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Review Article

UNHAPPY PICTURES OF SHIFT DRIVERS AND PROPOSED MODEL OF CHRONOCLINIC

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ABSTRACT

"Shift work is commonly associated with health problems resulting in circadian misalignment and sleep restriction. Specially shift drivers, are affected by insomnia and up to 90% report regular fatigue and sleepiness at the workplace. According to Ayurveda*, Nidra vega dharana/ Ratri jagarana* causes *Rookshata* and *Vataprakopa* which leads to *Vishamata* in *Doshas* and *Dhatus*. Epidemiological data shows that shift workers are at increased risk of both physical and psychological health problems and shift work disorders (SWSD). These conditions typically lead to reduced work performance, road accidents, absenteeism and reduced quality of life. Given these wide spread and debilitating consequences there is an urgent need for treatment that help to improve the sleep and functional performance of the shift working drivers. The most common non pharmacological recommendations are, well planned shift scheduling, bright light exposure, napping, psychological counselling and education promoting sleep hygiene, and cognitive behavioural techniques. Along with these, implementation of chronoclinics and chronotherapy is very much needed. This article is dealing with deleterious consequences of shift work and some positive ways to optimize shift schedule and some recommendations to improve their health and sleep.

INTRODUCTION

Shift work is a form of work scheduling involving the process in which a group of workers succeed each other at the same workstation in shifts. Shifts can be organised either in a rotating, continuous/ discontinuous fashion. Notwithstanding the patterns of shift scheduling, it has been unequivocally accepted that shift work in general disrupt biological rhythms, sleep and social life of drivers. It leads to a number of clinical and non-clinical problems. Consequently, the population of shift drivers grew steadily and is still growing at a pace faster than before. The past few decades have witnessed tremendous growth in the population of shift drivers, surprisingly census doesn't differentiate night shift drivers or rotational shift drivers from the entire population.[1] But it is in indeed essential that a database should be created separately for all types of shift drivers in India. It is unequivocal that most of the animals including Man under natural conditions exhibit circadian rhythms with 24 hours and the timing device keep these rhythms synchronised with the light-dark cycle and other oscillatory components of the environment. This phenomenon is called external synchronisation.[2] Such rhythms are expressed in various physiological, biochemical, immunological, psychological and behavioural variables.[3] When this synchronisation breaks down and internal rhythms no longer oscillate with frequency similar to the environmental cycles. In this state internal bodily rhythms are termed externally desynchronized. However, there are instances when many bodily rhythms despite being externally desynchronized remain internally synchronized. Here internal rhythms have similar frequencies although not circadian. There are however several compelling situations that cause complete temporal disorder characterised by both internal and external desynchronization.[4] Ayurveda considers *Nidra* as one among *Adharaneeya vega*, and its suppression causes *Dosha vaishamya* (by causing *Rookshata* and *Vata prakopa)*[5] which affects the overall health of drivers. In this article we are going to discuss the consequences

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of shift work on drivers and some recommendations to improve their health.

AIMS AND OBJECTIVES

1) To understand the consequences of *Nidra vega Dharana* in shift working drivers.
2) Recommendation of ''Shift'' plan and ''Chronoclinic'' for the welfare of shift drivers to improve their health along with Ayurveda

Materials and methods: A literary survey is done mainly on *Brihatrayee*, the data is collected from other sources and Ayurvedic texts, contemporary texts and internet sources.

Literature review

Ayurveda has given its importance on *Nidra* and its intake. *Acharya charaka* has explained *Nidra* under *Tasyaasitiya adhyaya* of *Sutrasthana* in that we seen the indication of *Diva swapna in Greesmarithu* and some various conditions, but apart from this by *Ratri jagarana, Vatadosha* of body will increased which have antagonistic action to that of *Kapha* hence will cause the leanness in the body.[6]

