



ORIGINAL RESEARCH PAPER

Social Sciencea

EFFECT OF ALTERED FOOD HABIT ON HEALTH OF SHIFTWORKERS

KEY WORDS: Shift workers, Food habits, Biochemical parameters

Dr. Chitrotpala Devadarshini

Asst Professor, Dept of FN, CCS, OUAT

Dr. Diptimayee Jena

Assoc. Professor, Dept of FN, CCS, OUAT

Dr. Snehalata Nanda

Professor, Dept of FN, CCS, OUAT

ABSTRACT

Study was carried out at various software industries in Bhubaneswar, Orissa on 70 software engineers with the objective to assess the impact of food habit on health status of software engineers. Result suggested that higher percentage of day workers were in ideal body weight group (41.7%) compared to shift workers, where majority of subjects (55.9%) were in obese grade-I group. Among the day workers, 38.9 per cent skipped meal, but the percentage of meal skipping was more in case of shift workers(47%). The fasting blood sugar of day workers was lower (91.84 mg/dl) as compared to shift workers (97.10 mg/dl). The mean total cholesterol was noticeably higher 195.33 mg/dl in shift workers compared to 173.32 mg/dl for day workers. With regard to HDL, when the day workers and shift workers were compared, the day workers were having higher value 44.96 ± 5.44 mg/dl than the shift workers (39.62 ± 7.57 mg/dl).

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 (i.e. 9am to 5pm). The human body is meant to be active during the day time hours and in night, 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 clock. As people work in irregular hours, their daily routine is interrupted. Regular eating and exercise habits are difficult to maintain. Changes in lifestyle, particularly dietary habits (such as eating regular meals and more snacks), have been suggested as explanations for finding links of shift work with BMI. Other recent evidence suggests that shift workers take smaller amount of energy and nutrients than day workers (Sudo, N. and Ohtsuka, R., 2001). Unfortunately, shift work is the part and parcel of today's fast life in the working atmosphere, be it call centre, Business Process Outsourcing (BPOs) or even Software companies, which needs people working in night hours to provide technical expertise for their clientele abroad. So, the impact of shift work on people's health called for the study with the objective to assess the food consumption pattern of the subjects.

MATERIAL AND METHODS

The present cross-sectional study was carried out at various software industries in Bhubaneswar, Orissa. A total of 80 subjects in the age group of 22-33 years, belonging to software profession were considered for the study, with 40 members in each shift work (study group) and permanent day work (control group) category. Finally 70 filled in questionnaires were obtained (36 day workers and 34 shift workers) out of 80 subjects. All the subjects were male workers as there were no female workers working in shifts due to safety reasons. Structured and pre-tested questionnaire was used to assess the BMI, food consumption habit like fluid intake per day mainly water, tea, coffee, milk, soft drinks, fruit juices, number of meals per day, meal skipping habits, habit of eating outside and its frequency, choice of food, etc. were collected.

Based on the quantity of consumption of the above mentioned fluids per day, the subjects were classified into three different groups by using the formula, Mean \pm SD (0.425). The raw food equivalents of cooked food were computed from the standardized cups. The fat present in the food were computed from Annapurna VAR 3 a software developed by M.R.Chandrashekar of Bangalore.

RESULTS AND DISCUSSION

When the BMI of the day workers and shift workers were compared, higher percentage of day workers were found to be in

ideal body weight group (41.7%), followed by 33.3 per cent in over weight group, 19.4 per cent belonged to obese grade-I and 5.6 per cent were reported to be obese-grade II. But in case of shift workers, majority of subjects (55.9%) were in obese grade-I group, followed by equal percentage of subjects (17.6%) in over weight and ideal BMI group and least (8.8%) subjects were in obese grade II group. (Table-1). These results were in line with the results of Chee *et al.* (2004), Sudo and Ohtsuka (2001) who stressed that, shift workers have a higher prevalence of being overweight.

The saturated fat intake was higher in shift workers (24.66 g) compared to day workers (19.07 g) and 't' test value showed it was statistically significant. The mean cholesterol intake was high in shift workers (147.23 g) compared to day workers (120.94 g), table-2.

The data on the fluid consumption of the subjects in presented in Table-3. The average consumption of water was found to be 2.75L and 2.64L in day and shift workers respectively. But higher difference was noticed in the average value of tea consumption among shift workers (3.78 ± 1.21 cups) compared to day workers (1.99 ± 0.69 cups), which was statistically significant. The average soft drinks consumption was more in shift workers (567.5 ± 373.55 ml) compared to day workers (350.0 ± 162.36 ml) and it was statistically significant. When average fruit juice consumption was considered it was low in shift workers (295 ± 135.62 ml) compared to day workers (450 ± 202.26 ml), values were found to be statistically significant.

