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Comparative analysis of health problems experienced by day workers and shift workers in Visakhapatnam

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Abstract
The present study was carried out to assess and compare the health problems experienced by day and shift workers in Visakhapatnam. The research was conducted on a sample of 70 software engineers, in the age group of 22-33 years in Bhubaneshwar, Orissa. All the shift workers followed an 8 hour irregular rotating work schedule namely morning, evening and night shift. Permanent day workers were the workers of typical day schedule who work for 8 hours. It was witnessed that the major health problem experienced by the subjects were loss of appetite, gain of weight, fatigue/tiredness, headache, common cold, backache, irritability, acidity, abdominal bloating or gas etc. more frequently observed in shift workers compared to day workers. To protect the health of the potential young generation nutrition education is required regarding the role of nutrition; importance of balanced diet.

Keywords: health problems, day workers, shift workers, Visakhapatnam

Introduction

Generally work schedules follow the sun. But working at nights or at irregular times has become a regular phenomenon in recent years. This phenomenon is known as shift work, which is the need and demand of modern society. Shift work is an employment practice designed to make use of the 24 hours of the clock, rather than a standard working day in normal day light hours (i.e. 9am to 5pm). The past few decades have witnessed a tremendous growth in the population of shift workers, especially in developed and highly industrialised countries. Developing countries are also not free from experiencing this phenomenon. Approximately 14.5 million full time workers regularly work an alternate shift, i:e, they work in night, evening, rotating or split shifts. This is almost 15% of work force, which represents a substantial portion. In Netherland and France, the shift workers were estimated to be around 19% and 21% respectively. In Canada, at present about 2 million people (23%) of the 8.5 million full time workers, work in shifts. (Shift work survey, 1999). Industrialization in India and in other countries has lead to the widespread adoption of 24 hour continuous operations in a number of industries. This has resulted in an increase in the proportion of the population routinely engaged in shift work. Although the effect of shift work on health has been studied extensively in other countries, in India very few studies have been carried out. Some of the most common health problems identified in shift workers are gastrointestinal complaints including constipation, diarrhoea, excessive flatulence, abdominal pain and heart burn. These ailments are two to three times more frequent among them. The causes are poor eating or diet high in saturated fats. Too much fast food is consumed because of constant tiredness and lack of time to prepare healthy foods. Also the body secretes certain hormones like adrenaline, which is required to cope with stressful situations. These hormones are secreted more during day time and late nights taking a toll on a person's physical and mental wellbeing. Heart disease is an added risk. Increased consumption of fast foods, especially those high in fats, can increase cholesterol levels in the blood stream, leading to coronary heart disease. Higher levels of smoking among shift workers exacerbate the danger. Studies found that over a five year period, rotating shift workers had a 40 to 50per cent increased risk of heart disease compared to day workers. Studies also suggested that, working night shift is associated with higher rate of cancer. This may be due to alteration in circadian rhythm. The production of melatonin, a known tumour suppressant, generally produced at night is disrupt in late shifts. The World Health Organization's international agency for research on cancer listed "shift work that involves circadian disruption" as a possible carcinogen in 2007. Shift work is associated with symptoms such as general health symptoms such as sleep disturbances, fatigue, common infections etc. Changes in eating habits and lifestyle (reduced exercise) also contribute to higher chances of cardiovascular risk, hypertension, cancer, digestive disorders. Below are few reviews where the focus is on major diseases related to shift work. Kandolin. (1993) conducted a study on 124 mental health nurses and 162 nurses of mentally handicapped persons, among them 52 per cent were in three-shift work and other half worked in two shifts in Vantaa, Finland. The objective was to analyze the psychological stress of nurses in two and three shift work. Results explored that female nurses in three shift work reported more stress symptoms and had ceased to enjoy their work more often than women in two shift work. Khaleque. (1998) compared the quantity and quality of sleep, health and well-being of 60 industrial shift workers in The Netherlands. Results suggested that night shift is the most disruptive of all

