

RESEARCH ARTICLE

A Study of General Health Pattern among Night Shift Work Employees in a Tertiary Care Hospital

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Abstract

A prospective study enrolling 100 employees of Father Muller Medical College and Hospital on health pattern of shift workers with daytime workers was investigated. The subjects were divided into two groups of 50 members each, Group A-night shift employees/shift employees (study group) and Group B-day employees (control group). The study was conducted over a period of 2 months (July to September 2013) and the data was collected using a health based questionnaire divided into six parts which included working conditions, physical attributes, lifestyle, food habits, psychological health, and other health problems. Permanent day employees and shift employees from different occupational ranks like doctors, house-surgeons, nurses, administrative employees, lab technicians, ward maids etc. were included. Subjects unwilling to fill the questionnaire and incompletely filled questionnaires were excluded from the study. Chi-square was used to study the association of various social factors like working conditions, lifestyle, eating habits etc. with shift work. Among the 100 subjects enrolled, 39% were doctors, 21% were nurses, 18% were lab technicians and 27% were other non-clinical staff such as ward maids, secretaries, watchmen etc. Shift workers had low general health score (35.1) compared to day workers (39.5). The mean psychological health score was 12.5 in day workers and 10.7 in shift workers. Lifestyle factors like inadequate sleep, irregular eating habits, skipping of meals and lack of exercise had significant association with shift work and were found to contribute to ill health.

Keywords: Night shift work employees, health pattern, questionnaire, chi-square test, psychological health score.

Introduction

The past few decades have witnessed tremendous growth in the population of shift workers, especially in the developed and highly developing countries (Gordon *et al.*, 1986; Zaho and Turner, 2008). According to the International Labour office, shift-work is defined as: 'A method of work organization under which groups or crew of workers succeed each other at the same workstations 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. Often the term is used when more than one work period is scheduled in a workday or when most of the working hours fall outside the standard workday, such as evening, night or weekend shift (International Labour Office, Conditions of work digest, Geneva, 1986). Today, about one in five workers in Europe are employed in shift work involving night work and over one in 20 work extended hours (Harrington, 2001). It has been estimated that in UK about 20% of employees work in a shift system and it has become the need and demand of the modern society (Bureau of Labor Statistics, 2005). India is the frontrunner as an outsourcing destination owing to its huge population and cheap labor. A survey from NASSCOM reports that 4.5 million Indians are employed in Business Processing Outsourcing (BPO)

industries and are exposed to long working hours, erratic timings and increased workload leading to stress and other health problems. As such, we could not find a database which provides information about the percentage of labor working shift rotations in India (Bijavara and Honnamachanahalli, 2012). However, shift workers, particularly those who work at night may be at a risk of ill health because it causes a permanent conflict in biological clock of human body (Costa, 1996; Harrington, 2001). Human body's 'biological clock' helps in maintaining complex internal functions throughout the day. Past research has suggested that shift work has a significant negative impact on quantity and quality of sleep (Khaleque, 1998). An important and extensively researched marker of biological-clock activity is the rhythm of melatonin. In human beings, sleep is normally initiated during the rising phase of the melatonin rhythm. Attempts to sleep at inappropriate phases of the circadian cycle, for example during the declining phase of melatonin will usually result in shorter sleep episodes and more night awakenings (Dijk *et al.*, 1999). Desynchronization of circadian rhythms attributed to shift work may lead to several clinical complications. Thus disruption of circadian rhythm in shift work exerts a major influence on physiological, psychological and pathological functions of human body (Costa, 1996;

