utilization of human resources and to ensure continuity in operation of various production houses. The reasons for growing number of shift workers are manifold while some major factors being : quality in the current day lifestyle demands immediate and round the clock service from various indispensable sectors such as public health, transport, security, communication and media. Modern industries depend upon expensive machines and, continuity in the functioning is extremely mandatory and cost effective (2).

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I. Introduction

SHIFT WORKS- working in shifts is "a method of organisation of working time in which workers succeed one another at the workplace so that the establishment can operate longer than the hours of work of individual workers" at different daily and night hours. (3) The terms can alternate in different working periods between early mornings, afternoons, and night shifts or they may work a permanent shift. Shift work causes subjective daytime sleepiness and interferes with daytime performance.(4,5) Several studies have reported that shift work causes significant sleep disturbances associated with Excessive day time sleeping (EDS). Shift workers are more likely to have insomnia, poor sleep quality and are more likely to have EDS.(5-9) A number of reviews on shift work and the sleep/wake patterns have concluded that night shifts after midnight and early-morning shifts are associated with disturbances in the sleep/wake pattern causing poor sleep quality during and outside the shifts.(7,8,10) Poor sleep quality and excessive daytime sleepiness can interfere with a health care professional's performance causing more medical errors.(2) Studies have shown that night shift nurses have an increased risk of insomnia. In addition, nurses sleep longer when they are on their day off, but they have shorter sleep duration when working a shift.(11,12) Nurses working mixed or permanent night shifts have low sleep quality.(12)

SHIFT WORK SLEEP DISORDERS

Shift work disorder was defined by the SS-Q, which was developed at the Finnish Institute of Occupational Health. The definition is based on the International classification of sleep disorders (ICSD-3) (13) and is consistent with prior research using a large population based sample (14). SWSD is characterized by sleepiness and insomnia, which is attributed to the persons work schedule. The diagnostic criteria for SWDS^S are –

- i. complaints of insomnia or excessive sleepiness temporally associated with a recurring work schedule in which work hours overlap with the usual time for sleep
- ii. symptoms must be associated with the shift work schedule over the course of at least one month
- iii. sleep log or autographic monitoring for >7 days demonstrates circadian and sleep-time misalignment
- iv. sleep disturbance is not better explained by another sleep disorder, mental disorder, a medical or neurological disorder, medication use or substance use disorder (13)

PHYSIOLOGICAL EFFECTS OF SWSD

The reason for the health problems in shift work is the conflict between displaced work hours and the output of the biological clock. The latter resides in the suprachiasmatic nuclei of the hypothalamus [18], and generates a signal that results in a pronounced 24 hr oscillation in virtually all physiological and psychological functions.

INSTRUMENTS OF SLEEP WORK DISORDERS

i. BERGEN INSOMNIA SCALE – A self-administered insomnia scale with symptoms related questions based on APA’s diagnostic and statistical manual of mental disorders.

(15) The scale has 6 items which are scored along an eight point scale indicating the no of days per week. Total score ranging from 0 to 42.

ii. EPWORTH SLEEPINESS SCALE- (ESS) - The ESS constitutes eight items. Each item describes a specific situation for which respondents are asked to assess the likelihood of them falling asleep or dozing off on a scale ranging from 0 (would never doze off) to 3 (high chance of dozing off). The ESS score (clinical cut off ≥ 11) has been shown to allow for distinctions to be made between patients with various sleep disorders, and healthy subjects (16). The ESS has shown high validity and reliability in numerous studies

iii. HOSPITAL ANXIETY AND DEPRESSION SCALE (HADS) - The HADS is a self-assessment scale consisting of fourteen items, (scored on a four-point scale) measuring non-vegetative symptoms of anxiety (seven items) and depression (seven items) experienced during the last week (17). The instrument has demonstrated acceptable reliability.

iv. GLOBAL SLEEP ASSESSMENT QUESTIONNAIRE (GSAQ)- The GSAQ is a reliable and validated general sleep assessment tool which distinguishes between symptoms of different sleep disorders.(18)

v. FATIGUE QUESTIONNAIRE- The 11-item Fatigue Questionnaire is a commonly used tool for measuring fatigue. Items are scored on four-point Likert scale. (19)The scale is divided into two dimensions: Physical Fatigue, based on the seven first items (range 0 to 21), and Mental Fatigue, based on the last four items (range 0 to 12).

