Shift work induced lifestyle change and its adverse health effects in software sectors

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A study was conducted during the year 2009-2010 with the objective to know the impact of changed lifestyle on the health status of the software engineers. A total of 70 (36 day workers and 34 shift workers) subjects in the age group of 22-33years, belonging to software profession in Bhubaneswar, Orissa were considered for the study. Results indicated that smoking, alcohol consumption was more in shift workers compared to day workers. Approximately fifty five per cent shift workers were not satisfied with their sleeping habit. Impairment in the social life, personal life and family relationship were the most common complaints reported by the shift workers compared to day workers. The mean BMI of the shift workers was 25.82 kg/m² which were higher than that of day workers, 23.37 kg/m². Higher mean of serum total cholesterol (195.33 mg/dl), triglycerides (159.65 mg/dl), LDL-cholesterol (125.48 mg/dl) levels in shift workers compared to permanent day workers (total cholesterol 173.43mg/dl, triglycerides 150.08mg/dl, LDL-cholesterol 114.17mg/dl) were observed. The health score for the shift work group (2.67±1.03) was remarkable lower than the day work group (3.66±0.79). In conclusion, shift workers were characterized by higher BMI, and increased biochemical parameters.

INTRODUCTION

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 of 9am to 5pm (Presser, 2003). Around twenty per cent of individuals in the industrialized countries have irregular work hours. As people work in irregular hours, their daily routine is interrupted; regular eating and exercise habits are difficult to maintain. Changes in lifestyle, such as higher tendency to smoke and drink particularly in shift workers, have been associated with increased BMI, which in turn contribute to higher level of hypertension and cardiovascular risk. In addition, these daily habits (lack of exercise, smoking and alcohol consumption) and their immediate consequences (*e.g.* obesity) are the fundamental cause of chronic diseases. So, the study was conducted with the objective to know the impact of changed lifestyle on the health status of the software engineers.

METHODOLOGY

The study was carried out during 2009-2010 at various software industries in Bhubaneswar, Odisha. A total of 70 (36 day workers and 34 shift workers) belonging to software profession were selected randomly for the study. 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 irregular rotating work schedule. The starting times of three shifts were 6.30 am for the morning shift, 2.30 pm for the evening shift and 10.30p.m for the night shift. The subjects selected for the study were having at least shift work experience from 6 months to 1½ years. Permanent day workers were the workers of typical day schedule who work for 8 hours. They were all in the same age range and from the same profession doing the

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same work. These workers did not have shift work in the last 1½ years.

General information of subjects such as age, education, occupation, duration of work, timing of work etc. and the information on lifestyle habits were collected for smoking habits, alcohol consumption, exercise, sleep pattern and social and family activities was collected through personal interview method.

The health status of subjects was assessed by nutritional anthropometry, biochemical parameters etc. The anthropometric measurements *viz.,* height, weight waist and hip circumference were recorded. The anthropometric data was further used for computing BMI, by the formula expressed as the ratio of weight in kgs to height in square meters. The abdominal obesity was judged by waist to hip ratio. The levels of fasting blood glucose, total-cholesterol, triglycerides, HDL- cholesterol, VLDL were estimated by taking subsamples of 15 subjects from each group. The level of total cholesterol, HDL-cholesterol and triglyceride were analyzed by using swemed diagnostic kits.

Also 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.

Table A. Assesment of the health status

Indicators	Health score criteria (Add one for each positive answers)
BMI	18.5 < BMI > 23
Meal skipping	No
Smoking	Non smoker
Alcohol consumption	Non drinker
Exercise	Yes

Among the statistical tests; frequency and percentages were applied for the analysis of the information on background data and life style standard deviation and student 't' were used for anthropometric and biochemical data, consumption pattern and health score of the subjects.

OBSERVATIONS AND ASSESSMENT

In the present investigation, majority of the subjects from both the groups belonged to 25-27 years of age group. Maximum numbers of subjects were found to be graduates. More than 70 per cent were reported to be unmarried. (Table 1). Majority of subjects were found to be in the income range of Rs 27,000/- to Rs 30,000/-.

Much higher difference was noticed in mean weight of the shift workers (73.67 ± 9.92 kg) in comparison to the day workers (67.52 ± 8.32 kg), which was statistically significant. The mean BMI of the shift workers was 25.82 kg/m² which was higher than that of day workers, 23.37 kg/m² and this difference was statistically significant (Table 2). However, majority of the subjects doing day workers (41.7%) were having ideal BMI, whereas, 55.9 per cent shift workers were in obese grade I group (Fig. 1). This could be due to the irregular work hours, the daily routine is interrupted, regular eating and exercise habits are difficult to maintain. These results are in line with the results of Chee *et al.* (2004) and Sudo and Ohtsuka (2001) who stressed that, shift workers have a higher prevalence of being overweight.