Harrington, 2001). Sleep loss is obviously the most important immediate consequence of night work resulting in performance deficits, including increased variability in performance, slowed physical and mental reaction time, increased errors, decreased vigilance, impaired memory, and reduced motivation and laxity. This situation also causes a change in feeding cycle. Having meals at regular timings is considered as an important socio-environmental synchronizer of the circadian rhythms and in turn influences human metabolism. Rotating shift work disturbs sleep, wakefulness, eating patterns and social life and in the long run, often results in gastrointestinal diseases (Costa *et al.*, 1987). Social factors like age, lifestyle, eating habits, working conditions may be factors which contribute to the risk of ill-health in night shift workers. Some of the most common health problems identified in shift workers are insomnia; gastrointestinal problems which include abdominal pain, diarrhea, loss of appetite etc.; cardiovascular problems and reproductive problems (Harrington, 2001). The endocrine responses may be less suitable for food intake during night leading to high incidence of obesity and cardiovascular diseases (Holmback *et al.*, 2003). In a study titled 'Sleep deficiency and quality of life of shift workers' by Khaleque (1998), the quantity and quality of sleep, health and well-being of 60 industrial shift workers in Netherlands were compared and it was opined that night shift is the most disruptive of all shifts in terms of sleep deficiency and health complaints. An investigation carried out by Ohayon (2002) on 817 staff members of a psychiatric hospital in USA found that night shift workers reported difficulty in initiating sleep compared to day workers. This study concluded that shift work causes sleep disturbances and as a consequence, shift workers were more likely to feel sleepy during work and more likely to avail sick leaves.

Shift work is a factor in timing of food consumption; hence eating pattern may be affected more in night shift workers compared to day workers leading to poor eating habits. The association between shift work and food intake was revealed in many studies. Reeves *et al.* (2004) conducted a study with the aim to investigate the effect of shift work on food intake and eating habits in 36 shift workers in US. The results revealed that night shift workers did not eat as much as day workers but ate smaller meals and snacked more frequently. In a research titled 'Circadian variation of energy expenditure in response to diet induced thermogenesis (DIT)' by Romon *et al.* (1993), it was revealed that the time of meal consumption affects the thermogenic response and favors weight gain among night workers who eat more snacks. Findings of a cross-sectional study conducted by Lasfargues *et al.* (1996) to investigate dietary intake, behavioral habits and metabolic differences in night workers compared to day workers suggested that night workers had poorer dietary habits and metabolic profile compared to day workers.

Many studies have been carried out on the impact of shift work on daily health habits and adverse health outcomes. Furnham and Hughes (1999) examined psychological correlates of night workers and results indicated that night workers expressed lower job satisfaction when compared to day workers. The relationship between shift work and job stress was assessed by Harda *et al.* (2005). Subjects enrolled included 3078 d workers and 1884 shift workers. The study revealed higher job stress among night workers. Mohren *et al.* (2002) studied the prevalence of common infection among employees working different time schedules in Netherland. This study pointed out that shift work was associated with higher prevalence of common cold, flu-like illness and gastroenteritis compared to day workers. Shift work was further found to be associated with differences in health behavior, sleep, fatigue etc. In Japan, Sewega *et al.* (1987) examined 1657 employees in factories, banks and schools by endoscopy. The prevalence of gastric ulcers was found to be 2.38% in shift workers as compared with 1.03% in day workers. For duodenal ulcers, prevalence was 1.37% and 0.69% for shift workers and day workers respectively. Another cross-sectional survey of 343 US factory workers was done by Caruso *et al.* (2004) with the aim of examining the relationship between work schedule and gastrointestinal symptoms, medications and diagnosis. The findings suggested that night workers were at a higher risk of gastrointestinal disturbances.

Kim *et al.* (2002) performed a study to investigate effect of shift work, in terms of general health, insomnia, stress, psychological health on 850 shift workers and 550 d workers, in several manufacturing plants in Korea. The results revealed that shift workers suffered from physical and psychological distress and sleep problems. Shift work is thus a part and parcel of today's life and working atmosphere. Although the impact of shift work on health has been studied extensively in other countries, in India very few studies have been carried out in this area. Moreover the studies previously done were on shift workers in call centers, BPO's, software companies, etc. Not much has been known regarding the health of night shift employees in hospital sector. Moreover, it has been found that proportion of shift employees in hospitals was significantly high (38%) (Bureau of Labor Statistics, 2005). In this scenario, there is a need to study the health pattern of night shift hospital employees with the following objectives:

1. To study and compare the health pattern between day and night shift health care employees.
2. To study the association of various social factors (like working conditions, lifestyle and dietary habits) with shift work.

Materials and methods

Study group: The present study was conducted among employees of Father Muller Medical College and Hospital.

