

Shift Work and Blood Pressure

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1. INTRODUCTION

The human body is meant to be active during daytime hours, while during night time hours it is meant to sleep which allows it to recover and replace energy. Working at night and sleeping during the day is opposite, to the body's "biological clocks" and what the body naturally wants to do. The past few decades have witnessed a tremendous growth in the population of shift workers especially in developed and highly industrialized countries. 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. Problems associated with shift work are most often attributed to the assumptions that employees are being required to do the opposite of what their sleep wake rhythm would predict i.e. to stay awake during the night and to sleep during the day. (Walker et al, 1985; Feeney et al, 1998). Under certain compelling circumstances, internally synchronized rhythms no longer exhibit comparable frequencies and this situation is referred as a state of internal desynchronization. It has been rigorously demonstrated that very often shift workers suffer from internal desynchronization (Reinberg et al, 1984, 1989; Pati and Saini, 1991; Gupta and Pati, 1993).

The number of shifts per day may be two or three in a typical shift system. In two shifts per day system, two 12-hour shifts are often seen, whereas in three shifts per day system, three 8-hour shifts, or shifts comprising two 6-hour and a 12-hour shift may be adopted based on the work type or situation. The circadian rhythms are operated by the nucleus supra-chiasmaticus in the hypothalamus (Akerstedt, 1996).

This structure regulates the physiology and psychology functions of the body. Physiological disruptions are some of the major problems for the shift workers. Shift work has been shown to develop impaired metabolism and impaired tolerance or response to medications (Philips et al, 1995). Work schedules can have a negative impact on the health and well being of shift workers (Costa, 1996) and even within day work (Martens et al, 1999).

Several other studies have shown that shift worker has an increased risk of cardio-vascular diseases (Knutsson et al, 1986; Kristensen 1989; Tenkanen et al, 1997; Boggild, Knutsson, 1999; and Van Ameslvoort, 2000). 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), and diminished well-being (Costa, 1996). Bohle and Tiley, (1989) have shown a clear and significant increase in self-reported psychological symptoms (such as depression, loss of self-esteem, difficulty in concentrating, etc.) in a group of nurses. Sleepiness after successive night shifts is also decreased by age although older shift workers ability to resist acute sleep loss seems to be even better (Harma, 1996). Thus, it seems unlikely that such temporal disorder should be completely harmless to human beings, while some could be more vulnerable. Various studies (Schor 1991; Tarumi et al, 1992; Harrington 1994; Morimoto, 1994; Maruyama et al, 1995; Maruyama and Morimoto 1996; Spurgeon et al, 1997; Sparks et al, 1997) have reported that long hours of work are one of the possible risk factors which may cause health defects in employees working in varying shift schedules of time.

Together with the alarming relationship of shift work to 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 fatigue as was also reported by Rosa (2000).

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. 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. Therefore, it is desirable to become vigilant so that the quality of life and the state of health do not deteriorate among shift workers. Surprisingly, in India, very meager work has been done in

shift workers from chronobiological point of view. Work of this nature is of considerable significance to India, especially because the number of shift workers is likely to go up and if shift work posed a threat to health of the workers it would become a problem of national importance. 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.

In view of the above, the present work entitled “**Studies on the Occupational Health Impacts among Shift Staff in Railways**” 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

2. METHODOLOGY

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 physical health questionnaire was specifically constructed for the initial survey as the standardized health questionnaire subjects are asked to rate how frequently they experience symptoms such as digestive difficulties, respiratory problems, heart palpitations etc. A question relating to weight loss and weight gain has been included.

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). These guidelines are recommended for everyone aged 20 to 64 years, excluding pregnant women. The BMI scale is intended to be used as a “continuum” where the risk of developing health problems increases with shifts away from the “generally acceptable range.” Rapid changes within and between BMI categories should be considered as

important indicators of potential problems. Results obtained were analyzed statistically wherever necessary.

3. RESULTS

Distribution of Age Groups:

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.

3.1 GENERAL HEALTH STATUS

The general health condition of the respondents was determined mainly basing on two criteria: (1) Having no general health complaints over the past two years and (2) The Body Mass Index (BMI). The first category is herein after referred to as *Resistants*. Based on the BMI, the Underweight and the Overweight individuals were considered as the *Vulnerables*

3.2 SPECIFIC HEALTH PROBLEMS

Among the respondents, who complained with health problems and were taking medication or were under treatment, five types of health problems were identified to be most common. Blood Pressure is one of the problems amongst the five problems. And these symptoms of the health problems related the disturbance of biological clock was considered under health problem categories.