- *Achraya charaka* explained *Nidra* as a *Adharaniya vega* under *Navegadharaniya adhyaya*.[7]
- In *Sutrasthana Acharya charaka* has described *Nidra* in chapter of *Ashtauninditiya purusha* and also included *Aswapna* (loss of sleep) in 80 *Nanatmaja vata vikaras.*[8]
- *Acharya Sushruta* explain it in *Sharira sthana* in chapter *Garbha vyakarana shariram* which enlightens its role in nourishment and development of body.[9]
- *Asthanga Sangraha* describes *Nidra* and *Nidra vikaras* in *Viruddhanna vigyaniya adhyaya* and *Roganupadaniya adhyaya*. In that he explained *Nidra* as a *Adharaniya vega* and its suppression affects physically and mentally. He also explained, *Ratri jagarana* affects *Doshas* and same by doing *Divaswapna* which in turn leads *Dhatuvaishamya*[10]
- In *Yogadarshana*, explanation about *Yoganidra* and its uses seen.[11]
- *Acharya Charaka* and the commentator *Chakrapani* and *Gangadhar* explained that when the mind as well as soul gets exhausted or becomes inactive and the sensory and motor organs become inactive then the individual gets sleep. (Ch. Su.21/35) [12]

Need for the study: Ayurveda describes *'Nidra'* as one among the '*Trayopasthambha'* and a basic instinct of life. In Ayurveda*, 'Adharaneeya vega'* refers to the body's natural urges that help to maintain equilibrium among *Dosha, Dhaatu* and *Malas.* These urges play a crucial role in overall health. Suppressing these natural urges can lead to imbalances and manifests various diseases. Adequate sleep nourishes the body, rejuvenates the mind and support overall vitality. In today's scenario priority for health have changed, there by suppression of urges are commonly seen. Among the 14 *Vegas* explained in Ayurveda, it is *'Nidra vega'* which is more important in maintaining and restoring both physical and mental health.

Acharya Charaka emphasis that *Sukha* and *Dukha, Shareera Pushti* and *Krishata, Balaabala, Vrushata* and *Kleebata*, *Jeevan* and *Marana* of an individual depend on appropriate and inappropriate *Nidra.*[13] *Akaala Nidra, Ati nidra, Anidra* may destroy happiness and health, such circumstances might prove Goddess of death ''*Kaalaraatri*'' or '*Maran raatri'* and causes loss of life.[14] *Nidra Vega Dharna* may cause insomnia, less concentration in work, headache, giddiness, lethargy, indigestion, fever, constipation, mood swings, poor coping skills and impaired social functioning etc. According to Ayurveda, these disorders can be explained under *Nidra Vegavarodhajanya Vikaras*. In severe conditions it may become on among the major cause for road accidents, cardiovascular diseases, type 2 diabetes mellitus, obesity, hypertension, stroke, carcinoma breast, back pain, menstrual problems, infertility and psychological disorders. Such repercussions reflect on productivity of work, impairment in personal and social performances. Although a lot of explanation about avoidance of *Ratri Jagaran*, advantages of proper *Nidra* and complications of *Nidra Vega dharana* are described in Ayurvedic classics. But its significance for public health has not been realised yet. So, this article is to understand the consequences of *Nidra Vega Dharana* on health of shift wise drivers. So, this study is important to prevent manifestations of diseases in their future and to improve the productivity in their work by adopting ''Shift' 'plan and implementation of 'Chronoclinic 'along with *'Vidhivat Nidra*' and healthy lifestyle.

Consequences of Shift Work on Drivers Health

Several studies have been made on the problems of shift workers in relation to 3 important modulatory factors namely, circadian rhythm, sleep and socio/ psychological/domestic factors.[15]

1. **Consequences related to sleep:** The rotation of existing shift schedules affects sleep causing health problems like shift work sleep disorder, sleep apnea, restless leg syndrome and disorders associated with the sleep wake cycle namely rapid eye moment and narcolepsy (sleep attack during daytime). In addition, the deregulation of the state of the homeostasis and circadian rhythms can lead to the disruption of human physiological patterns controlled by circadian rhythm and sleep, like the regulation of the energy expenditure and glucose

metabolism. The reduced alertness and the performance of the worker as well as the association to higher rates of comorbidity is a serious condition that should be the focus of attention. Daytime drowsiness and night time Insomnia become more prominent in individuals who work in shift for extended period of time. The major risks associated with sleep deprivation are depression, ulcer, and accidents related to drowsiness in shiftwork.[16]