In this prospective questionnaire based study, a total of 100 subjects in the age group 20-60 yrs including men and women were enrolled. The study was carried out within a 2 month period between July and September 2013. Ethical clearance was obtained from the institute and data was collected after gaining informed consent, by asking the subjects to fill up a questionnaire which had questions regarding the age, sex, physical attributes, lifestyle, food habits, psychological and physical illness.

Selection criteria:

- a) **Inclusion criteria**-Permanent day employees and shift employees from different occupational rank like doctors, house-surgeons, nurses, administrative employees, lab technicians, ward maids etc. were included.
- b) **Exclusion criteria**-Subjects not willing to fill the questionnaire and incompletely filled questionnaires were excluded.

The subjects were divided into two groups of 50 members each, Group A-night shift employees/shift employees (study group) and Group B-day employees (control group). Day employees are defined as those employees who work only during the daylight hours i.e. within the standard working time of 7 am to 7 pm. Shift employees refers to those employees who work both day and night, i.e. those who work outside the standard daytime hour of 7 am to 7 pm. In our study, the terms 'night shift employees' and 'shift employees' are used interchangeably and it refers to those who work both day and night in a shift system.

Questionnaire: Keeping in view, the objective of the study, a detailed questionnaire was prepared to obtain the information on various aspects related to the assessment of health status of night shift employees. The questionnaire was divided into six parts as follows: I-Working conditions, II-Physical attributes, III-Lifestyle, IV-Food habits V-Psychological health and VI-Health problems. A set of self-designed questions was used to assess the general health problems of the night shift employees in section V and VI which consisted of 5 and 10 questions respectively. A 4 point scale with the alternatives 'never', 'sometimes', 'often' and 'always' was made as given in Table 1. Score for all the questions was added and total health score of each subject was calculated. The mean average health score for group A (shift employees) and group B (day employees) was calculated separately with the help of statistics. Also average psychological health score and average general health score was calculated separately for both the groups.

Table 1. Category and score levels.

Category	Score
Never	4
Sometimes	3
Often	2
Always	1

Statistical methods: Data collected from the questionnaire was analyzed manually and assistance of Microsoft Excel (2007 version) was used to compute the frequencies and percentages. Chi-square was used to study the association of various social factors like working conditions, lifestyle, eating habits etc. with shift work. P value of <0.05 was considered as highly significant and <0.001 was very highly significant.

Results

The study included 53 females and 47 males. Among the day workers, 58% were males and 42% were females and among shift workers 48% were males and 52% were females (Fig. 1). Among the 100 subjects, 39% were doctors, 21% were nurses, 13% were lab technicians and 27% included others like ward maids, watchmen, secretary etc. (Fig. 2). Figure 3 demonstrated that shift workers had significant shorter durations of sleep than day workers (p=0.001). About 20% of shift workers slept for <5 h, while in day workers this figure was only 4%. Those who slept for more than 7 h were only 4% in shift workers and 28% in day workers.

Fig. 1. Gender distribution.



Fig. 2. Occupational status.

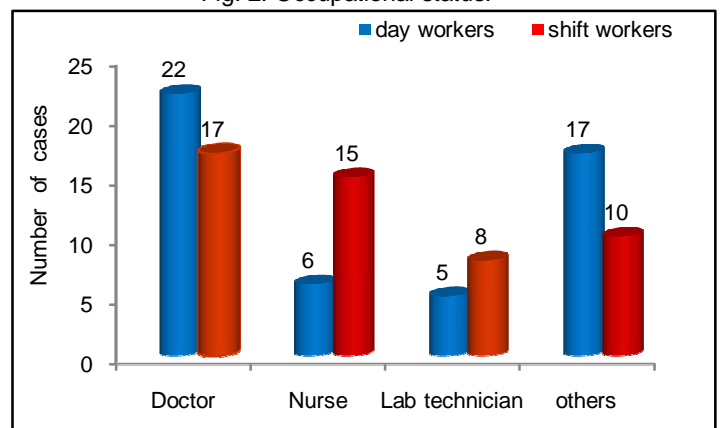


Fig. 3. Duration of sleep.