3.3 BLOOD PRESSURE

Among all the 300 respondents, 99 (33%) have expressed the Blood pressure (BP) problem, for which they were/had under the treatment. Among the men and women respondents, the incidence of the BP problems was recorded at 37.72% and 18.06%, respectively. Nearly 33% each of the underweight vulnerables and Overweight Vulnerables were in this category. In case of 52.53% of the affected, BP was traced to be hereditary.

The distributions of the respondents with the BP problem in to different age groups indicate that in AG-2, their number is very high. Among the AG-1 respondents, 21.67% were having BP complaint. In case of AG-2, AG-3 and AG-4, BP patients account for 38.38%, 37.50% and 25%, respectively (**Fig. 1**).

Among the different employee types, 38.71% of the LPs, 28.57% of the GDs; 25% of the OSs and TTEs; and 34.33% of the TNs were with BP problems. Of the 48 LPs with the BP problem, 31.25% were in AG-1; 39.58% in AG-2 group, 18.75% were in AG-3; and 10.42% were in AG-4 class.

Of the 6 GDs with the BP problem, 16.67% were in AG-1 and AG-3; none were in AG-2; and 66.67% were in AG-4. Of the

5 TTEs with BP problem 40% were in AG-1, 20% each in AG-2, AG-3 and AG-4. Of the 17 OS with the BP problem, 29.41% were in AG-1, and 64.71% were in AG-2; and 5.88% were in AG-3 and were none in AG-4 group. Of the 23 TNs

with the BP problem, 13.04% were in AG-1; 30.43% in AG-2; 39.13% in AG-3 and 17.39% were in AG-4 (**Fig. 2**). The distribution of the BP complainants among different employee types and Age groups is presented in **Table 1**

Table 1 - Distribution of the BP complainants among different employee types and Age groups

S.No.	Gender	AG-1	AG-2	AG-3	AG-4	TOTAL
1	Men	18 (20.93)	35 (40.70)	19 (22.09)	14 (16.28)	86 (37.71)
2	Women	8 (61.54)	3 (23.08)	2 (15.38)	0	13 (18.06)
3	Total	26 (21.67)	38 (38.38)	21 (37.5)	14 (25)	99 (33)
Employee Types						
1	LP	15 (31.25)	19 (39.58)	9 (18.75)	5 (10.42)	48 (38.71)
2	GD	1 (16.67)	0	1 (16.67)	4 (66.67)	6 (28.57)
3	TTE	2 (40)	1 (20)	1 (20)	1 (20)	5 (25)
4	OS	5 (29.41)	11 (64.71)	1 (5.88)	0	17 (25)
5	TN	3 (13.04)	7 (30.43)	9 (39.13)	4 (17.39)	23 (34.33)

