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Shift Work and Insomnia

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1. INTRODUCTION

The vital need to extend services or enable uninterrupted productivity, several millions had to work in shifts varying in length of time for a greater part of their age. Shift work has frequently been shown to have detrimental effects on the health of employees, yet it is becoming increasingly prevalent in contemporary life (Harma 1998; Smith et al, 1999.). According to the International Labour Office, shift work is defined as a method of work organization under which groups or crews of workers succeed each other at the same work station to perform the same operations each crew working a certain schedule or shift so that the undertaking can operate longer than the stipulated weekly hours for any worker.

Ergonomics is the study of work (Latin: ergo = work; nomos = rules, laws). More specifically ergonomics is the science of designing the job to fit the worker, rather than physically forcing the worker's body to fit the job. Shift workers main problem is disturbed habits by clock. There are several concepts and mechanisms how the working hours and schedules could influence the workers health and well being (Smith et al, 1998). First biological disruption to physiological processes, including the sleep wake cycle (Akerstedt 1990; Harma et al, 1998), Second the impairment of physical health and psychological well being (Bohle and Tilley, 1989) and Third the disruption of domestic and social life (Walker 1985; Monk and Folkard 1992). Thus, sleeplessness is inevitable. Akerstedt and Folkard, (1997) found alertness deficits for instance are caused not only by the length of a shift but also by working hours shifting within the circadian phase indicates that, shift work that involves night shifts strongly influences the psychology and psychophysiology of the individuals. Thereby several other physical and mental stresses follow and make them vulnerable. (M Harma et al 2002)

Desynchronization of circadian rhythms attributed to shift work may lead to several clinical complications and has been demonstrated that very often shift workers suffer from internal desynchronization (Reinberg et al 1984, 1989; Pati and Saini, 1991; Gupta and Pati, 1993). It may produce disastrous chronopharmacologic effects such as impaired metabolism and impaired responsiveness to medications. Reinberg, (1986); Akerstedt, (1987); Akerstedt, (1990), Shah, (1990); Chang et al, (1993); Pati and Gupta, (1994); Gillberg, (1995) found that association between shift work and sleep disruption results in adverse medical and psychological consequences and may lead to increased use of alcohol and hypnotics (Phillips et al 1991). Brown et al, (1989) provides evidence to support the view that lack of sleep lowers resistance to infection and that during periods of sleep deprivation, respiratory tract infections occur more frequently. A few studies have reported depressed immune function in relation to shift work, which may explain an increased susceptibility to infections (Curti et al, 1982; Kobayashi, 1997).

Night shift workers suffer from insomnia like sleep disorder whereby individuals have difficulty in falling and staying asleep (Tepas and Mahan 1989). In a study by Breslau et al., (1996) patients with insomnia were nearly four times more likely to suffer major depression than those without insomnia. A positive correlation between the magnitude of sleep problems and age is a natural phenomenon (Tepas and Mahan 1989; Tepas et al 1993; Marquie and Foret, 1999; Marquie et al 1999). The disturbance of circadian rhythms can affect concentration, motivation, and reaction time, particularly at night (M Harma et al 2002). This combination can result in an increased risk of accidents and injury. Many systems in the body are very active at certain times of the day and not active at all in other times of the day. The least activity usually occurs in the middle of the night when most people are asleep. The combination of sleep loss and working at the body's low point can cause excessive fatigue and sleepiness. (M Harma et al 2002). This makes more difficult to perform well, which increases the risk of accidents (Madide, 2003). Pheasant, (1991) states that the likelihood of error increases when the operator is under abnormal pressure of work, or when the working capacity is reduced because of fatigue. Further, explanation is that the time of the day may be regarded as a contributory factor, which reduces the individual's ability to cope with abnormal circumstances as they arise. Working at night makes it difficult to get enough sleep (M Harma et al 2002). The accidents at Chernobyl and Three Mile Island occurred, around 01:00 hrs and the Bhopal disaster also occurred during the hours of night shift.

In transportation sector moving of the trains is required for a continuous period, which extends to 24 hours. In the modern industrial society, reasons for shift work, found to be similar in different countries (Kogi, 2001). Miller et al (1994) hypothesized that an extended situation of stress reduced alertness associated with attention, possibly leading to an increased incidence of accidents in the work place, since the fragmentation of sleep architecture might result in an increase of sleepiness, (Yules et al, 1997) decreased alertness, (Carskadon and Dement, 1982) and higher incidence of accidents and increased probability of precipitation of health problems among night workers. (M Harma et al 2002)

Shift workers do not get enough quality sleep over long periods and as such dozing-off while operating the train, is an extreme manifestation of sleepiness at work, and has been reported by 11% and 26% of train drivers, respectively (Akerstedt et al, 1983; Kogi and Ohta, 1975). Reduction of fatigue in rail transportation is a safety question. (M Harma et al, 2002)

Lack of alertness was the most important single contributor for accidents and near accidents in a recent analysis (Edkins and Pollock, 1997). Hildebrandt et al (1974) found that locomotive engineers fail to operate their alerting safety device more often at night than during the day. Accident reports also suggest that fatigue and poor shift schedules have occasionally been reported or identified as major contributors in serious rail accidents (Lauber and Kayten 1988; Moore-ede et al, 1996; Onnettomuustutkintakeskus, 1999).