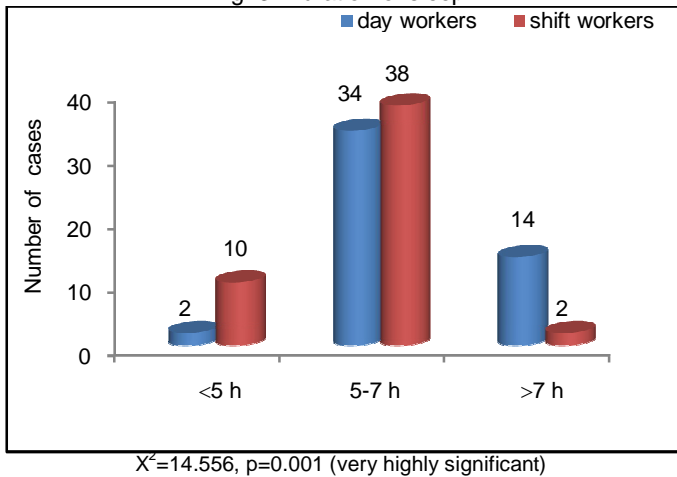


Table 2. Frequency of sleep awakenings.

No. of times		Day workers	Shift workers	Total
Once	Count	31	26	57
	%	62.0%	52.0%	57.0%
Twice	Count	15	19	34
	%	30.0%	38.0%	34.0%
Thrice	Count	3	5	8
	%	6.0%	10.0%	8.0%
>3 times	Count	1	0	1
	%	2.0%	.0%	1.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

$X^2=2.409, p=0.492$

Table 3. Exercise.

Regular exercise		Day workers	Shift workers	Total
Yes	Count	31	20	51
	%	62.0%	40.0%	51.0%
No	Count	19	30	49
	%	38.0%	60.0%	49.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

$X^2=4.842, p=0.028$ (Significant).

Fig. 4. Type of exercise.

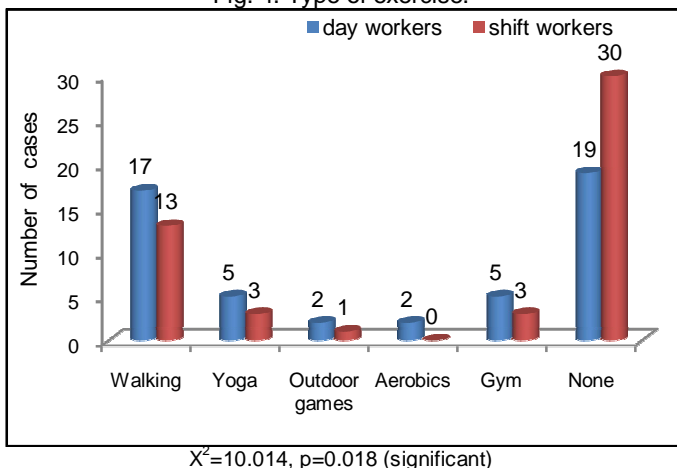


Table 2 depicts 48% of shift workers reported awakenings from sleep on more than one occasion. Among day employees this was only 38%. Compared to shift workers, more number of day workers were found to exercise regularly, 62% of day workers exercised regularly whereas among shift workers only 40% reported regular exercise (Table 3). Figure 4 shows that in both the groups, walking was the most preferred form of exercise (30%) followed by yoga and gym (8%), outdoor games (3%) and aerobics (2%). Table 3 indicates a greater tendency to skip meals among shift workers as compared to day workers. Prevalence of meal skipping was 58% in shift workers and 28% among day workers (p value=0.003). Figure 5 shows evidence that in both groups; breakfast was the most commonly skipped meal of the day. From this figure it can be observed that among shift workers, 38% skipped breakfast, 4% skipped lunch and 16% skipped dinner. In day workers, 22% skipped breakfast, 2% skipped lunch and 4% skipped dinner.

Fig. 5. Type of meal skipped.