With reference to the findings of the smoking pattern the percentage of smokers (52.9%) in shift workers was more than the day workers (19.4%) per week. The possible mechanism might be the use of nicotine as a way to cope with feelings of sleepiness or to maintain vigilance, which was required in night workers to reduce job stress. The findings are in conformity with the results of Amelsvoort *et al.* (2004), Lin *et al.* (2005) who concluded that shift workers are more often smokers and have significantly higher risk to take up smoking as compared to day workers. Numbers of alcohol consumers were more among shift workers (61.7%) than permanent day workers (25%). This result is at par with the study conducted by Smart (1979) who also pointed out that alcohol drinking was more prevalent in shift workers than day worker. The results depicts that 32.3 per cent shift workers did not do exercise regularly, whereas, this percentage was only 16.7 per cent in day workers. It could be also due to the fact that the obese individuals were

Table 1. General information of the subjects   (n=70)

Characteristics	Category	Day workers (n=36)		Shift workers (n=34)	
		Frequency	Percentage	Frequency	Percentage
Age (years)	<25	12	33.3	12	35.5
	25-27	15	41.7	12	35.5
	>27	9	25.0	10	29.0
Education	Graduate	29	80.6	24	70.6
	Post graduate	7	19.4	10	29.4
Income (Rs)/ month	< 27,000/-	12	33.3	10	29.4
	27,000/-30,000/-	17	47.2	14	41.2
	> 30,000/-	7	19.4	10	29.4
Marital status	Married	7	19.4	8	23.5
	Unmarried	29	80.6	26	76.5

less likely to engage in physical activity than the ideal weight subjects. Approximately fifty five per cent shift workers mentioned that, they did not feel well rested after a full night shift (Table 3a). This might be due to the fact that day time sleep of shift workers were shorter than the night time sleep of permanent day workers. This result is in conformity with the results of Folkard (1990) and Knauth (1993) who revealed that sleep disturbance is a major problem of shift workers. Impairment in the social life, personal life and family relationship were the most common complaints reported by the shift workers compared to day workers. (Table 3b). Due to day time light, heat, noise, the sleep is disturbed, leading to tiredness and negative mood. Ultimately resulting in dysfunction in family and marital relationship.

Table 2. Mean anthropometric measurements of subjects (n=70)

Parameters	Day workers (n=36)	Shift workers (n=34)	't' Value
Height (m)	168.02 ± 0.05	168.91 ±0.07	0.57[NS]
Weight (kg)	67.52±8.32	73.67±9.92	2.77*
BMI	23.87±2.99	25.82±2.99	2.64*
Waist circumference (cm)	84.51±6.64	86.83±7.76	1.34[NS]
Hip circumference (cm)	96.59±4.18	94.7±6.48	1.44[NS]
WHR	0.87±0.04	0.91±0.03	3.94**

Values are expressed in terms of Mean ± S.D
* and ** indicate significance of values at P=0.05 and P=0.01, respectively   NS=Non-significant

Table 3(a). Lifestyle of the subjects (n=70)

Particulars	Category	Day workers (n=36)		Shift workers (n=34)	
		Frequency	Percentage	Frequency	Percentage
Smoking habit	Smokers	7	19.4	18	52.9
	Nonsmokers	29	77.8	16	47.1
Alcohol habit	Alcohol consumer	9	25	21	61.7
	Non-consumer	27	75	13	38.2
Habit of doing exercise	No exercise	6	16.7	11	32.3
	Walking	16	44.4	8	23.5
	Yoga	10	27.7	5	14.7
	Physical exercise	6	16.6	10	29.4
Satisfied with sleeping habit	Usually	19	52.8	4	11.7
	Sometimes	14	38.9	11	32.4
	Never	3	8.3	19	55.9

Table 3(b). Social and family life of the subjects (n=70)

| Statements	Categories	Day workers (n=36)		Shift workers (n=34)	
		Frequency	Percentage	Frequency	Percentage
Social leisure activities (parties, clubs, outings, home entertainment) are impaired	Yes	13	36.1	21	61.8
	No	23	63.9	13	38.2
Personal leisure activities (like reading, walking, gardening) are impaired	Yes	19	52.8	25	73.5
	No	17	47.2	9	26.5
Ability to form and maintain close relationship with family members is impaired	Yes	11	30.6	19	55.9
	No	25	69.4	15	44.1
Work pattern affects the child upbringing	Yes	2	5.6	5	14.7
	No	4	11.1	2	5.9
Maintained balance between work and child care	Yes	4	11.1	4	11.8
	No	2	5.6	1	2.9
Hard to supervise and help your child / children with their homework work	Yes	2	5.6	2	5.9
	No	4	11.1	3	8.8
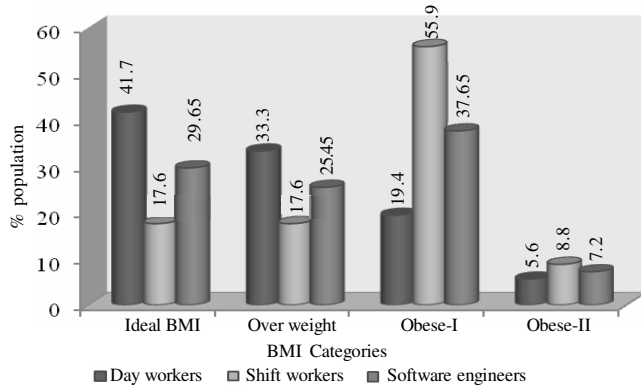
Fig. 1. Distribution of subjects according to BMI