2. **Consequences related to metabolism:** Shift workers are gravely vulnerable to three metabolic problems, high levels of triglycerides, obesity and hypertension. Some studies have established a link between shift workers and increased food intake with a preference for carbohydrate rich food and changes in lipid parameters, especially triglyceride levels. In addition, behavioural changes associated with shift work reduce the physical activity may also contribute to weight again and the development of associated conditions such as metabolic syndrome and type 2 diabetes. Few studies have investigated the relationship between shift work and diabetes mellitus despite a high prevalent of the disease, its negative impact is that this disease has its impact on multiple organ systems. Insufficient sleep time or poor quality of sleep are risk factors for the development and exacerbation of the insulin resistance and can increase both appetite and adiposity. Gastrointestinal disturbances range from dyspepsia, gastritis, peptic ulcer, indigestion, appetite disturbance, irregularity of bowel movements, constipation, heart burn, abdominal pain, stomach grumbling, flatulence and gastroduodenitis.[17] Other factors that may predispose this type of disorder namely disturbances of circadian rhythm linked to gastric functions (gastric secretions, and activity and intestinal motility number of meals consumed, types of food consumed, and hours in which it is consumed, medication, consumption of alcohol, tobacco, coffee and stress and for female workers the menstrual cycle).
3. **Impact on cardiac system:** Cardiovascular diseases associated with shift work is one of the problems that have been studied for more than two decades since it has long been assume that shift work has a detrimental effect on the vascular system. Studies have shown that the relative risk of developing CVD in men who work in shift is 1.5 times more than in men working at regular schedule. The link between shift work and CVD points to the sleep loss incurred by shift workers is a significant factor, sleep loss or change in time of sleep constitute a major metabolic challenge for the body .[18] This theory encompasses the research that investigate inflammation, blood coagulation, cardiac autonomic function and the interaction between and cortisol and catecholamine and CVD .
4. **Hypertension:** Loss of sleep and stressful environment affect the immune system, considering that shift work schedule may predispose workers to inappropriate behaviour such as smoking, poor eating habits and poor balance between work and personal life and potentiate the activation of autonomic nervous system, inflammation, metabolic syndrome it is likely that the workers have higher risk of hypertension.[19]
5. **Effects on reproductive system:** Low levels of testosterone with clinical symptoms of such as decreased libido, erectile dysfunction, loss of interest in sexual life, lethargy, and infertility.
6. **Cancer:** Malignancies are mostly developed by mitigation in pineal hormone, melatonin, by a bright light at night. Reduced production of melatonin, phase shift, and sleep disruption caused by exposure to light at night, might be the possible mechanism that causes cancer and related disorders. There may be a link between shift work affected the immune system which increases inflammatory markers thereby causing malignancies and metabolic and cardiovascular disorders. The risk of breast cancer increases in women where the circadian rhythms of cortisol and prolactin do not adjust when women work in shifts.
7. **On Psychological health:** Continuous rotational work adversely effects the nervous system and may accelerate the development of psychiatric disorders, schizophrenia and major depressive disorders which impose enormous medical burden. Changes in mood state, feeling of fatigue, irritability, inability to concentrate, misperception also occur on account of sleep length reduction.[20]
8. **On social life:** Moreover shift work also causes impacts in social life, they may experience more difficulties in socializing with family and friends, stress and dissatisfaction with work.

