

# Shift Work and Stress

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**Abstract**—Disturbance of circadian rhythms can affect concentration, motivation, and reaction time, particularly at night. This combination can result in an increased risk of accidents and injury and health problems. Symptoms of the health problems related to the disturbance of biological clock, were considered as Stress problem categories like (a) Sleeplessness; (b) Stress; (c) Anxiety; (d) Anger; (e) Depression; and (f) Mental perturbations. Stress and Mental health affected individuals among the shift workers were identified based on their own ratings and respondents, on their own perception rated each of the symptom on a 4-point scale. Only those respondents, who have rated them either Medium or High degree only were considered as the individual affected by stress. On the whole, 143 respondents were identified as stress affected, and some of them with more than one symptom. Respondents with more than one stress symptoms were considered under Multisymptom groups of four orders based on the number of symptoms manifested. Of the total 97 MS respondents, only 5 (3.5%) were in the MS5 group, manifesting all the five symptoms. The frequency of the MS<sub>2</sub>, MS<sub>3</sub>, and MS<sub>4</sub> were recorded at 27.97%, 22.38% and 13.99%, respectively. 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.

## 1. INTRODUCTION

Today shift work has become a routine feature in industries, hospitals and many other essential sectors (Gupta et al, 1997). The shift schedules in railway transportation are often irregular and include early morning shifts and relatively short time-off intervals between the shifts (Caban et al, 1993; Dekker et al, 1993; Foret, 1987; Hak and Kampman, 1981; Ingre et al, 2000). About one-fourth of Swedish train drivers reported chronic fatigue at least once a week (Ingre, 2000). Excessive fatigue is most frequent during night and early morning shifts (Dawson et al, 1998; Ingre et al, 2000; Hak and Kampman, 1981; Moore et al, 1996).

It has also been reported that shift workers both rotating and stable night workers do have an increased risk for myocardial infarction and number of systemic illness, notably exacerbation of insulin dependent diabetes, epilepsy and neuropsychiatric disorders (Brief and Scala, 1986, Phillips et al 1991), gastrointestinal diseases (Gordon et al, 1986; Harrington, 1994; Costa, 1996) and diminished well-being (Costa, 1996). Thus, it seems unlikely that such temporal

disorder should be completely harmless to human beings, while some could be more vulnerable.

In shift workers, alterations in performance and sleep wake cycle have been reported (Folkard et al, 1980; Akerstedt et al, 1987; Minors and Waterhouse, 1988). The shift workers very often encounter a number of psychological disturbances and family dysfunction, as a result of which there is serious impact on the family and social-life (Wedderburn, 1981; Akerstedt, 1990; Chang et al, 1993). All the studies show that the adverse effects of the temporal disorders vary in their magnitude and importance depending upon the age, sex, work type, work load and general health conditions of the worker.

The poorly adapted night workers suffers from a potentially progressive state of chronic fatigue, which may be manifest in episodes of irritability, loss of drive, depression, loss of appetite, constipation and other disturbances (Pheasant, 1991). Akerstedt and Torsval, (1978) showed a clear decrease in sleep disturbance, mood disorders, gastrointestinal complaints and sickness absence in a group of steel workers who were transferred from shift work to day work. Frees and Semmer, (1986) found a significant excess in psychological and gastrointestinal symptoms in both shift workers and former shift workers (who left for reasons of ill-health) compared with day workers.

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. 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 view of this dearth, the present study is contemplated and focuses on the shift workers in Railways, perhaps the largest group under a single employer in India. The present work entitled "Shiftwork and Stress" was carried out during June 2006 to February 2009. The staff of the E.Co. Division of the Indian Railways, who were working on shift duties constituted the main target group of the study.

In view of the above, the present work entitled “Shiftwork and Stress” has been contemplated with the following objectives :

1. To understand the occupational health problems among shift staff of different age groups with varying service experiences;
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 impact on health and to suggest the optimal pattern.

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 chronobiologic index/indices to ascertain individual shift workers tolerance.

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.

## 2. METHODOLOGY

The study followed “*Syndrome Approach*” to realize the objectives of the study. The selection of the employees for the study was random. The shift pattern considered was rotational shift work and the employees mostly included were Running staff members. 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. The Canadian guidelines for healthy weights use Body Mass Index (BMI) to determine the acceptable range of healthy weights, and conditions of obese and underweight. Results obtained were analyzed statistically wherever necessary.

The Canadian guidelines for healthy weights use Body Mass Index (BMI) to determine an acceptable range of healthy weights and to identify conditions of excess weight and underweight. BMI is calculated by dividing weight in kilograms by height in meters squared.