the shifts in terms of sleep deficiency and health complaints. Furnham *et al*. (1999) examined psychological correlates of night work on different television workers in UK. 312 participants working night shift or day shift were studied for job satisfaction. Results indicated that night workers compared to day workers reported lower job satisfaction. A study by Boggild *et al*. (2001) was conducted on 5940 employees in Denmark and collected information on work schedule (permanent day work, two shift or fixed evening and three shift or fixed night), length of work week, physical factor (smoking, repetitive task etc.), psychological factors (conflict, job insecurity etc.) Results stressed that conflicts at work and low decision latitude were higher among all group of shift workers. Harma *et al*. (2002) studied the occurrence of an irregular shift system in Finland. A total of 126 randomly selected male train drivers (Tdrs) and 104 railway traffic controllers (Tcos) were investigated. Severe sleepiness was reported in 49per cent (Trds) and 15 per cent (Tcos) of night shifts and in 20% (Tdrs) and 15% (Tcos) of the morning shifts. Kim *et al*. (2002) performed a study to investigate the effect of shift work, in terms of general health concepts, insomnia, stress, quality of life and psychological health, at several manufacturing plants, Korea. Data was collected from 850 shift workers (Study group) and 550 non shift workers (Control group). Results indicated that shift workers suffered from physical and psychological distresses sleep problems (200 shift workers were classified as insomnic, in non-shift workers the figure was 84) and stressed than non-shift workers. Melamed *et al*. (2002) examined the possible association between Excessive Daytime Sleepiness (EDS) and risk of occupational injuries in non-shift day time workers in Isreal. The participants were 532 non-shift day time workers. Results stated 22.6 per cent workers had experienced EDS and it was associated with an increase risk of sustaining a work injury (Odds Ratio= 2.23, 95% Confidence Interval) even after controlling the environmental conditions. The prevalence of common infections among employees in different work schedules in The Netherlands was studied by Mohren *et al*. (2002). Data was collected from n=12,140 day and shift workers. It was revealed that shift work was associated with a higher risk for common infections compared to day work. Eight hundred and seventeen (n=817) staff members of a psychiatric hospital, U.S.A. were examined by Ohayon *et al*. (2002) [32] to evaluate sleep and mental disorders. The samples included fixed day time workers (n=442), rotating daytime shifts (n=323), night workers (n=52). Results indicated that rotating daytime shifts reported difficulty in initiating sleep (20.1%) compared to fixed daytime workers (12.1 %). Sick leaves in past 12 months were more in rotating shift workers (62.8%), followed by 51.9 per cent in night shift workers and 38.5 per cent in dayshift, workers. Jansen *et al*. (2003) described the prevalence of fatigue among employees in different work schedules (day work, three-shift, five shifts and irregular shift work) in Netherlands. Data was collected from n=12095 workers for consecutive four months period from a coherent study. Results elucidated that the prevalence of fatigue was 18.1 per cent in day workers, 28.6 per cent in three shift, 23.7 per cent in five shift and 19.1per cent in irregular shift workers. Amelsvoort *et al*. (2004) conducted a study on 95 workers in forward rotating three- shift-work and 681 workers in backward-rotating three shift work in Netherlands. Results pointed out a backward rotation schedule was related to an increased need for recovery (relative risk 2.88, 95% Confidence Interval) and poor general health (RR 3.21, 95% Confidence Interval) as compared with forward rotation schedule. Drake *et al*. (2004) studied 360 people working in rotating shifts, 174 people working in nights and 2036 working in days of metropolitan Detroit, Michigan. Results suggested that the prevalence of shift work sleep disorder was approximately 10 per cent of the night and rotating shift work population. Keneko. (2004) examined the effect of shift work on the life style of female factory workers for three consecutive years, (n=488, 2000; n=386, 2001; n=159, 2002) in Japan. Male subjects were also included for the study. Results indicated female shift workers faced more difficulty to maintain healthy habits in comparison to women who don't do shift work. Lac and Chamoux *et al*. (2004) conducted a study on sixteen day workers served as reference group, 16 shift workers of age group 23- 56 years from a same company in France. All subjects had comparable age and BMIs. Results indicated that shift workers expressed a higher stress level and frequency of health problems and a lower satisfaction at work than the control group. The relationship between shift work and job stress was assessed by Harda *et al*. (2005). Subjects were 4962 male workers (3078 day workers and 1884 shift workers) aged 18-60 years, Japanese steel company. The study revealed that the three shift system increased work related stress. An investigation by Nishitani *et al*. (2006) [31] was carried out to know the relation between subjective poor sleep and white blood cell (WBC) count. The subjects were 208 male Japanese workers in a synthetic fiber-manufacturing plant. The WBC count was greater in shift workers than day workers and shift workers complained of poor sleep more frequently. Tamagawa *et al*. (2007) explored the criteria for shift work tolerance from eighty nine (89) policemen and policewomen in Newzealand. Results suggested that tolerance of shift work was associated with anxiety repressive emotional style and mood. During night shift, anxiety was the most influential personality factor for the somatic health. An examination was conducted by Zhao *et al*. (2008) to know the association between shift works and people's daily health habits. The targeted populations were working adults engaged in shift work, in Australia. The results confirmed that shift work affects negatively on daily health habits and can lead to adverse health outcomes. The studies described the adverse effect of shift work in terms of sleep disturbances, fatigue, depression, mood changes; stress etc. sleep loss can lead to chronic fatigue, anxiety and decrease alertness. Working in irregular hours, including shift work, has been found to be associated with higher levels of lipid. These are some of the reviews which show the relationship between shift work and the possible risk of developing atherosclerotic changes. Shift workers are more likely to suffer from variety of diseases including cardiovascular disease. Theorell *et al*. (1976) conducted study with the objective to observe changes in cholesterol, uric acid, glucose and potassium in serum in two groups of railway workers (n=16 and n=17) on day and night work, New York. Results pointed out significant elevations in serum levels of cholesterol, glucose, uric acid and potassium in night workers.