Preventive Measures

Recommendation of "Shift Plan": '**Shift**' plan comprises,

S - **S**hift patterns and sleep

H - **H**ealthy life style

I - **I**llumination therapy

F - **F**asting

T - **T**aking supplements

1) **Shift patterns and sleep:** It is possible to reduce the effects of night shift, the first thing that comes to our mind is the speed and rotation of the shift

system. The quickly rotating System seems to find maximum favour. A fast rotation helps in minimising sleep deprivation, social contacts, alertness and wellbeing. Rapid rotation from a chronobiological point of view is advantages with regard to the conventional weekly rotation. One should find out the threshold for free time between shifts that would not cause loss of sleep. Another important factor that desires attention is the direction of the rotation of shift schedules. The direction of rotation maybe either clockwise or counter clockwise. The clockwise rotation was noticed to be better tolerated by shift workers then the one that follows the counter clockwise pattern. A change from counter clockwise to clockwise rotation has been documented to improve production from wellbeing, sleep quality, social and psychological problems. Short naps of 20-40 minutes in between the work can be beneficial as they may improve quality performance and night shift naps should be officially permitted. They should try to stay on the same sleep schedule every day of the week. Rotating shift workers are unable to keep a regular sleep schedule. Instead, they should begin to adjust their sleep time before a schedule change. For example, you may be working an evening shift. Soon you are going to rotate to a night shift. On the last few days of the evening shift, delay the times you go to bed and wake up by 1-2 hrs each day. Then when you begin the night shift, your body will already be getting ready for the new schedule. Add more break times if long shifts cannot be modified. Create a quiet and dark sleep den, and keep track on sleep how much you get each week and avoid stimulants like coffee within 4 hrs of your desired bedtime. Avoid sleeping pills, they can be helpful, but not good for long term use.

2) **Healthy lifestyle:** When you work in shifts your appetite for high calorie food goes up. Combination of caffeine and high carbs is the worst combination that can make your insulin spike and lead to obesity. Eating less carbohydrate food is advised, and eating small, high protein meals can be helpful. Bringing your home-made own food is ideal. Exercise as much as possible but sleep first and workout after you have rested. Get some sunlight when you are not working. Avoid smoking, alcohol, tobacco and any other unhealthy habits. Turn off electronics before going to sleep. According to *Ayurveda, Ratri Jagarana* is *Vata prakopaka* and causes *Rookshata*, to combat this we can recommend *Brihmana nasya, Snehapaana* (1-2 tablespoon of Ghee before going to work) etc. ''*Rutu Anusaar Panchakarma*'' is very much helpful to maintain their health. Along with these, Ayurveda recommends to follow *Dinacharya* and *Rutucharya*. Abhyanga, *Shirodhara, Shiropichu, Netra tarpana* with *Vatahar Taila's* helps to reduce *Nidra vegaavarodha janya laksana's* like anxiety, stress along with dryness of skin, wrinkles etc.

3) **Illumination therapy:** Timed exposure to bright light can be used to adjust body's sleep cycle. Artificial bright light can affect the body's clock in the same way that sunlight does. This therapy is used to expose your eyes to intense but safe amounts of light. This is done for a specific and regular length of time. This can keep you awake when you start to feel sleepy.

4) **Fasting:** Intermittent fasting during night shift leads to not only a higher intake of energy and macronutrients both in the early morning after work and throughout the next day. It improves insulin sensitivity, heart health, brain function and cancer prevention. It supports hormones and genes that influence metabolism and prevent premature aging.