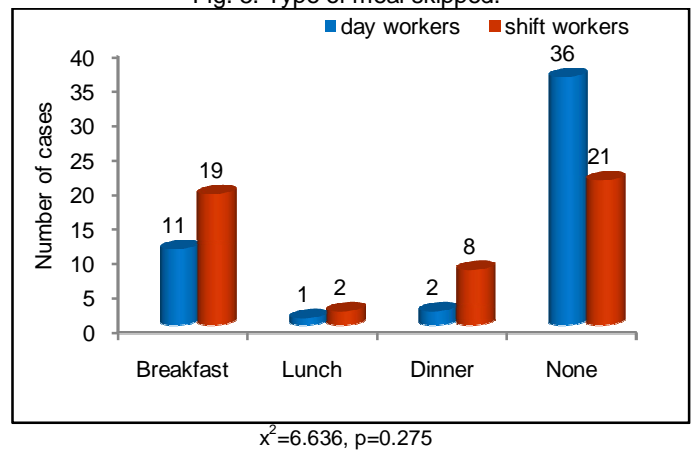


Table 4 shows that majority of day workers (64%) consumed homemade food whereas majority of shift workers (54%) ate food from canteen, followed by 28% who consumed homemade food and 18% who had food from hotels. Table 5 depicts a higher prevalence of snacking among shift workers (52%, p=0.034) when compared to day workers (38%). From Table 6, it is observed that about 40% of shift employees consumed more than 2 cups of coffee per day whereas in day employees this figure was only 26%. Figure 6 shows 54% of shift employees adopted various methods to stay awake during night shift. The most preferred method was consumption of hot beverages (tea, coffee) (28%), followed by listening to music (16%) and reading (8%). About 96% of shift workers reported being stressed whereas it was 78% among day workers (p=0.034). Those who reported that they felt depressed were 66% among day workers and 94% among shift workers. About 82% of day employees reported feeling anxious, whereas in shift employees this was 96% (p=0.001). All shift workers (100%) felt angry whereas in day workers (84%) felt angry.

Table 4. Source of meal.

No. of times		Day workers	Shift workers	Total
Once	Count	31	26	57
	%	62.0%	52.0%	57.0%
Twice	Count	15	19	34
	%	30.0%	38.0%	34.0%
Thrice	Count	3	5	8
	%	6.0%	10.0%	8.0%
>3 times	Count	1	0	1
	%	2.0%	.0%	1.0%

$\chi^2=2.409$, $p=0.492$

Table 5. Frequency of snacking.

Frequency		Day workers	Shift workers	Total
Daily	Count	19	26	45
	%	38.0%	52.0%	45.0%
3-5 d/w	Count	10	6	16
	%	20.0%	12.0%	16.0%
1-2 d/w	Count	7	13	20
	%	14.0%	26.0%	20.0%
5-8/month	Count	14	4	18
	%	28.0%	8.0%	18.0%
Never	Count	0	1	1
	%	.0%	2.0%	1.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

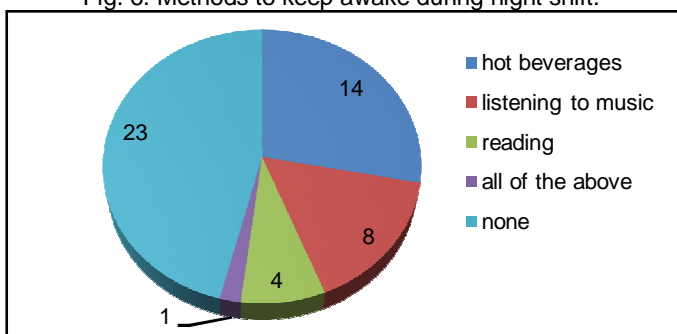
$\chi^2=10.444$, $p=0.034$ (Significant).

Table 6. Amount of coffee consumed per day.

No of cups/d		Day workers	Shift workers	Total
1/d	Count	37	30	67
	%	74.0%	60.0%	67.0%
2/d	Count	11	15	26
	%	22.0%	30.0%	26.0%
3 or >3/d	Count	2	5	7
	%	4.0%	10.0%	7.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

$\chi^2=2.632$, $p=0.268$

Fig. 6. Methods to keep awake during night shift.



Overall shift employees reported feeling more stressed, depressed, anxious and angry as compared to day employees (Fig. 7). Shift employees reported experiencing health problems like loss of appetite, abdominal pain, indigestion, diarrhea, heart palpitation more often than day employees.

Fig. 7. Pattern of psychological health.