DISPOSITIONAL RESILIENCE SCALE –REVISED (DRS-15-R) The 15 item scale measures three aspects of hardiness; commitment, control and challenge (20). Items are scored on a scale ranging from 0 (“not true”) to 3 (“completely true”), yielding a total score ranging from 0 to 45.

vi. DIURNAL SCALE- the Diurnal Scale measures morningness, and has demonstrated high reliability between measurements (21). The scale contains 7 items scored on a scale ranging from 1 to 4, which are then summarized giving a total score of 7–28. The scale was adapted to Norwegian by a standard translation-back-translation procedure. A high score indicates a preference for getting up early in the morning (morningness).

vii. REVISED CIRCADIAN TYPE INVENTORY (RCTI)- The rCTI has been designed to assess circadian phase (flexibility, 5 items) as well as the amplitude of the circadian rhythm (languidity, 6 items)(22). Items cover topics such as habits and preferences in relation to sleep and work schedules, and are answered on a 5-point scale. Flexibility (range 5 to 25) has been related to the capacity to adapt the sleep - wake cycle to unfamiliar patterns, and languidity (range 6 to 30) to the lack of ability to overcome sleepiness when sleep deprived.

COMPLICATIONS

Shift work is associated with disturbed circadian rhythm, which is involved in the torrent of disturbed physiological and pathological mechanism. The disruption is not only a risk factor for breast cancer, but can also be a risk factor for T2DM, Obesity, Hypertension, Metabolic Syndrome, CVD, Stroke, ARI,GIT problems, Back Pain, Headache, Anxiety, Mood Disorders & Depression[38-44]. Night shift workers are at a higher risk of Hypertension and increased shift hours can lead to occupational injuries [45,46].



Fig.1 Complications of SWSD

PREVENTION AND MANAGEMENT

a) PHARMACOLOGICAL – Hypnotic medications are effective treatment with few serious side effects. A review of several studies showed that patient prescribed hypnotics report more positive effects & fewer adverse effects than patient treated with over the counter medication. Meta-analysis have found that Hypnotics are significantly effective in reducing sleep latency, increasing total sleep time, reducing the number of awakenings during the night and improving sleep quality[23]. it should be noted that only people with the full spectrum of shift work disorder should get medical treatment and the medication doesn't alleviate the disturbance of the circadianrhythm.

b) NON PHARMACOLOGICAL – The desynchronization of the biological clock caused by shift work can lead to physical and psychiatric illness. Medical treatment should be recommended in addition to non-pharmacological interventions. Hazak and Zulley analyzed SWD in a systematic review and recommended optimizing the shift plan, enhancing concentration through light exposure, observing sleep hygiene[24]. Some generally acknowledged coping strategies against fatigue and insomnia in shift workers are–

i. Napping- short naps improve alertness, vigilance, reaction times, and performance and decrease the risk of accidents [25]. Rajaratnam, Howard, and Grunstein give the general advice that a 20–30-min nap during the night shift or napping for periods between 30 min and 2 h before evening or night shifts can help to maintain alertness and wakefulness [26]. However, napping itself leads to sleep inertia and may even impair vigilance. Hence, the efficacy of napping depends mostly on the timing and duration as well as on the stage of sleep and the particular circadianphase.

ii. Nutrition- Some studies also recommend the use of caffeine, especially at the start of a night shift[27, 28]. Beaumont and colleagues provided evidence for the positive effects of caffeine on vigilance (reported p