Alfredsson *et al*. (1982) [17] carried out a study on 334 shift workers and 882 control groups, by random sample technique to assess the risk of myocardial infarction in Sweden. Results identified that shift work was associated with myocardial infarction (relative risk (RR) =1.25, 95% Confidence Interval). A study was designed by Knutsson *et al*. (1990) to assess changes in diet and serum lipoprotein in 12 shift workers and 13 day workers in Sweden. Results focused on the increase in ratio between Apo B and Apo A-1 lipoproteins by 18 per cent in shift workers compared to 5per cent in day workers. Romon *et al*. (1992) studied the relationship between shift work and Serum lipid levels in 109 persons, from the 2 plants of northern France: a chemical and nuclear power station. Results revealed that shift workers had significantly higher levels Serum triglycerides (1.26 mmol/L verses 1.03 mmol/L), but cholesterol and HDL levels were similar for the two groups and day workers had higher alcohol intake (15.64 g/d versus 9.3g/d) compared to shift workers. Nakamura *et al*. (1997) studied three-shift workers (n=33) and two shift workers (n=27) and compared them with day workers to determine the association between shift work and risk factors for coronary heart disease (CHD) in Japan, male blue collar workers. The average age of shift workers and day workers were 34.5 (SD=7.1) and 32.7 (SD=7.6) respectively. Serum total cholesterol levels of three shift, two shift and day workers were 5.70 (SD=1.19) mmol/ L, 4.81 (SD=1.01) mmol/L, 4.98 (SD=0.95) mmol/L respectively and the cholesterol level of three shift workers were significantly higher than other workers. Amelsvoort *et al*. (2004) investigated the risk of cardiovascular disease in shift workers. The study sample included 239 shift workers and 157 daytime workers in USA. Results pointed out that there is significant decrease in LDL/HDL ratio (-0.33), Cigarettes smoked per day increased significantly in shift compared with day time workers (+ 1.42 and – 1.03). Ellingsen *et al*. (2007) investigated the relation of shift work on CHD in a cohort of men from Asian races working in a fertilizer plant in the Middle East. The medical records of 2562 staffs (648= shift workers, 1914=day time workers) were surveyed and 223 employees had cardiovascular event. Results suggested that CHD is significantly higher in shift workers (13.5%) compared with daytime workers (7.1%). Nazari *et al*. (2007) examined the relationship between shift work and dyslipidaemia among 148 male workers from one factory in Kota Bharu, Malaysia. The prevalence of hyper-cholesterolaemia (47.4%) and hyper triglyceridaemia (42.1%) were significantly higher among shift workers compared to day workers. An evaluation by Rahman *et al*. (2007) to find the change in serum lipid profile in apparently 30 healthy shift workers and 30 non shift workers, aged ranged from 20-50years to identify the risk of atherosclerosis in Bangladesh. Results mentioned that the mean serum total cholesterol and LDL- cholesterol levels were significantly higher in shift workers compared to those of non-shift workers. Male workers (n=5510) were surveyed by Dochi *et al*. (2008) to know the influence of shift work on total cholesterol levels in Japan. The results showed shift work was a potential risk factor for hyper cholesterolaemia among male Japanese workers. Sakata *et al*. (2008) assessed the effect of shift work on the serum cholesterol levels in male Japanese workers in a steel company (n=5510) workers. The odd ratio (OR) for shift work with respect to the onset of hypercholesterolemia was 1.01 and other significant covariates were age, BMI, HbA1c, gamma-GTP and alcohol consumption. Dochi *et al*. (2009) conducted a study with the objective to assess the effect of shift work on serum total cholesterol as an index of lipid metabolism in day workers (n=4079) and alternating shift workers (n=2807) in a Japanese steel company. The significant odds ratios of alternating shift work tended to be higher for serum total cholesterol affecting adversely the lipid metabolism. The impact of shift work on metabolic syndrome in a population of 98 strictly rotating shift workers (3X8h) compared to paired counter part of 100 regular day workers in France was studied by Esqucrol *et al*. (2009). Results indicated rise in triglycerides, free fatty acids and gamma glutamyl trans peptidase and lower HDL cholesterol. The studies explored that shift work influences the lipid metabolism and the alternating between day shifts and night shifts may be particularly deleterious to the health of the worker. These reviews say that shift work directly reduces cardiovascular health. Broken sleep, lifestyle problems and increased stress are thought to be potential mechanisms through which shift work increases the risk of CVD. Several studies have reported that elevated serum triglycerides and lower concentration of HDL-cholesterol tend to occur more frequently in shift workers than in fixed day time workers. Hypertension is an elevation of blood pressure. It is often called high blood pressure. Now a day's hypertension is seen much more frequently at very younger age in shift workers. Obesity and diabetes also contribute along with shift work. Below are some reviews on the association of shift work with hypertension. Yamasaki *et al*. (1998) conducted study on 99 nurses working in day shift (n=61), evening shift (n=11) and night shift (n= 27) to evaluate effect of shift work on the diurnal rhythm of blood pressure. Regression analysis indicated that evening and night shift workers had a 5.4mm Hg smaller drop than day shift workers. The influence of shift work on metabolic and cardiovascular risk factors in 319 glucose tolerant male subjects aged 35-60 years working in Apulia, Southern Italy was examined by Lorenzo *et al*. (2003). Results opined that shift work was directly responsible for increased body fat and indirectly associated with higher blood pressure levels. Sakata *et al*. (2003) assessed the effect of shift work on the onset of hyper tension in5338 worker in a Japanese Steel Company. The odds ratio of the onset of hypertension in shift worker for day time workers was 1.10 and significant. Oishi *et al*. (2005) [33] investigated whether shift work affects progression from mild hypertension to severe hypertension in 6495 male workers in a Japanese steel company. Findings demonstrated, job schedule was significantly associated with progression from mild to severe hypertension. A research was conducted by Yang *et al*. (2006) [29] to know the association between shift work and hypertension in California. The shift workers working for i.e. 40 hours per week, 41 to 50 hours per week and more than 51 hours per week were compared with those working between 11 and 39 hours per week. Results revealed that, individuals working 40 hours per week were 14 per cent more likely to report hypertension, who worked between 41 and 50 hours per week were, 17 per cent more likely to report hypertension and