Four weight categories are identified based on BMI

Underweight	: (BMI less than 20)
Acceptable weight	: (20-24.9)
Some excess weight	: (25-27)
Overweight	: (>27)

## 3. RESULTS

Results obtained were analyzed statistically wherever necessary. The parameters involving representation of averages were subjected for analysis to estimate the Mean, along with their Standard Deviation, Standard Error and Interval Estimates at 95% confidence level.

The sample population was stratified in to four Age groups, and 40% were in AG-1 (20-30 years); 33% in AG-2; 18.67% in AG-3 and 8.33% in AG-4. While men account for 76%, the women’s proportion has declined in the higher age groups. Of the 300 individuals examined in the study, Loco Pilots (LP) accounted for 41.33%; Train Guards (TG) have accounted for 7% and the TTEs have accounted for 6.67%, Technicians (TN) and Office Staff (OS) accounted for 22.67% and 22.33%, respectively. Women’s presence in different employee types in the sample reveals that their numbers is very low in LP and GD types. With the exception of the TN, in all others, AG-1 was the dominant age group

Symptoms of the health problems related to the disturbance of biological clock, were considered as *Stress* problem categories like (a) Sleeplessness; (b) Stress; (c) Anxiety; (d) Anger; (e) Depression; and (f) Mental perturbations. Stress and Mental health affected individuals among the shift workers were identified based on their own ratings and respondents, on their own perception rated each of the symptom on a 4-point scale. Only those respondents, who have rated them either Medium or High degree, only were considered as the individual affected by stress. On the whole, 143 respondents were identified as stress affected, and some of them with more than one symptom. Among the employee types, OSs ranked first with an incidence of 55.85%, and were followed by LPs (54.84), GDs (47.62%), TNs (31.34%) and TTEs (30%).

## 4. STRESS AND MENTAL HEALTH (SMH) PROBLEMS

Stress and Mental health affected individuals among the shift workers were identified based on their ratings on six specific symptoms: (1) Sleeplessness; (2) Fatigue; (3) Anxiety; (4) Anger; (5) Depression; and (6) Mental Stress. The respondents, in their own perception rated each of the symptoms on a 4-point scale as delineated below (**Table 1**):

**Table 1: Perception of the Symptom**

No.	Perception of the Symptom	Symptom	
		Degree	Rate
1.	Never a problem	Nil	0
2.	Problem, but with very less intensity	Low	I
3.	Problem, with medium intensity	Medium	II
4.	Problem with high intensity	High	III

Only those respondents, who have rated them either Medium or High degree only were considered as the individual affected by stress. On the whole, 143 respondents were identified as stress affected, and some of them with more than one symptom.

The distribution of the stress affected among different employee types are about 47.55% were LPs, who were followed by OS (26.57%), TN (14.69%), GD (6.99%) and TTE (4.2%). However, within the type, OSs ranked first with an incidence of 55.85%, and were followed by LPs (54.84), GDs (47.62%), TNs (31.34%) and TTEs (30%).(Fig.1).

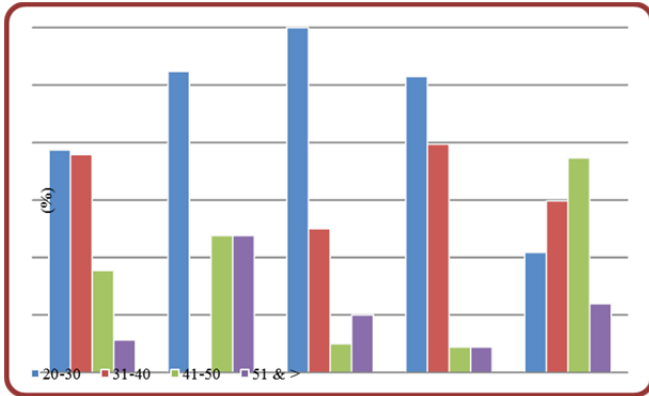


Fig. 1: Frequency of different Age groups within Employee Types

Of the total sample population, the incidence of *Sleeplessness* was 29.67%, and 31.33% for *Fatigue*; 17.33% for *Anxiety*; 1.33% for *Anger*; 23.67% for *Depression*, and 5.67% for *Mental* stress. Respondents with more than one stress symptoms were considered under Multisymptom groups of four orders based on the number of symptoms manifested. MS<sub>2</sub>, MS<sub>3</sub>, MS<sub>4</sub>, and MS<sub>5</sub>, are the groups with two symptoms, three symptoms, 4 symptoms and 5 symptoms, respectively. Of the total 97 MS respondents, only 5 (3.5%) were in the MS<sub>5</sub> group, manifesting all the five symptoms. The frequency of the MS<sub>2</sub>, MS<sub>3</sub>, and MS<sub>4</sub> were recorded at 27.97%, 22.38% and 13.99%, respectively.