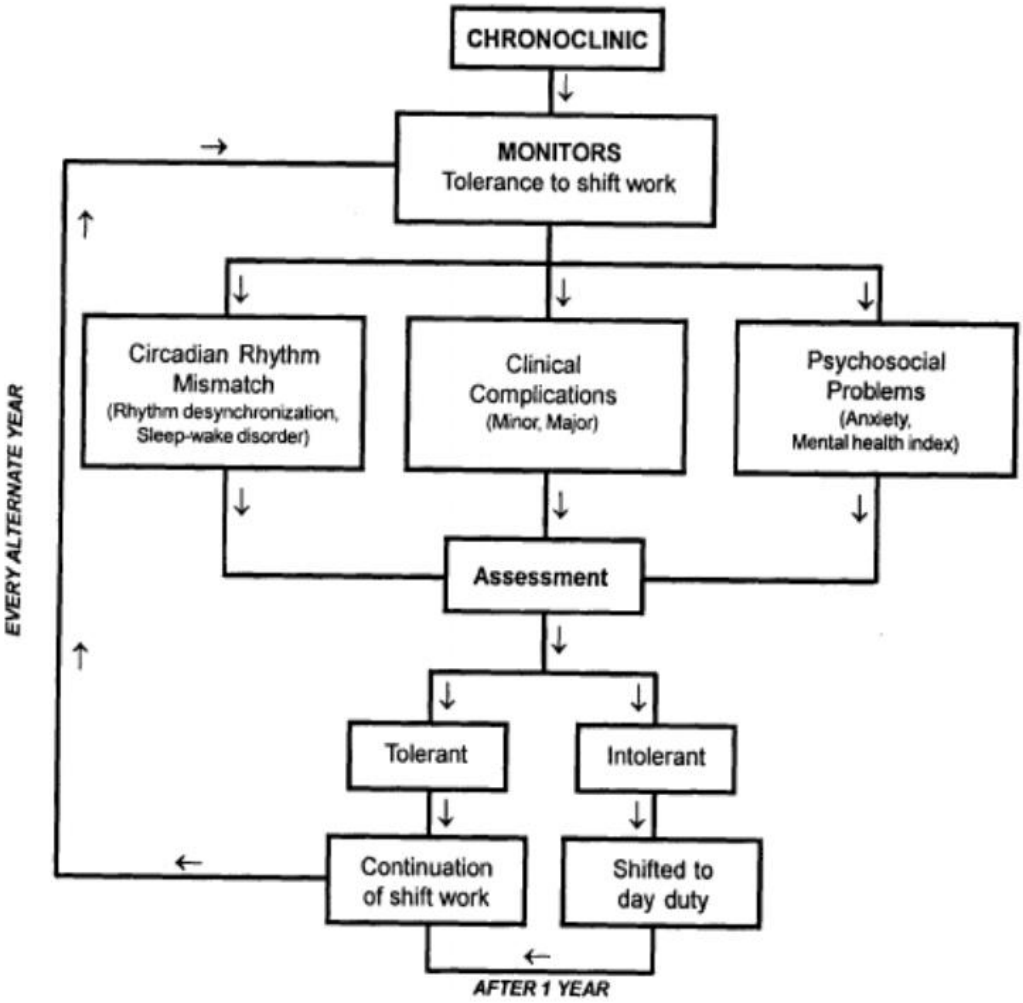
5) **Taking Supplements:** These are not substitutes for a balanced diet or adequate sleep. But they can however, in certain circumstances, fill some of the nutritional deficiencies exacerbated by a shifty schedule. By taking suggestion of health care provider, one can take iron, vit C, vit D, B12, omega 3 fatty acids, pre and probiotics etc. Some wake promoting medicines like modafinil and armodafinil are approved by U.S.FDA. Taking melatonin can help shift workers sleep during the day .It can help you to adopt your circadian clock to the work schedule under some circumstances. According to Ayurveda, *Ashwagandha* and *Shilajitu* supplementation can help to manage the effects of shift work.

Proposed Model for Shift-work Optimization

In every work place where shift work is mandatory, a 'Chronoclinic' should be established to offer 'Chronotherapy' for their drivers. Chronotherapy aims to restore the proper circadian pattern of the sleep-wake cycle, through adequate sleep hygiene, timed light exposure, and the use of chronobiotic medications, such as melatonin, that affect the output phase of circadian rhythms, thus controlling the clock. Trained healthcare personnel should monitor intermittently (preferably every alternate year) the state of biological clock of each shift worker. Upon discovering rhythm desynchronization his/her transfer from shift work today work for at least 1 year should be recommended to the management. This would perhaps rule out the possibilities of ill effects of shift work that are expected to be impinged upon drivers. It has been proposed that while examining

tolerance/intolerance of a driver to rotational shift work, the levels of anxiety, stress, mood swings, and his mental status under scrutiny should be taken into consideration. Appropriate chronotherapy should also be administered into intolerant drivers while they are transferred from shift duty to day duty. The below model has been proposed with a view to optimise shift driving.