> 51 hours per week were 29 per cent more likely to report hypertension. Chen *et al*. (2008) studied to determine the hemodynamic effects of 12 hours shift on blood pressure and heart rate variability (HRV), in Taiwan. 15 male shift workers with a mean age of 32.9 years were studied and results showed 12 hours night shift work may be associated with delayed BP recovery. Nazari *et al*. (2008) examined the relationship between shift work and hypertension among 148 male workers from one factory in Kota Bharu, Malaysia. The prevalence of hypertension was significantly higher among shift workers (22.4%) compared to day workers (4.2%). Suwazono *et al*. (2008) conducted study to clarify the effect of shift work on blood pressure in Japanese men in day workers (n=2748) in a Steel Company. Study revealed that altering shift work was a significant independent risk factor for an increase in blood pressure. From the above studies it is clear that the prevalence of hypertension was significantly higher among shift workers compared to day workers. Diabetes Mellitus is a chronic metabolic disorder that is the result of an abnormal insulin metabolism. Changes in the dietary habits and life style (such as eating fewer meals, more snacks, and alcohol or cigarette consumption) have been associated with shift work and increase in BMI ultimately raises the chances of diabetes. Below are few reviews describing the association of shift work with diabetes. A cohort study by Morikawa *et al*. (2005) was conducted on 2860 male fixed day blue collar workers, shift blue-collar workers and white collar workers in a sash and zipper factory in Japan for the risk factor of diabetes mellitus. Among the 2860 workers, there were 87 cases of new onset of diabetes, resulting in an incidence rate of 4.41 per 1000 person per year. The relative risk of diabetes mellitus for the two-shift workers and the three shift workers compared with the fixed day time workers was 1.73 and 1.33 respectively. Suwazono *et al*. (2006) investigated the effect of alternating shift work (ASW) on the onset of diabetes mellitus, in a steel company, Japan. Longitudinal study included day shift workers (DSW) (n=3203) and alternate shift work (ASW) (n=2426). Subjects were studied for a period of 10 years. The odds ratio for development of diabetes mellitus in the ASW group compared with DSW group was 1.35, indicating that shift work is a risk factor for the development of diabetes mellitus. Results from the above studies suggested that serum concentration of glucose increased during night work. The prevalence of diabetes was found to increase with increasing exposure to shift work. Gastrointestinal symptoms are very common in the general population. Below are few reviews which state the association of shift work with gastrointestinal problems. Koller *et al*. (1978) investigated 300 workers at an Austrian oil refinery and found that the prevalence of endocrine and metabolic disease was 3.5% in shift workers and 1.5% in day workers. In Japan Segawa *et al*. (1987) [11] examined 11657 employees in factories, bank and school by endoscope. The prevalence of gastric ulcers was 2.38 per cent in shift workers as compared with 1.03 per cent in day workers. For duodenal ulcers, the prevalence was 1.37 per cent and 0.69 per cent for shift workers and day workers respectively. A study was conducted by Wolfhagent *et al*. (1994) to describe the pattern of gastric pH, food in take, cortisol levels during changing shifts, in Europe. For the study 12 shift workers, 16 healthy controls and 15 patients with active duodenal ulcer were chosen. Results indicated no significant difference in median pH between either the different shifts or group of subjects. The pH value of < 3 was observed in shift workers which was in between the value observed between the control and duodenal ulcer patients. Caruso *et al*, (2004) in a cross-sectional survey of 343 US auto factory workers, examined the relationship between work schedules and GI symptoms, medications, and diagnoses. Findings suggest that evening shift and widely varying work times may increase risks for GI disturbances. However, the studies pointed out that gastrointestinal disorder are more common in shift workers than in day workers as a result of irregular eating habits. Shift workers were at higher risk of experiencing ulcers, indigestion, and loss of appetite. Shift work also includes physical and mental changes; changes in hormone secretion caused by circadian rhythm are a contributory factor of cancer risk. Here are few studies showing the relation of shift work with the risk of cancer. Davis *et al*. (2001) investigated shift workers (n=813, having experience of working at night), aged 20-72 years and control subjects (n=793), of same age group to analyze the relationship between exposure to light at night and risk of breast cancer in women, Farmigton. Results indicated that, the exposure to light at night suppresses the melatonin production and increases the risk of breast cancer. Viswanathan *et al*. (2007) [24] conducted a study with the hypothesis that night workers may have an increased risk of endometrial cancer. In a prospective cohort study, 53487 women nurses surveyed, who were on rotating shift in US were included. Out of which a total 515 women had confirmed medical record of endometrial cancer. It was observed that women who worked 20+ years of rotating night shifts had a significantly increased risk of endometrial cancer. Studies showed that low levels of melatonin along with exposure to light at night increased the risk of cancer. A number of physiological functions show distinct rhythmic changes in a course of 24 hour period. There is change in the heart rate, body temperature and changes in different hormonal levels. Below are few studies which elucidate the effect of night work on certain hormones. Axelsson *et al*. (2003) conducted a study to compare satisfied and dissatisfied shift workers with respect to major hormones. Total 42 shift workers were studied in Sweden. Results indicated that dissatisfied shift workers had lower morning testosterone than satisfied one. Lac. and Chamoux (2003) conducted a study on 63 rotating shift workers for whom adaptation to shift work was evaluated through measurement of salivary cortisol levels at intervals of 2 hour during morning, evening and night shifts in France. Results showed that there was rise in cortisol which was due to the sleep deprivation as a result of rapidly rotation shift pattern of morning, evening and night. A study was conducted by Borugian *et al*. (2005) on hospital office staffs (n= 5) and nurses (n=17), in Canada working either rotating night shift or day shift to measure melatonin levels. Results indicated that rotating shift workers exhibited higher than normal melatonin levels. Marilyn *et al*. (2005) conducted a study on 5 office workers and 17 nurses working either day or rotating night and day shifts to measure the melatonin levels, in Canada. Results focused that rotating shift workers had abnormally high melatonin levels on arising and during the day times, and