*** significant at <1% level
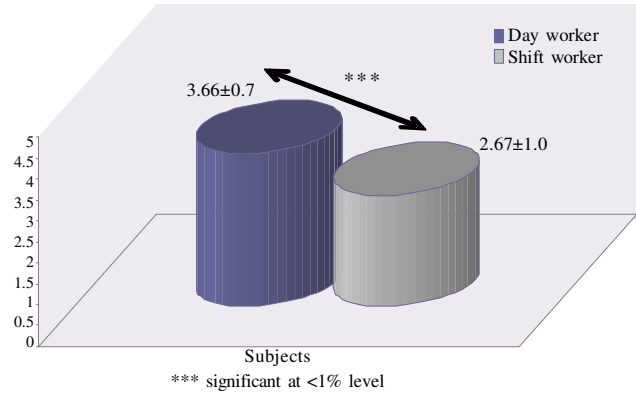
Fig. 2. Health score of the subjects based on life style indicators

Table 4. Biochemical parameters of subjects (n=30)

Lipid profile	Normal levels (mg/dl)	Day workers (n=15)	Shift workers (n=15)	't' value
Fasting blood sugar (FBS)	60-110	91.84 ± 4.38	97.10± 4.90	3.09**
Triglycerides (TG)	<150	150.08 ±25.71	159.65 ± 51.59	0.64[NS]
Total cholesterol (TC)	<200	173.41 ±33.06	195.33 ±27.56	1.96[NS]
HDL-C	>40	44.96± 5.44	39.62 ±7.57	2.21*
VLDL-C	?30	30.45 ± 5.58	36.32± 13.21	1.58[NS]
LDL-C	<100	114.17± 24.08	125.48± 27.75	1.19[NS]
TC/HDL-C	<5	3.95 ±1.15	5.03 ±1.00	2.71*

Values are expressed in terms of Mean ± S.D.
* and ** indicate significance of values at P=0.05 and P=0.01, respectively.   NS= Non-significant

The statistical analysis demonstrated that there was a significant difference with regard to fasting blood sugar in day (91.84 mg/dl) and shift workers (97.10 mg/dl), (Table 4). This could be due to the erratic eating pattern and more consumption of. This result is in agreement with that of Morikawa *et al.* (2005), who stressed that the relative risk of diabetes mellitus for the two-shift and three shift workers were more empty calories in terms of alcohol consumption compared with the fixed day time workers. In the present study, higher mean of serum total cholesterol (195.33 mg/dl), triglycerides (159.65 mg/dl), LDL-cholesterol (125.48 mg/dl) levels in shift workers compared to permanent day workers (total cholesterol 173.43mg/dl, triglycerides 150.08mg/dl, LDL-cholesterol 114.17mg/dl) were observed (Table 4). The results also showed low HDL cholesterol among shift workers (39.62 mg/dl) than day workers (44.96 mg/dl). The ratio of total cholesterol and HDL-C was found to be higher (5.03 ± 1.00) in shift workers compared to day workers (3.05 ± 1.15). Similar findings were observed by Rahman *et al.* (2007). The findings of Karlsson *et al.* (2003) and Lennerans *et al.* (1995) suggested the higher prevalence of high serum triglyceride levels and low HDL-cholesterol levels among shift workers than day workers. But Knutsson (1990) in his study has shown that there was no difference in serum total cholesterol levels between shift workers and day workers.

The observed findings might be due to the fact that, nocturnal eating raises the blood insulin concentration and decrease in production of pancreatic polypeptide. This reduced pancreatic polypeptide affects the sensitivity of the receptor tissues available for the insulin. The higher insulin concentration has an antagonist effect on the enzyme lipase required for the hydrolysis of fat. Ultimately affecting the lipid metabolism. The ratio was found to be high in shift workers, might be due to the lower value of serum HDL-C and higher cholesterol value observed in shift workers.

The health score based on the lifestyle indicators of both the groups is shown in Fig. 2. Among the two groups the health score for the shift work group (2.67±1.03) was remarkable lower than the day work group (3.66±0.79), it was found to be statistically significant.

Conclusion:

In conclusion the subjects of this study were in the same age group and had work experience from 6 months to 2 years, majority were unmarried. The result shows tobacco consumption and alcohol consumption were also significantly

higher in shift workers. Higher percentages of shift workers were found to be obese. There was also increased trend in biochemical parameters which is an alarming factor at this young age. The synergistic effect of adverse life style along with shift work will have health impact in long run. So, if this segment is neglected, then very soon we the young, healthy population will be reduced affecting the development of the Company, Institution or Nation.

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