Model suggesting optimization of shift schedule



The above model takes into account most of the important variables that are thought to have bearing effect on the effective management of shift driving. All the above counter measures either individually or in combination, may improve the coping ability of shift drivers thus minimizing occupational health hazards and maximising their performance. This would substantially increase the productivity of the organization for whom they are working.

DISCUSSION

Referring to WHO'S definition of health shift working is a risky condition at all the three reference levels (circadian rhythm, sleep, social/domestic factors) as it is not only a risk factor for many health disorders but it also perturbs homeostasis and hampers family and social life. Moreover, in shift drivers it is observed that, reduced job satisfaction associated with more frequent physical and psychological symptoms related to stress, which gives clear link between shift work and impaired health. The literatures in Ayurveda already mentioned that *Nidra Vega dharana* or *Ratri Jagarana* should be avoided; otherwise it leads to a greater number of health issues with the higher risk for several chronic diseases.

Prospective research in large samples is needed which could help us to investigate this topic in greater depth. Moreover, further useful counter measures can be adopted concerning additional stress brakes for meals and naps, supplementary holidays to improve sleep, recovery facilities, rehabilitation courses for shift workers, and progressive decrease of night work with increasing age should be adopted. Shift schedules should be designed according to some ergonomic criteria, recognized to be suitable to lesson stress and limit adverse effects on health and wellbeing by avoiding or minimising circadian disruption and accumulation of sleep deficits and fatigue, such as 1). Limit night work as much as possible 2). Avoid a large number of consecutive night

shifts 3). Prefer quickly rotating (every 1-3 days) shift systems to slowly rotating (i.e., weekly or longer) ones and to permanent night shifts. 4). Prefer clockwise rotation (morning -afternoon- night) to the counter clockwise (afternoon-evening- morning) rotation. 5). Set the length of the shift according to psycho physical demand 6). Avoid morning shift that starts too early, set an adequate number of rest days between shifts particularly after night shifts. 7). Allow flexible working time arrangements according to workers needs and preferences. However, it should also be taken into account that no one has a Priori the best solution as the arrangement of the shift schedule should be tailored to the specific job demands, personal characteristics, social economic conditions, and cultural background of the involved workers. This also requires the workers participation in the whole process of designing and implementing the shift schedule not only because of their direct experience of the problems but also to promote good motivation for adopting the most convenient coping strategies that are able to limit as much as possible, cultivation of their health and social life.

CONCLUSION

Shift and night work interferences, on health and wellbeing are complex and multifaceted in their Origins and time manifestations dealing with several aspects of personal characteristics and working and living condition. Therefore, given that our goal is the preservation of the shift driver's health as a whole, it is necessary to go beyond health protection to the view of health promotion. Our strategies must be oriented to defining the best diagnostic tools for health surveillance and assessing the risk/benefit ratio for the drivers and if it is acceptable or not. For the latter we have to adopt epidemiological approach aimed at assessing extension and severity of such a risk factor and addressing the most appropriate preventive measures at the best cost/effectiveness ratio for the drivers' groups and the communities in general. Consequently, it is necessary to apply a systemic approach, different domains which intern can affect the outcomes and address the interventions at the best involving physio-pathology, psychology, sociology, ergonomics, economics, politics and ethics. This implies the concurrent action of several actors beside the occupational health physicians such as psychologist, sociologist, educators, ergonomists, economist, legislator as well as manager and workers. '*Paadamshika Krama''* which is explained in Ayurveda (Gradually adjust your shift in a definite pattern like day shift-evening shift-night shift is beneficial for slow transition in sleep patterns which helps the biological clock to adjust itself for changing shifts. To prevent manifestation of diseases it is advised to follow Healthy diet and lifestyle along with purificatory procedures to maintain equilibrium of *Dosha, Dhatu*, and *Malas*.

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