normal or abnormally low melatonin levels during sleep. A cross sectional study by Grundy (2008) was conducted among 61 rotating shift nurses at Kingston, Canada to know the light intensity exposure and melatonin levels. A statistically significant inverse association between light exposure and urinary melatonin levels was observed, however there was no significant relationship with shift schedule.

Methodology

The study was carried out at various software industries in Visakhapatnam. The purpose of the present investigation was to assess the health status of shift workers in comparison to permanent day workers. Information on the lifestyle related diseases as perceived by the subjects was collected. A set of self-designed questions were also used to assess the general health problems of the shift workers. It consisted of 25 statements. It was a 4 point scale having alternatives 'never', 'rarely', 'occasionally' and 'always'. The average health score was calculated by the set scorings.

Participants

A total of 70 software engineers, in the age group of 22-33 years were selected for the study, with 36 members in control group (permanent day workers) and 34 members in study group (shift workers). The study was conducted in five software industries in Bhubaneshwar, Orissa. All the subjects were male workers as there were no female workers working in shifts due to safety reasons. All the shift workers followed an 8 hour irregular rotating work schedule namely morning, evening and night shift. Permanent day workers were the workers of typical day schedule who work for 8 hours. The first step included sample selection and then, rapport was formed with the subjects.

Stages of Study

Stage-1 Sample was selected through purposive sampling technique.
Stage-2 Rapport was built with the subjects.
Stage-3 The data were collected using the schedules and interviews.
Stage-4 The data were analyzed to make meaningful inferences and comparisons.

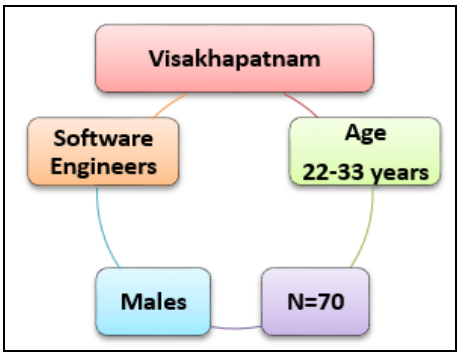

Fig 1: Sampling

Result and Discussion

Once the data was obtained, it was coded, tabulated and analyzed, keeping in mind the objectives of the study. Appropriate statistical tools were used to draw meaningful inferences.