Most train accidents in India or elsewhere were reported to have occurred due to human error. (Harma et al 2002). Rodgers et al, (1986) reports that the highest number of errors occurred between 03:00 with a second, lower peak occurring at 15:00 hrs. All the operators showed similar peaks in errors in the 01:00 to 04:00 am periods (M Harma et al 2002). Pheasant (1991) explanation is that time of the day may be regarded as a contributory factor which reduces the individual's ability to cope with abnormal circumstances as they arise. Working at night makes it difficult to get enough sleep. Therefore, it is essential that Loco pilots, Train guards, Track technicians and Signal controllers, whose alertness need to be 100% accurate, need to have special shift hours pattern, if not throughout the day, but for at least the night shifts.

A perusal of the last 15 major train accidents in India reveals that 75% of these accidents have occurred during the night times. Of these, 25% have occurred during the first part of the night (1800 hrs to 2200 hrs); another 25% during the second part of the night (2200-0200 hrs), while 50% have occurred during the final part of the night (0200-0600 hrs). These support the view, that night times are critical and support the views of Rodgers et al, (1986) and Pheasant, (1991).

Together with the alarming relationship of shift work to Insomnia, fatigue, performance, accidents and chronic heart disease, there is reason to believe that shift work may become a major challenge for the employer, employee and occupational health professionals. Thus, work schedules and work load factors need to be examined in combination to obtain a realistic picture of the effects of shift work on insomnia and fatigue. (M Harma et al 2002) as was also reported by Rosa (2000) and are considered as the primary symptoms for the disturbances in the biological clocks or the circadian rhythms.

In view of the above, the present work entitled ""*Shift work and Insomnia*"" has been contemplated with the following objectives:

1. To understand the occupational health problems among shift staff of different age groups with varying service experience;
2. To identify the different health disorders or diseases associated with the shift staff and the incidences of these health problems;
3. To assess the different types of stress associated with the shift work and understand the impacts on health;
4. To evaluate the present shift pattern with special reference to their impacts on health and to suggest the optimal pattern.

The present work entitled "Shift work and Insomnia" was carried out during June 2006 to February 2009. The staff of the E.Co. Division of the Indian Railways, who are working on shift duties constituted the main target group of the study.

In India, the adversaries being faced by the shift workers have not received much attention from the researchers and required a systematic documentation of the studies on the impacts of the altered biological rhythms on the health, social and domestic well being of the workers, along with the public safety. In view of this dearth, the present study is contemplated and focuses on the Railway shift workers, perhaps the largest group under a single employer in India.

Unfortunately, so far a proper strategy could not be evolved. It is also surprising that a consensus has yet to be reached among workers in this field concerning the identification and use of proper chronobiological index/indices to ascertain individual shift workers tolerance.

2. METHODOLOGY

The study followed "Syndrome Approach" to realize the objectives of the study, by adopting a combination of the methods of obtaining data on the study respondents. The focus of the study being the health problems associated with the shift work, sampling was carried out by selecting the employees. Results obtained were analyzed statistically wherever necessary.

The ***Standard Shift Work Index*** developed by the Shift work Research Team MRC/ERSC Social and Applied Psychology Unit was used in the present study with few modifications to

suit the local conditions. This Shift Work Index is a questionnaire which aims to identify the shift schedules, sleep habits, eating patterns if any psychological effects for an initial survey of the health which might be expected to increase or decrease the effects on health.

The questionnaire also identifies to the type of shift pattern the employee belongs, the nature of duties, work load etc. The identification of sleep habits according to which is being worked early, late or night or if on a rest day, extent to which sleep is disturbed depending on which shift he has been or is about to work. To estimate working hours, respondents were asked about jobs they had over the previous years. They were asked their usual weekly working hours and the start and end timings for each shift. The questionnaire also deals with the General and Specific health problems, doctors consulted for treatment or medication taken, ailments during the past two years, and other information related to the health and family health. Two general screening questions concerning stress felt, diseases suffered, and medicine consumption since starting shift work and before, where in the respondent can compare the two stages.

3. RESULTS

The sample selected for the present study is described here under. The distribution of the different age-sex groups in the sample reflected their proportional distribution among the employees of E.Co Railway division. About 3-5% of the population was selected as samples that constitute 300 individuals.