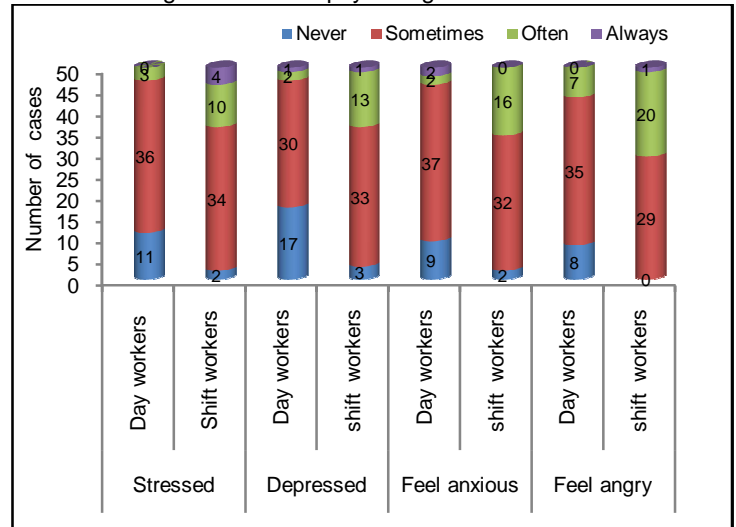


Fig. 8a. Pattern of health problems.

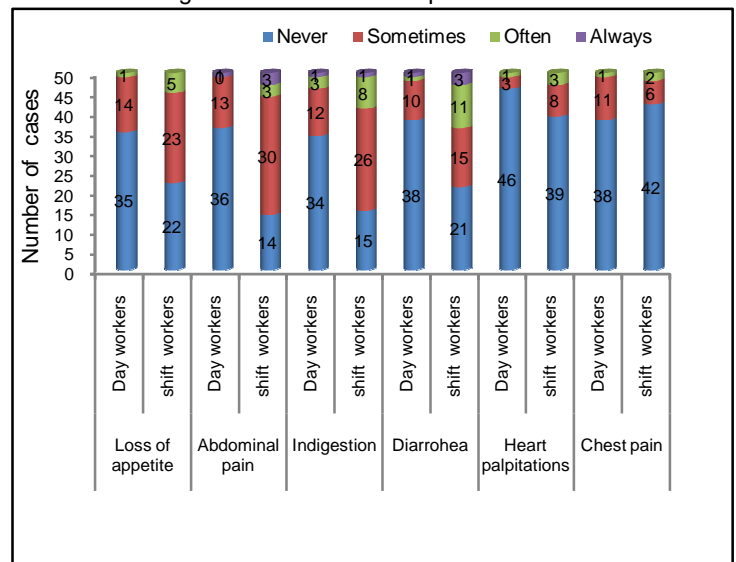


Fig. 8b. Pattern of health problems.

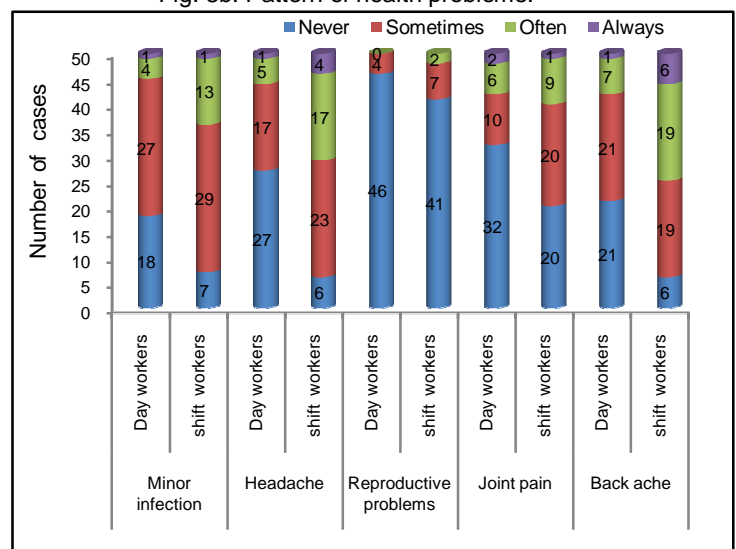
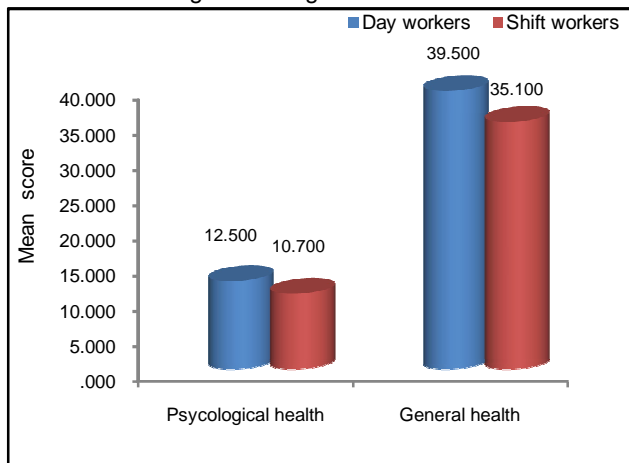