Table 1: Symptoms among Day Workers & Shift Workers

Symptoms	Day Workers	Shift Workers
Loss of appetite	2	1.94
Gain in weight	1.66	1.82
Fatigue/ Tired	1.41	1.44
Abdominal pain	2.36	2.05
Headache	1.66	1.7
Common cold	2.3	1.82

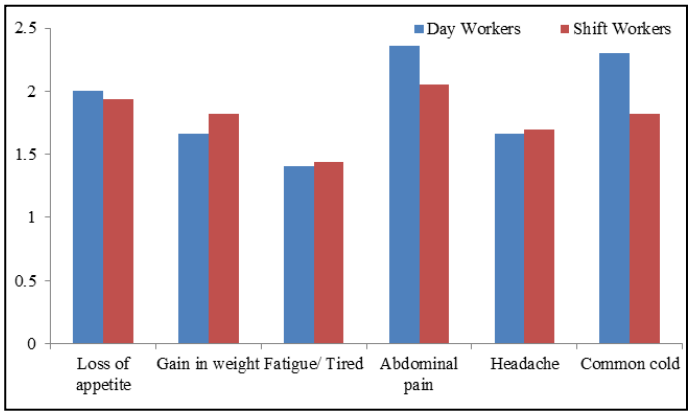

Fig 2: Symptoms among Day Workers & Shift Workers

Information on frequency of experiencing health problems in last three months were collected based on 24 symptoms and the subjects were expected to answer in terms of never, rarely, occasionally and always. As the frequency of rarely was found to be negligible, these values were clubbed with the answers of occasionally. Among the shift workers, 35.3 percent, followed by 25.4 per cent and 35.3 experienced loss of appetite always, occasionally and never respectively. But in day workers equal numbers of subjects (33.3%) were there in all the three categories. The mean score for loss of appetite was found to be high in day workers (compared to shift workers (1.94). Equal percentage of subjects from both the group (approximately 50%) always experienced gain in weight, followed by 35.3 per cent shift workers and 33.3 per cent day workers experiencing gain in weight occasionally. Twelve per cent shift workers and 16.7 per cent day workers reported that they did not observe any increase in weight. With regard to gain in weight day workers were having better score (1.82) compared to shift workers (1.66). Majority of day workers (72.2%) and 61.8 per cent shift workers reported that they always experience fatigue, followed by 23.5 per cent shift workers and 13.9 per cent day workers experiencing tiredness occasionally. Less than one forth percentage of subjects (13.9 % day workers and 14.7 % shift workers) from both the group never felt tired, no significant difference in health score was observed between day (1.41) and shift workers (1.44). Abdominal pain was always experienced by 13.9 percent day workers and 29.4 per cent shift workers, equal percentage of subjects from both the group (approximately 35%) had abdominal pain occasionally, followed by 50 per cent day workers and 35.3 per cent shift workers never experiencing stomachache, no significant difference was observed in the

mean score between day (2.36) and shift workers (2.05). Forty seven per cent of subjects from both the group reported to have headache regularly, followed by 27.8 per cent of day workers and 35.3 per cent of shift workers experiencing it occasionally. Headache was never felt by 17.5 per cent shift workers and 25 per cent of day workers, no significant difference was observed in the health score between day (1.66) and shift workers (1.70). Common cold was observed in 44.1 per cent of shift workers and 22.2 per cent day workers more frequently, followed by 25 per cent day workers and 29.4 per cent shift workers reported to have it occasionally. Fifty two per cent of day workers and 26.5 per cent of shift workers never felt this symptom. Statistically significant difference was observed between day (2.30) and shift workers (1.82), shift workers were reported to have poor health condition.

Table 2: Symptoms among Day Workers & Shift Workers

Symptoms	Day Workers	Shift Workers
Frequent urination	2.58	2.2
Craving for sweets/fatty foods	2.11	1.91
Muscle pain	2.27	2.02
Ringing in ears	2.61	2.11
Difficulty in remembering the things	2.13	1.85
Dizziness	2.3	2.11