Among the day workers, more than fifty per cent (58.3%) consumed 3 meals a day, but in shift workers the percentage was only 38.2. The per cent of shift workers consuming 2 meals per day was found to be 20.6. Majority of day workers (77.8%) and shift workers (88.2%) preferred the canteen food. Only 22.2 per cent and 11.8 per cent shift workers carried the lunch box. Among the day workers, 38.9 per cent skipped meal, but the percentage of meal skipping was more in case of shift workers (47%). In the day workers 61.6 per cent and (53%) of shift workers never skipped any meal. Thirty three per cent day workers and 26.5 per cent of shift workers skipped breakfast, 5.6 per cent of day workers and 14.7 per cent of shift workers skipped the lunch. Approximately six per cent shift workers skipped the dinner, where as no day workers were there in this category. Regarding the frequency of meals skipped 19.4 per cent day workers and 38.2 per cent shift workers skipped meals 2-3 times a week and 8.3 per cent day workers skipped meals more than 4 times a week, but no shift worker

skipped meal more than 4 times a week. Eleven per cent of day workers and 8.8 per cent shift workers reported to skip meals daily. North Indian food was most preferred by 50 per cent of day workers and 55.9 per cent of shift workers followed by Chinese food by 33.3 per cent day workers and 23.5 per cent shift workers. With regard to the frequency of consumption of outside food 19.4 per cent and 44.1 per cent shift workers reported that they went for food outside every day, 44.4 per cent day workers and 26.5 per cent shift workers went outside for food once in a week followed by 25.2 per cent day workers and 29.4 per cent shift workers once in fifteen days. (Table-4)

When day workers and shift workers were compared with respect to fasting blood sugar, day workers represented a lower value 91.84 mg/dl, compared to shift workers 97.10 mg/dl and it was statistically significant for shift workers compared to day workers. Among the day workers the serum triglycerides value was found to be 150.08 mg/dl and in the shift workers it was higher (159.65 ± 51.59 mg/dl). The mean total cholesterol was noticeably higher 195.33 mg/dl in shift workers compared to 173.32 mg/dl for day workers. With regard to HDL-C, when the day workers and shift workers were compared, the day workers were having higher value 44.96 ± 5.44 mg/dl than the shift workers (39.62 ± 7.57mg/dl) and it was statistically significant. The VLDL-C value was found to be 30.45 mg/dl in day workers and 36.32 mg/dl among the shift workers. The mean LDL-C value revealed that the shift workers were having higher LDL-C (125.48 ± 27.75 mg/dl) than day workers (114.17 ± 24.08 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) which was significant. (Fig-1). The findings of Karlsson *et al.* (2003) suggested the higher prevalence of high serum triglyceride levels and low HDL-cholesterol levels among shift workers than 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.

So the study pointed out that majority of the soft ware engineers were in obese category with higher biochemical parameters.

Table.1 Classification of subjects based on BMI N=70

BMI Classification	Presumptive Diagnosis	Day Workers (N=36)		Shift Workers (N=34)	
		Frequency	Percentage	Frequency	Percentage
18.5-22.9	Ideal BMI	15	41.7	6	17.6
>23	Over Weight	12	33.3	6	17.6
>25	Obese Grade-I	7	19.4	19	55.9
>30	Obese Grade-II	2	5.6	3	8.8
	Total	36	100.0	34	100.0

BMI classification for Asian Adults (WHO, 2002) * < 18.5 Under weight No subjects

Table-2 Mean fat intake of the subjects N=70

Total Fat (g/d)	Day Workers (n=36)	Shift workers (n=34)	't' Value
Fat	105.28 ± 32.99	106.80±26.27	0.21 ^{NS}
Saturated Fat	19.07 ±9.76	24.66 ± 11.79	2.16*
MUFA	26.58 ± 8.09	25.53 ± 8.84	0.51 ^{NS}
PUFA	50.02 ± 15.05	52.7 ± 16.2	0.71 ^{NS}
Cholesterol	120.94 ± 149.99	147.23 ± 236.17	0.55 ^{NS}