Fig. 9. Average health score.



Chest pain was experienced more often by day employees compared to shift employees (Fig. 8a). Additionally, health problems like minor infections, headache, reproductive problems, joint pain and backache were experienced more often by shift employees compared to day employees (Fig. 8b). Figure 9 demonstrates poor psychological health among shift workers when compared to day workers (Mean psychological health score was 12.5 in day workers and 10.7 in shift workers). The mean general health score was also poor in shift workers (35.1) when compared to day workers (39.5).

Discussion

This study enrolled 100 individuals working in Father Muller Medical College Hospital. After a questionnaire survey, the health pattern of the hospital employees was studied. Shift employees were found to have poor health status compared to day workers and various risk factors leading to ill health of shift employees were analyzed. With reference to exercise habits, the results depict that 60% of shift workers did not partake in regular exercise, but among day workers this percentage was only 38% (Table 2). Among the employees, who exercised regularly, percentage of those who did heavy exercise (aerobics, gym) was 6% and 14% in night shift and day employees respectively (Fig. 6). These results are in accordance with previous study conducted by Lasfargues *et al.* (1996) who pointed out that very few subjects were doing physical activity in shift workers (50.2%) in comparison with day workers (59.9%). On studying the association between sleep and shift work, it was found that about 14% of day workers slept for >7 h, whereas it was as low as 2% in shift workers. Similarly about 10% of shift workers and 2% of day workers slept for less than 5 h (Fig. 5). A large proportion (58%) of shift workers reported that their sleep was disturbed more than twice during sleep. Among day workers, this proportion was 38% (Table 2). These results are similar with that of a study conducted by Khaleque (1998) who revealed that the quantity and quality of sleep was better in day workers compared to

shift employees. It may be explained by the fact that shift workers work against the biological clock i.e., they work at night and sleep during day, hence the normal sleep wake cycle is disturbed. Other unfavorable environmental conditions like surrounding temperature, noisy surroundings, crowded rooms etc. may also be factors leading to disturbed sleep. Meal skipping habits were found to be highly significant statistically. Among the 58% of shift workers who skipped food, around 38% skipped breakfast and 16% skipped dinner. Day workers who skipped food were significantly lower when compared with shift workers (38%). Among these, day workers, 22% skipped breakfast and 4% skipped dinner (Fig. 7). This is comparable with a study conducted by Reeves *et al.* (2004) who showed that night shift workers ate lesser meals and snacked more compared to day workers. The reason for skipping meals might be attributed to the nature of work, improper timings of intervals, etc. It was also observed that night shift employees consumed more snacks at intervals compared to day workers. Approximately 58% of night workers and 38% of day workers reported having snacks daily. It should be noted that in both these groups, breakfast was the most skipped meal of the day. This is in accordance with the findings of Lasfargues *et al.* (1996) who pointed out a high prevalence of missing breakfast in night shift employees as compared to day employees. Shift employees often feel tired and sleepy after a full night shift, so they are more likely to go to bed without taking food. This could be a possible explanation for higher prevalence of skipping breakfast among shift employees. In addition, 54% of shift workers and 30% of day workers had food from a canteen. Majority (64%) of the day workers consumed homemade food, whereas only 28% of shift workers consumed homemade food (Table 4). A logical explanation for this difference could be the nature of work schedule and timings among shift workers. It was observed that 10% of shift workers reported consuming 3 cups of coffee per day. Among day workers, those who consumed more than 3 cups were very few (4%) (Table 6). It was also observed that among different methods adopted to stay awake, consuming hot beverages was the highest (28%) (Fig. 6). The increased consumption of coffee as a stimulant among night employees may be explained as a mechanism to stay alert during night hours. This is comparable with the study conducted by Knutson (1989) and Tepas (1990) who observed that consumption of coffee and sucrose was more during night shift. On comparing the psychological health in both groups, it was found that shift employees experienced stress, depression, anxiousness and anger to a greater degree than day employees (Fig. 7). The mean psychological health score was less in shift employees (10.7) compared to day employees (12.5) as observed from Fig. 9. One of the reasons behind increased psychological stress in shift employees might be the higher workload and extended working hours as compared to day employees.