- Values in parenthesis are percentages

Fig. 1 Incidence of Blood Pressure Problem among Shift workers

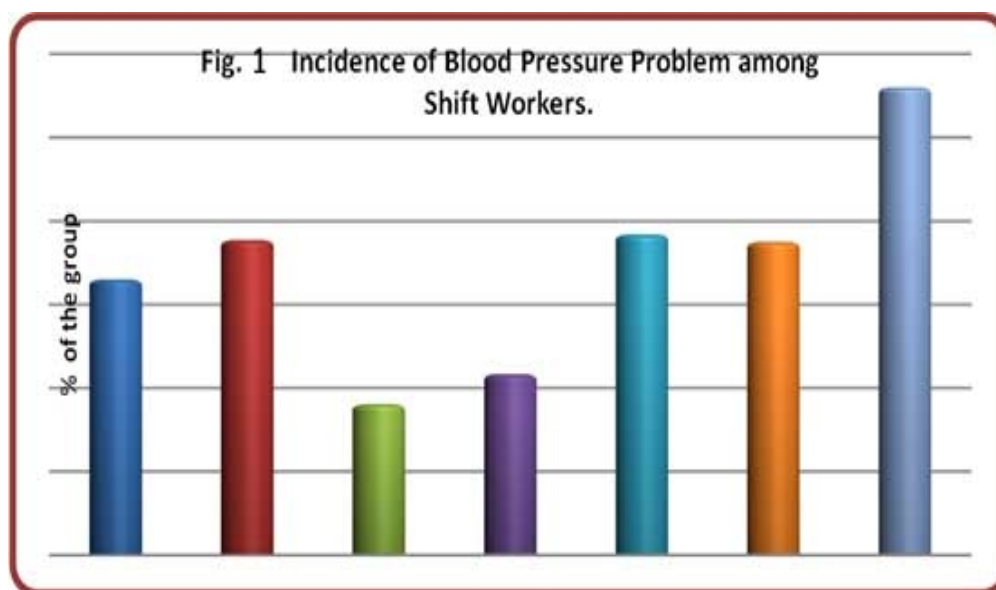
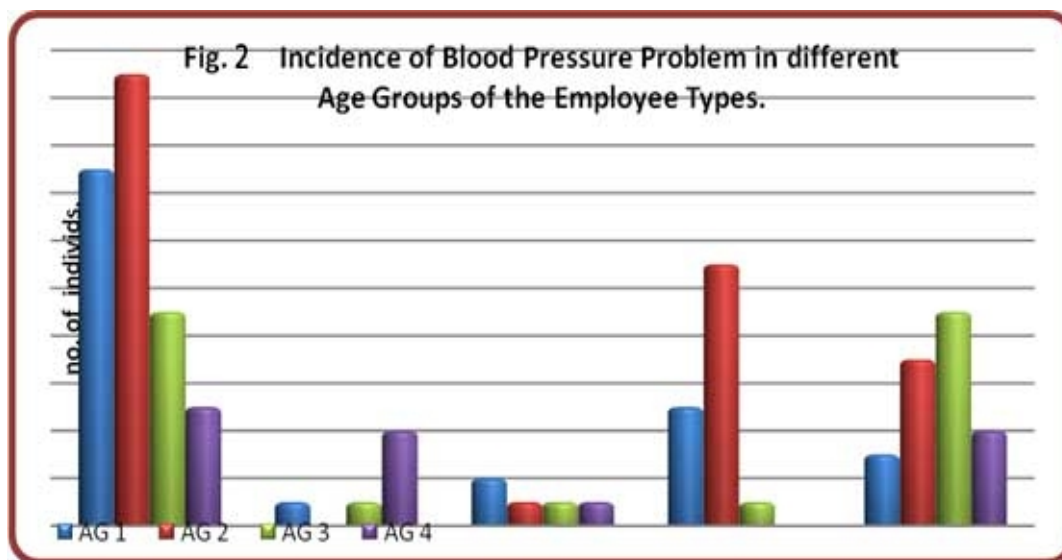


Fig .2 Incidence of Blood Pressure problem in different Age Groups of the Employee Types

4. DISCUSSION

Thus health hazards and stresses of work by itself, as well as intervening factors from outside the working life may influence and impair the state of health. 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.

In Japan (Maruyama, Morimoto, 1996; Nakamura et al. 1998) studies on some occupational groups with less physical work have shown have shown associations between long hours and weight gain increase which has led to stress and unhealthy lifestyle in men. Vulnerable to health problems by overweight was evident from the present study also. Among the OS and LP types, the vulnerability by overweight was found relatively high, compared to the other three groups.

Spurgeon et al, (1997) and Van der Hulst, (2003) suggest a link between long working to adverse health, like diabetes, cardiovascular diseases and mental health problems. The stress induced by long working hours and disturbance of the physiological biological clock affects the circulatory system. Hyashi et al, (1996) observed increased Blood Pressure in groups of white collar employees working 84 to 96 mean hours of overtime per month as compared with those working 25 to 43 mean hours of overtime. Iwasaki et al (1998) reported significantly elevated systolic blood pressure in older sales men (aged 50-60) whose work hours exceeded 61 hrs per week compared with sales men working 57 hrs or less. Others who established links existing between shift

work and increased risk of blood pressure and cardiovascular problems include Knutsson et al, (1986); Kristensen, (1989);Tuchsen et al, (1994); Uehata (1994); Kawachi et. al. (1995); Hayashi (1996); Tenkanen et al (1997); Iwasaki (1998); Sokejima, Kagamimori (1998); Tenkanen et al (1998); Boggild and Knutsson (1999); Van Amelsvoort et al (2001); Lipscomb et al (2002).

In the present study, one third of the total respondents have some degree of problem with their blood pressure. Over 82% of them complained hypertension. Among all the employee types, LPs ranked first with 38.71% of them as affected, and were followed by TNs (34.33%), GDs (28.57%) and TTEs and OSs with 25% each. Thus the stress creating hypertension appears to be high among the LPs and TNs.

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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