Values are expressed in terms of Mean ± S.D

* Significant at 5% level NS Non Significant

Table-3 Fluid consumption pattern of the subjects N=70

Fluid (per day)	Range	Day Workers (n=36)	Shift workers (n=34)	Average Consumption		't' Values
		Frequency	Frequency	Day Workers (Mean ±SD)	Shift Workers (Mean ±SD)	
Plain water (L)	< 2.1	15 (41.7)	11 (32.4)	2.75 ± 1.27	2.64 ±1.08	0.42 ^{NS}
	2.1-3.2	11 (30.5)	17 (50.0)			
	> 3.2	10 (27.8)	6 (17.6)			
Tea/Coffee (cups)	Don't drink	8 (22.2)	2 (5.9)	1.99±0.69	3.78±1.21	7.23**
	< 2	22 (61.1)	5 (14.7)			
	3-4	6 (16.7)	6 (17.6)			
	> 4	-	21 (61.8)			
Milk (ml)	Don't drink	22 (61.1)	24 (70.6)	457.14±336.18	390 ±144.9	0.66 ^{NS}
	< 300	4 (11.1)	-			
	300-500	4 (11.1)	7 (20.6)			
	> 500	6 (16.7)	3 (8.8)			
Soft drinks (ml)	Don't drink	24 (66.7)	14 (41.2)	350.0±62.36	567.5±373.55	2.27*
	< 350	9 (25.0)	10 (29.4)			
	350-600	-	-			
	> 600	3 (8.3)	10 (29.4)			
Fruit Juice (ml)	Don't drink	16 (44.4)	22 (64.8)	450±202.26	295±135.62	2.35*
	< 250	7 (19.4)	-			
	250-400	10 (27.8)	6 (17.6)			
	> 400	3 (8.4)	6 (17.6)			

Figures in parentheses indicated percentage.

* Significant at 5% level

** Significant at 1% level

NS Non Significant

Table-4 Food consumption habits of the subjects N=70

Particulars	Categories	Day Workers (n=36)		Shift Workers (n=34)	
		Frequency	Percentage	Frequency	Percentage
Numbers of meals/day	3 meals	21	58.3	13	38.2
	4 meals	13	36.1	14	41.2
	Other (2 meals)	2	5.6	7	20.6
Types of meals	Homemade food (any meal timing))	8	22.2	4	11.8
	Canteen food	28	77.8	30	88.2

Meals skipping	Yes	14	38.9	16	47
	No	22	61.1	18	53
Frequency of skipping	Daily	4	11.3	3	8.8
	2-3 times in a week	7	19.4	13	38.2
	>4times a week	3	8.3	-	-
Type of meal skipped	Break fast	12	33.4	9	26.5
	Lunch	2	5.6	5	14.6
	Dinner	-	-	2	5.9
Eat outside	Yes	32	88.9	34	100
	No	4	11.1	-	-
Outside food Preference	Chinese	12	33.4	8	23.5
	North Indian	18	50.0	19	55.9
	South Indian	2	5.6	7	20.6
Frequency of outside food consumption	Daily	7	19.5	15	44.1
	Once in a week	16	44.4	9	26.5
	Once in 15 days	7	19.5	10	29.5
	Once in a month	2	5.6	-	-

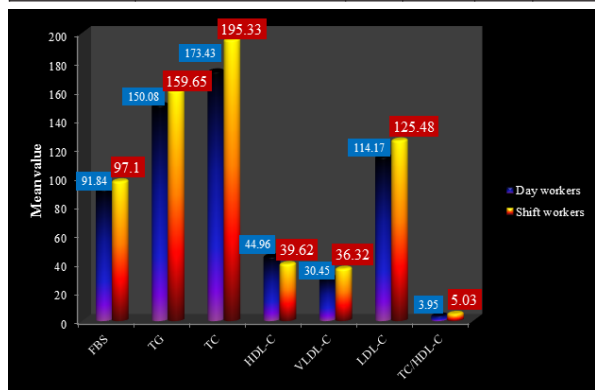


Fig-1 Biochemical parameters of the respondents

REFERENCES

1. Boyee, W. R., Boone, L.E., Cioci, W.B. and Lee, H. A., 2008, Physical activity, weight gain and occupational health among call center employees. Occupational Medicine, 58: 238-244.
2. Chee, H., Mirnakil, K., Maimunah, K., Khadijas, S., Jamilah, J., Rashidah, S. and Intan, O., 2004, Body mass index and factors related to overweight among women workers in electronic factories in Peninsular Malaysia. Asia Pacific Journal of Clinical nutrition, 13 (3): 248-254
3. Karlsson, H.B., Knutsson, A. and Lindahi, O.B. and Alfredsson, S. L., 2003, Metabolic disturbances in male workers with rotating three-shift work, Results of the WOLF study. Int. Arch. Occup. Environ. Health, 76: 424-430.
4. Sudo, N. and Ohtsuka, R., 2001, Nutrient intake among female shift workers in a computer factory in Japan, International Journal of Food Science and Nutrition, 52: 367-378.