Gender Distribution:

The population was stratified in to the four Age groups: AG-1: between 20 and 30 years of age; AG-2: between 31 and 40 years of age; AG-3: between 41 and 50 years of age; and AG-4: 51 years or above. On the whole, about 228 (76%) of the individuals were Men; and 72 (24%) were women. Among different age groups, the gender composition varied and the women's ratio has declined in the higher age groups.

Distribution of Employees Types:

Of the 300 individuals examined in the study, Drivers (Loco Pilots) accounted for 41.33%; Train Guards have accounted for 7% and the TTEs have accounted for 6.67%. Thus, Travel mode shift employees altogether constitute 55% of the total individuals examined. Stationary employees i.e. Technicians and Office accounted for 22.67% and 22.33%, respectively

Shift Pattern:

Of the total 300 respondents, the number of workers within the age group 21-30 are 120. Amongst these number of workers who worked in rotational shift work with nights is 76.67%, rotational shift work without night is 8.33%, and permanent nights is 15%. Similarly within the age group 31-40, the number of respondents is 99. Amongst these the workers who worked in rotational shift work with nights is 85.86%, rotational shift work without night shift is 10.10% and those who worked permanent nights is 4.04%. Within the age group 41-50 the number of respondents is 56. The respondents who worked rotational shift work with nights are 67.86% those who worked rotational shift work without night is 21.43%. Those who were on permanent nights are 10.71%. Within the age group 51-60 the number of respondents are 25. The number of respondents who worked in rotational shift work with night are 72% and the workers who worked rotational shift work without night is 20% and those who worked permanent nights is 8%.

Resistants:

The respondents, who were not having any general health complaints over the last two years are referred to as *Resistants*, were 55 (18.33%) in number. Of these, 42 (76.36%) were men and 13 (23.64%) were women.

Vulnerables:

Of the 300 respondents, 114 (38%) were found to be Vulnerables. Among them 73.68% were men and 26.32% were women. However, among the men, 36.84% were Vulnerables; while among women 41.67% were Vulnerables. Among the total Vulnerables, underweight category accounts for 28.95% only, and of these, 54.54% were women. Among the overweight category, 85.19% were men.

Incidence of *Sleeplessness:*

The incidence of Sleeplessness was found in 29.67% of the total 300 respondents or 62.24% of the 144 respondents identified as affected by the stress. Of the total affected, 19.10% were women and 80.90% were males. Among the affected women, 88.24% were in the AG-1, while 5.88% each in AG-2 and AG-3 groups, while there were none in AG-4. Among the affected Men, 34.72% were in AG-1; 44.44% were in AG-2; 15.28% were in AG-3 and 5.56% were in AG-4 **(Fig.i).** Of the total affected, 47.19% were LPs, 23.60% were OSs, 17.98% TNs, 8.99% were GDs and only 2.25% were TTEs (**Fig. ii**). However, among the each employee type, a majority of the affected were in the lower age groups: Among the LPs, 85.72% were in AG-1 and AG-2 groups. Among the GDs, 62.5% were in AG-1; while among the TTEs and OSs, AG-1 group accounted for 50% and 61.90%, respectively. While in TNs, the first three age groups had less variation among the incidence. However, among the affected belonging to AG-4 group, incidence among GDs was high (**Fig. iii**). The incidence of the Stress symptoms by Sleeplessness, and the distribution of the affected in various age-sex groups are presented in **Table 1**.

Table i - Incidence of the Stress symptoms by Sleeplessness in respondents of various age-sex groups

S.No.	Employee Type	AG-1		AG-2		AG-3		AG-4		TOTAL	
		N	%	N	%	N	%	N	%	N	%
1	LP	17	40.48	19	45.24	5	11.90	1	2.38	42	47.19
2	GD	5	62.50	0	0	1	12.50	2	25.00	8	8.99
3	TTE	1	50.00	1	50.00	0	0	0	0	2	2.25
4	OS	13	61.90	7	33.33	1	4.76	0	0	21	23.60
5	TN	4	25.00	6	37.50	5	31.25	1	6.25	16	17.98
6	Total	40	44.94	33	37.08	12	13.48	4	4.49	89	

In the present study also stress by sleeplessness was reported by nearly 30% of the respondents. 80.9% of them were men. Among the different employee types, GD ranked first with 38.1% of them being affected, followed by LP (33.87%); OS (30.88%); TN (23.88%) and TTE (10%). The high incidence among the GD and LP is perhaps due to their prolonged duties coupled with the requirement of high alertness in the duty.