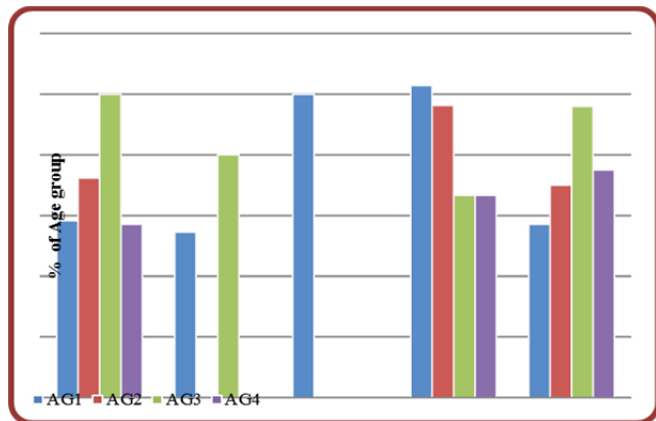


Fig. 2: Frequency of Vulnerables in different Age Groups Among Employee Types

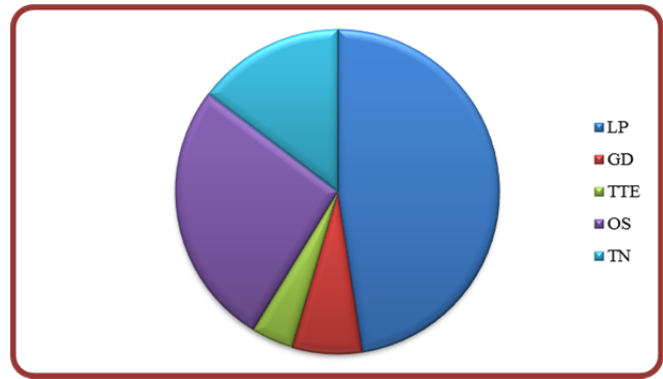


Fig. 3: Distribution of the Stress Affected among different Employee Types

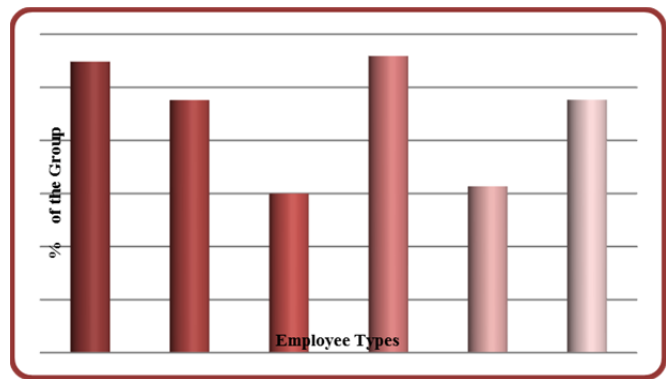


Fig. 4: Frequency of the Stress Affected among Employee Types

### 5. CONCLUSION

Rutenfranz et al, (1977) reports that perhaps the most important physiological problem regarding shift work, particularly shift work which includes night work, is the problem of entrainment of physiological functions after a phase shift of working and sleeping times.

There is extensive evidence that shift work including night work, increases the risk of developing psychological and physiological health problems (Andlauer 1960; Koller 1983; Bohle and Tilley 1989; Scott et al, 1997). Moldofsky, (1995) suggests that disorganization or disturbance of the sleep wake system interferes with the immunological, neuroendocrine and thermal systems and contributes to pathological processes and is evident in diseases, such as infections etc.

Shift workers main problem is the disturbed habits by clock. 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 indicated that, shiftwork that involves night shifts strongly influences the psychology and psychophysiology of the individuals. (M Harma et al 2002). Thereby several other physical and mental stresses follow and make them vulnerable.

Reinberg, (1986); Akerstedt, (1987); Akerstedt, (1990), Shah, (1990); Chang et al, (1993); Pati and Gupta, (1994); Gillberg, (1995) found that association between shiftwork and sleep disruption results in adverse medical and psychological consequences and may lead to increased use of alcohol and hypnotics (Phillips et al 1991). The proportion of shift workers suffering from sleep disturbances is usually above 50%, compared to 5-20% for day workers (Akerstedt, 1984). Rutenfranz et al, (1969) reports the sleep disturbance levels by different types of shift workers and it was 15% to 20% among Day workers; 5% among Shift workers not working night shifts; while among Night shift workers it has a wide range from 10% to 82%.

It is alarming that 84.62% of the affected by Anxiety stress; and 84.5% of the affected by Depression stress were in the AG1 and AG2 groups, while all the affected by mental stress were in the AG1 group. It is important to note that 67.83% of the stress affected had more than one type of stress symptoms. Although there seems to be no strong correlation between the length of the service and the number of stress symptoms, it appears that the number of stress symptoms is being affected not only by the work pressure, but also the other social conditions.

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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