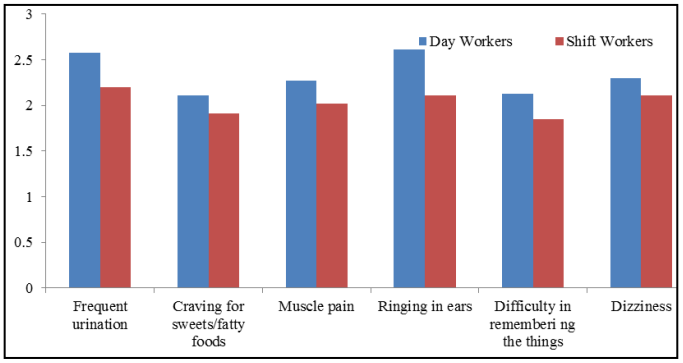

Fig 3: Symptoms among Day Workers & Shift Workers

Majority of day workers (66.7%) and shift workers (41.2%) never had the symptom of frequent urination, followed by 19.4 per cent of day workers and 38.2 per cent shift workers experiencing it occasionally. Symptom of frequent urination was always felt by 13.9 per cent of day workers and 20.6 per cent of shift workers, statistically significant difference was observed in health score between day (2.58) and shift workers (2.20). More than 30 per cent of subjects from both the group always had a tendency of craving for sweet or fatty foods, followed by 22.2 per cent day workers and 32.4 per cent shift workers occasionally had such craving for sweets. Forty four per cent day workers and 29.4 per cent of shift workers never had any such tendency, no significant difference was observed in the mean score between the day (2.11) and shift workers (1.91). Muscle pain was always experienced by 16.7 per cent day workers and 35.3 per cent shift workers, followed by 38.9 per cent day workers and 26.5 per cent shift workers felt it occasionally. Forty four per cent of day workers and 38.2 per cent shift workers never reported to have muscle pain, no significant difference was observed in the average health score between day (2.27) and shift workers (2.02). Majority of day workers (69.4%) and shift workers (41.2%) never experienced ringing in ear, followed by 22.2 per cent day workers and 29.4 per cent shift workers experiencing it occasionally. Eight per cent day workers and 29.4 per cent of shift workers always felt their ear ringing, statistically significant difference was observed in the mean score between day (2.61) and shift workers (2.11). Thirty six per cent day workers and 23.5 per cent shift workers never reported to have difficulty in the remembering things, followed by 41.7 per cent of day workers and 38.2 per cent shift workers experiencing it occasionally. Twenty two per cent day workers and 38.2 per cent shift workers expressed difficulty in remembering things more frequently, no significant difference was observed between day (2.13) and shift workers (1.85) in the mean score. Dizziness was never felt by 55.6 per cent day workers and 35.3 per cent shift workers, followed by 19.4 per cent day workers and 38.2 per cent shift workers experiencing giddiness occasionally. Twenty five per cent day workers and 26.5 per cent shift workers experienced it always, no significant difference was observed with respect to the mean value between day (2.30) and shift workers (2.11).

Table 3: Symptoms among Day Workers & Shift Workers

Symptoms	Day Workers	Shift Workers
Chest pain	2.66	2.5
Numbness or tingling in the extremities	2.5	1.94
Joint pain	2.27	2.2
Backache	1.91	1.85
Irritability	1.66	1.58
Acidity/ Indigestion	1.83	1.44

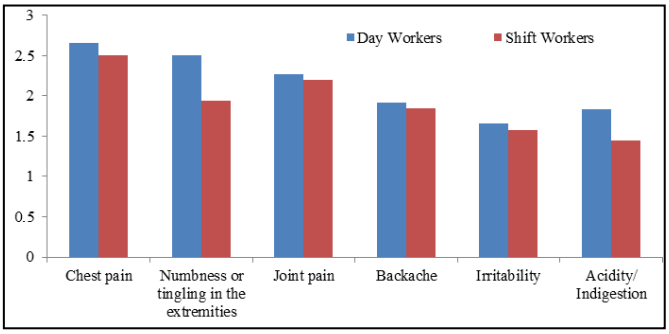

Fig 4: Symptoms among Day Workers & Shift Workers

Majority of day workers (75%) and shift workers (67.6%) never experienced chest pain. Average score between the groups were found to be non-significant. Numbness or tingling in the extremities was experienced by 32.3 per cent shift workers and 11.1 per cent day workers regularly. Majority of day workers (55.6%) and 26.5 per cent shift workers reported that they had never experienced this symptom, whereas, where as 33.3 per cent day workers and 41.2 per cent shift workers reported to experience it occasionally, average score between the groups were found to be significant (2.5), day workers and (1.94) for shift workers). Sixteen per cent day workers and 26.5 per cent shift workers reported to experience joint pain mostly, followed by
38.9 per cent day workers and 26.5 per cent shift workers

occasionally. More than forty per cent subjects (44.4) per cent day workers & 47.1 per cent shift workers) never felt joint pain, average health score between the groups were found to be non-significant (2.27), day workers and (2.20) for shift workers). Backache was experienced by 30.6 per cent day workers and 38.2 per cent shift workers regularly. Twenty two per cent of day workers and 23.5 per cent of shift workers never experienced backache, followed by 47.2 per cent day workers and 38.2 per cent shift workers experiencing it occasionally, average score between the groups were found to be non-significant (1.91), day workers and(1.85) for shift workers). Approximately 60 per cent subjects in both the group reported irritability. No significant difference was observed in the mean score between day (1.66) and shift workers (1.58). Acidity was more frequent in 41.7 per cent day workers and 67.6 per cent shift workers, significant difference was observed in the health score between day (1.83) and shift workers (1.44).

Table 4: Symptoms among Day Workers & Shift Workers

Symptoms	Day Workers	Shift Workers
Abdominal bloating or gas	1.83	1.7
Eye pain	2.25	1.73
Constipation	2.36	2.29
Diarrhea	2.72	2.7
Intolerance to caffeine	2.72	2.32
Very dark yellow urine	2.38	2.2