Fig – i Incidence of Sleeplessness Stress in different Age-Sex groups

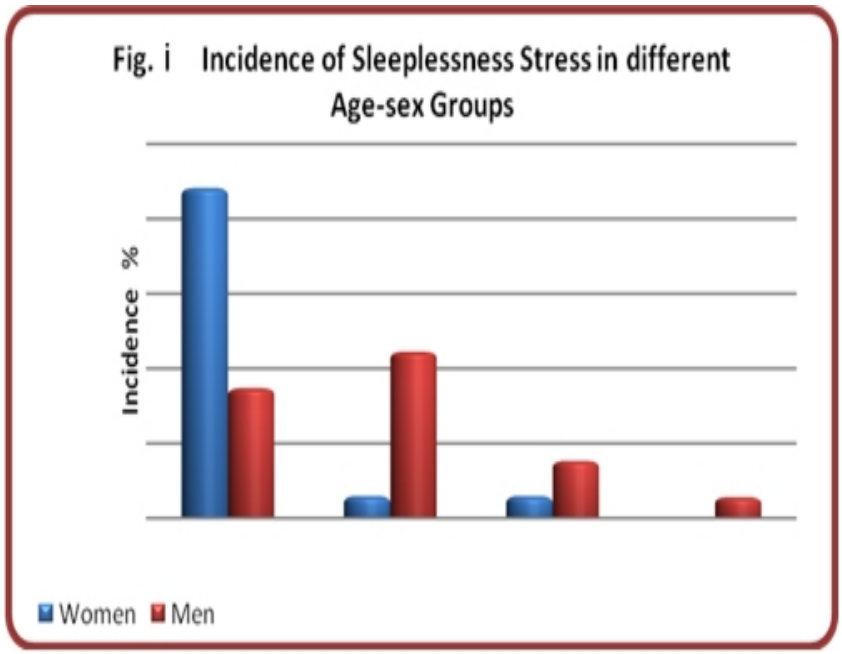
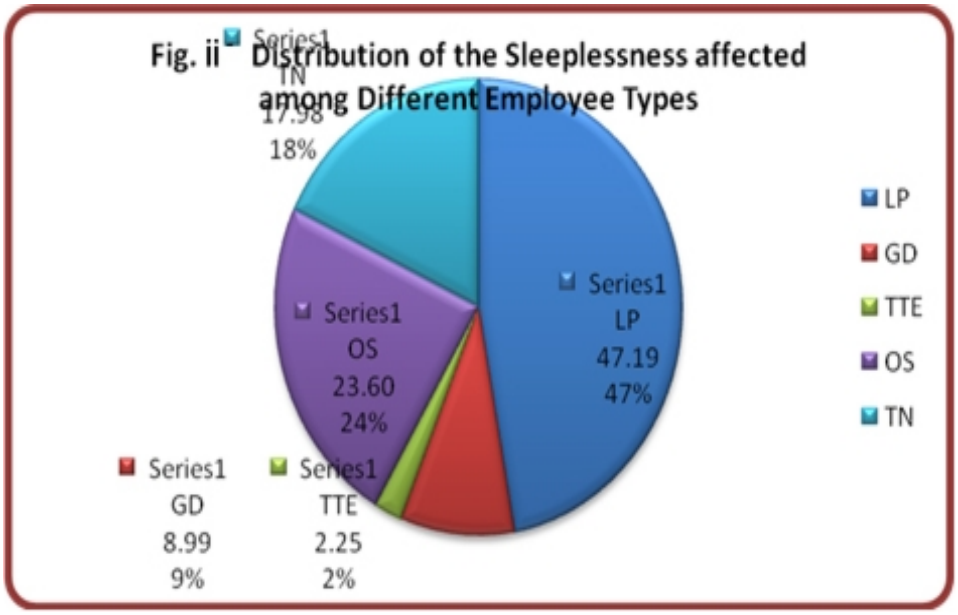


Fig ii – Distribution of Sleeplessness affected among different Employees



4. CONCLUSION / SUGGESTIONS/ FINDINGS

There is an agreement that shift workers are a population at risk. This is due to the fact that, they are exposed to psychobiological desynchronization and reduced coping associated with shift work. The study reveals alarming situation of the lower age groups being affected mostly, and the railways being one of the vital sectors that need to ensure safety of not only their employees, but also the public, their customers, at large, a review of the shift pattern in terms of work load and distribution compatible to the biological clock, the study recommends the following:

In view of the high incidences of health problems especially in the lower age groups (between 20 and 40 years); and among the employee types like Loco Pilots, Train Guards, and Technicians (like track staff and signal controllers) the study recommends that the night shift be limited to 4 hrs duration, and the ideal break up can be as follows: Day Shift 1: 0600 to 1400 hrs;Day Shift 2: 1400 to 2200 hrs;Night Shift 1: 2200 to 0200 hrs;Night Shift 2 : 0200 to 0400 hrs.

Further, it is essential that an ideal rotation of the shifts be adopted so as to reduce the sleeplessness and fatigue among the shift workers, ideally limiting the total work hours to less than 50hrs/week and night shift hours to less than 8hrs/week. Thus, the intensity of the stress reduces and the physical ability to cope up increases.

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