< 0.01) & cognitive performance (reported p < 0.05) during a long wakefulness period [29]. Nutrition is also an important factor for employees working shifts. Paz and Berry investigated the beneficiary influence of certain meal compositions. On the performance of shift workers. They showed that the ratio of protein and carbohydrates should be 1/3 to provide an optimal diet for shift workers. Differences in psychometric performance were correlated with glucose (reported p = 0.05) and insulin concentrations (reported p = 0.04), and a large neutral amino acid ratio was correlated with alertness (reported p = 0.05) [30]. Lowden and colleagues [31] reviewed the influence of nutrition and specific meal patterns on shift workers' performance. They provided some useful nutrition guidelines for shift workers, yet individual metabolic differences and the willingness to adapt eating habits to the shift schedule should be taken into consideration. A wholefood diet consisting of vegetables, fruit, wholegrain, and low-carb food such as cottage cheese and eggs, and the avoidance of sugar-rich products with a high glycemic load and convenience foods, is advised. Despite the night work, regular normal day and night eating patterns should be maintained.

iii. Light- Shift workers experience a circadian misalignment since they have to work when their bodies are actually prepared to sleep. Melatonin is suppressed by indoor light. As a result, suppressed endogenous levels of melatonin were found in employees working night shifts [32]. However, the exposure to bright artificial light can counteract this suppression and may lead to the circadian adaptation to night or shift work [33]

Scheduling- In a naturalistic study by Juda, Vetter, and Roenneberg, shift workers were asked to complete the Munich Chrono Type Questionnaire for shift workers (MCTQShift) and the Sleep Questionnaire from the Standard Shiftwork Index (SSI). The results (length of sleep, social jet lag, and sleep disturbances) were modulated by the respective chronotype: e.g., —early-birds| had a shorter sleep duration (reported $p < 0.001$) and a more intense social jet lag (reported $p < 0.001$) on night shifts than the —night-owls. Therefore, it is recommended to take the particular Chronotype into consideration when assigning the day, night, or rotating shift to individual employees[34].

iv. Lifestyle Training- Lifestyle training is a measure that goes one step further: it provides a holistic approach using counseling and psycho education [35]. Circadian Technologies, (CIRCADIAN) is a company that helps employees to cope with the challenges of shift work. CIRCADIAN designed the Managing a Shiftwork Lifestyle program, an on-the-job training program to support employees and their families with issues associated with shiftwork.

v. Cognitive and behavioral interventions- Cognitive and behavioral interventions can also be useful in coping with the effects of shift work [36]. Behavioral measures beyond improved sleep hygiene, such as exercise, can enhance sleep quality and combat insomnia and excessive sleepiness[37].

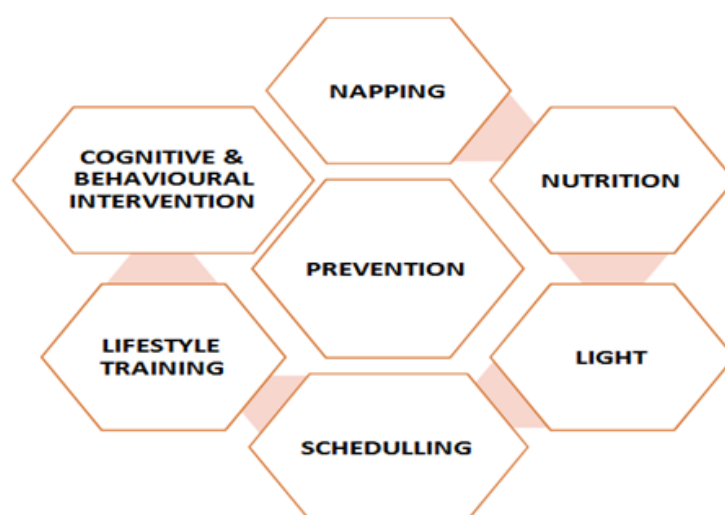


Fig.2 Prevention & Management for SWSD

II. Conclusion

Irregular work hours seem to exert strong, acute effects on sleep and alertness in relation to night and morning work. The mechanism behind the disturbances is the sleep-interfering properties of the circadian system during day sleep and the correspondingsleep-promoting properties during night work. More rigorous research is needed to understand the specific risks associated with various domains of shift work involving night work and the underlying biological mechanisms, and to provide more specific and evidence-based recommendations on the prevention of diseases related to shift work.

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