Lack of sleep in shift workers could also be a factor leading to stress and anxiety. In totality, night shift employees experienced a greater proportion of health related complaints such as headache and back pain (88%), joint pain (60%), minor infections (86%) and cardiac palpitations (22%). Gastrointestinal symptoms reported were significantly higher and included abdominal pain (72%), indigestion (70%), diarrhea (58%), loss of appetite (56%). Chest pain was the only symptom recorded higher (22%) among day workers (Fig. 8a, b). The average health score indicates that shift workers have poorer health status compared to day workers. Thus, it can be concluded that night shift work, can have a negative impact on both psychological and physical health of hospital employees as it alters normal circadian rhythms. Shift work causes a mismatch between circadian system and environmental synchrones such as the sleep wake and the feeding cycle leading to ill health. In this study, gastrointestinal complaints including indigestion, abdominal pain, loss of appetite etc. were two or three times greater among shift workers. It can be hypothesized that these gastrointestinal disturbances are the result from eating food at the wrong time, with abnormal patterns of gut motility and gastric acid secretion being likely. Other possibilities may include the lack of hot food at night and thus the tendency to eat out; the tendency to nibble rather than take full meals; the higher intake of carbohydrate, caffeine. Other factors might be disturbed sleep, overeating, excessive coffee drinking and job related psychological stress. The study is in line with the study conducted by Segawa *et al.* (1987) who suggested prevalence of duodenal ulcer was more in shift workers compared to day workers.

Conclusion

- Among the 100 subjects enrolled 47% were males and 53% were females, 39% were doctors, 21% were nurses, 18% were lab technicians and 27% included others like ward maid, secretary, watchman etc.
- Night shift employees were found to have lesser sleep than day employees. Also sleep was disturbed more often in shift workers compared to day workers.
- More day workers exercised regularly (62%) in comparison with shift workers (40%). In both the groups walking was the most preferred form of exercise (38%) followed by yoga and gym (8%), outdoor games (3%) and aerobics (2%).
- It was observed that prevalence of meal skipping was more common among shift employees (58%) than day employees (28%). Among all the subjects who reported skipping their meals, breakfast was the most commonly skipped (30 %) followed by dinner (10%) and lunch (3%).
- It was observed that majority of day employees (64%) consumed homemade food whereas in shift employees majority consumed food from canteen (54%). Shift workers were found to snack at more frequent intervals than day employees.

About 52% shift employees had snacks daily, and in day employees this figure was 38%.

- Shift employees consumed more coffee when compared to day employees and consuming hot beverages was the most preferred method adopted by shift employees to keep awake during the night.
- More number of shift employees experienced stress, anger, depression than day employees. The mean psychological health score was greater (12.5) in day workers when compared to shift workers (10.7).
- Shift employees also experienced other health problems like gastrointestinal, common infections, headache etc more often than day workers. Shift workers had low general health score (35.1) compared to day workers (39.5).
- The most common health problems reported by night shift employees were headache and back pain (88%), followed by minor infection (86%), abdominal pain (72%), indigestion (70%), joint pain (60%), diarrhea (58%), loss of appetite (56%), heart palpitation (22%), and reproductive problems (18%).

Acknowledgements

Authors sincerely extend their gratitude to Father Muller Medical College and Hospital for granting permission and providing the support to carry out this study.

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