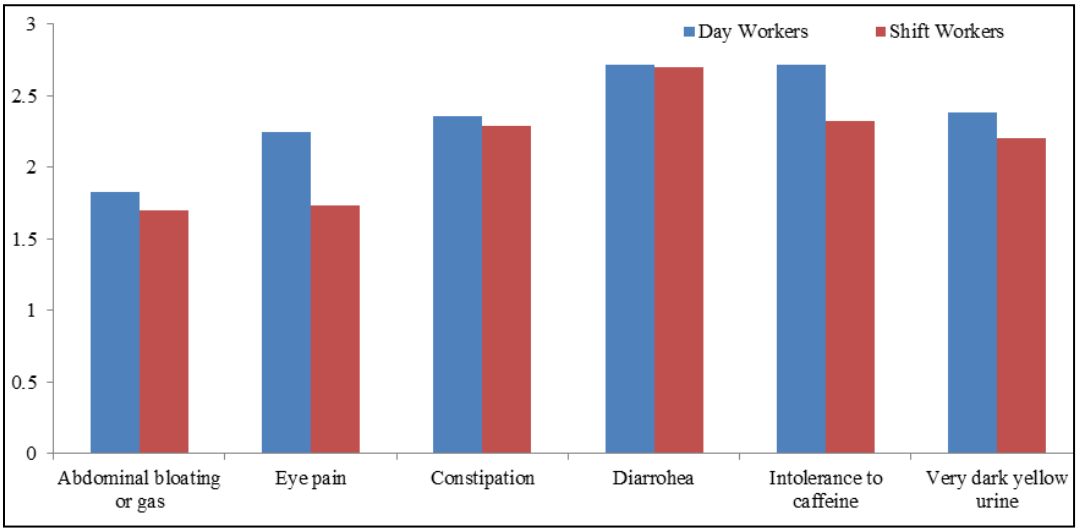

Fig 5: Symptoms among Day Workers & Shift Workers

Abdominal bloating or gas was always experienced by 38.9 per cent day workers and 47.1 per cent shift workers. Occasionally it was experienced by 38.9 per cent day workers and 35.3 per cent shift workers. Twenty two per cent day workers and 17.6 per cent shift workers never had abdominal bloating problems; mean score showed no significant difference between the day (1.83) and shift workers (1.70). Majority of shift workers (47%) and 27.8 per cent day workers always had eye pain, followed by 19.4 per cent day workers and 32.4 per cent shift workers felt it occasionally. More than half (52.8 %) of day workers and 20.6 per cent of shift workers never had any such eye problem, significant difference in the health score was observed between day (2.25) and shift workers (1.73). More than half (58.3 % day workers and 52.9% shift workers) reported never to experience constipation, no significant difference in the score was observed between day (2.36) and shift workers (2.29). Higher number of day workers (77.6%) and shift workers (76.5%) never had diarrhea in last few months. Approximately 17 per cent subjects from both the group experienced it occasionally, followed by negligible percentage of subjects (6% from both the group) felt this problem always. No significant difference in the mean score for diarrhoea was observed between day (2.72) and shift workers (2.70). Higher percentage of day workers (75%) and shift workers (52.9%) never reported intolerance to caffeine, followed by approximately 25 per cent subjects from both the group experiencing it occasionally. Caffeine intolerance was always experienced by 20.6 per cent shift workers, significant difference in the mean score was observed between day (2.72) and shift workers (2.32). Majority of day workers (52.8%) and shift workers (41.2%) reported that they never had any urinary problem, followed by 33.3 per cent day workers and 38.2 per cent shift workers experiencing it occasionally. Fourteen per cent day workers and 20.6 per cent shift workers always experienced this problem. No significant difference was observed in the mean score between day (2.38) and shift workers (2.20).

Conclusion

The major health problem experienced by the subjects were loss of appetite, gain of weight, fatigue/tiredness, headache, common cold, backache, irritability, acidity, abdominal bloating or gas etc. more frequently observed in shift workers compared to day workers. To assess the health status, five lifestyle indicators were used advocated by Belloc and Breslow (1972). Scoring system was used to assess the health status. For every positive answer one point was given and for every negative answer zero was given. The major health problems experienced more by shift workers were found to be

loss of appetite (36.3%), gain in weight (52.9%), fatigue or tiredness (61.8%), abdominal pain (29.4%), headache (47.2%), common cold (44%), muscle pain (35.3%), difficulty in remembering things (38.2%), backache (38.2%), irritability (85.9%), acidity (27.6%), abdominal gas (47.1%), eye pain (47%) than their counter parts i.e day workers except fatigue (72.2%) which was highest in day workers. From the health score it was also clear that shift workers were having poorer health status compared to day workers. These findings suggested that, shift work in particular night work, can have a negative impact on health and well-being of workers as it could cause, disturbances of normal circadian rhythms beginning with the sleep/wake cycle. These symptoms were more frequently observed in shift workers as human body is meant to be active during day time hours, while during night time hours it is meant to sleep, which allows of to reserve and replace energy. Working at night and sleeping during the day is opposite to the body's biological clock and what the body naturally wants to do. This may make sleeping difficult, it may also mean that the body can't recover as quickly from physical and mental exertions/demands. To protect the health of the potential young generation nutrition education is required regarding the role of nutrition; importance of balanced diet etc. There is a need to make aware of these facts to the policy makers/ managements of the corporate. The policy makers should provide workers the support policies i.e. shortening of working hours (reduce overtime) by ample staff appointment. There is also a need to provide scope for yoga, relaxation, entertainment to improve the efficiency of the workers.

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