

ORIGINAL ARTICLE

Eating Behavior and Its Association with Night Work and BMI among Female Nurses in Shiraz Hospitals, Iran

Marzieh Akbarzadeh^{1,2}, Shabnam Mohabati^{2,3*}, Zahra Sohrabi^{1,2}, Mohammad Hassan Eftekhari^{2,3}

1. Department of Community Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

2. Nutrition Research Center, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

3. Department of Clinical Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

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**Corresponding author:*

Shabnam Mohabati,
Nutrition Research Center,
School of Nutrition and Food
Sciences,
Shiraz University of Medical
Sciences,
Shiraz, Iran
Tel: +98-936-0006361
Email: mohabati_sh@yahoo.com
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ABSTRACT

Background: People's eating habits are effective for prevention and control of obesity. Shift works are shown to be associated with an increased risk of being overweight and obesity. This study aimed to investigate the eating behavior and its association with night work and BMI among female nurses in Shiraz, Iran.

Methods: Eighty female nurses working in Shiraz hospitals, Iran were enrolled. The number of night work shift for each nurse was determined. The anthropometric data were also collected and the Dutch eating behavior questionnaire was used to assess eating behavior.

Results: There was a significant positive correlation between the subscale scores of eating behavior and weight, body mass index (BMI) and waist circumference. There was no significant correlation between the number of night shift work with anthropometric indices and subscales of eating behavior questionnaire. Comparing the subscales scores of the eating behavior questionnaire in the two groups of normal weight (BMI<24.9) and overweight and obesity (BMI≥25), it was observed that the score of restrained eating index was significantly higher in overweight and obese subjects than those with normal weight.

Conclusion: There was no statistically significant correlation between night work and anthropometric indices or eating behavior, but there was a statistically significant correlation between eating behavior and weight, body mass index and waist circumference. The score of restrained eating index was significantly higher in overweight and obese nurses than those with normal weight that necessitates a planning for health policy makers.

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Introduction

In the present century, a growing trend was seen

in obesity and it is becoming one of the greatest health challenges in the world (1), causing 2.8

million deaths annually (2). The prevalence of obesity is constantly increasing worldwide, as the total number of overweight and obese adults was respectively 937 and 396 million in 2005 (1). This number has been doubled in comparison with the last 20 years (3) and it is said that the number of overweight and obese adults will respectively reach 3.1 billion and 537 millions in 2030 (1). The prevalence of obese women and men has been reported 27.3% and 13.7% in Iran, respectively (4).

The most significant health consequences of obesity are high blood pressure, high blood cholesterol, coronary heart disease, ischemic stroke, type 2 diabetes and certain types of cancers (5). Therefore, attention to this issue is very important because of the rise in obesity-related diseases and the high cost of the treatment. Regarding to the importance of the issue, many researchers have focused on its etiology. Since the main cause of obesity is the imbalance between energy intake and energy expenditure, many studies have approached to eating behaviors and factors affecting it (6, 7).

The most common method of treatment for obesity is reducing the amount of calorie intake by a special diet. It was shown that many people cannot follow their diet despite they like, indicating their inability to stick to a healthy diet, regular daily exercise and appetite control (6, 7). Another component that plays a role in the success or failure of dieting is the eating style. In this regard, there are three main theories. The first theory is psychosomatic theory that according to this theory, some people do not recognize true hunger and they start eating in response to emotional states. This type of eating style is called "emotional" eating (8).

The second theory is called externality which states that environmental stimuli make obese people more likely to eat that is not a true hunger, and this type of eating is called "external" eating. The third theory is called the restrain theory which shows the eating behavior among obese people because of their diet. In other words, there is a conflict mode among these people that they tend to eat more the prohibited foods as they are banned from eating them, and this style is called "restrained" eating (8).

The other factor influencing people's eating behavior are the pattern of sleep, wakefulness and shift works (9). In modern societies, one of the most important occupational factors is the shift works, especially the night shifts, which includes approximately 15 to 20% of the working population in Europe and America (10). Night work is associated with several diseases, including obesity, digestive disorders, cancer, cardiovascular diseases, mental disorders such as insomnia, depression, and

many other disorders, which are all related to the disturbance of the circadian system (10, 11). Although there are contradictions in the results of studies conducted on the relationship between night works and obesity, several cross-sectional studies have shown a positive relationship between night work and body mass index (BMI) (12, 13).

In a systematic review conducted by Van Dongen *et al.*, 8 longitudinal studies were undertaken indicating a crude association between night work and body weight gain. But, this relationship was not statistically significant after controlling the confounders (14). Hospital jobs, especially the nursing profession is one of the main occupations in providing 24-hour services. Fatigue is one of the problems that night shift nurses often complain about it. Generally, night shift nurses do not sleep continuously during the day. Poor sleep quality due to night shift work is associated with an increased BMI (15).

The night work is actually associated with the related diseases via inducing overweight and obesity in night shift workers. The precise mechanisms that link night work to obesity is still under investigation, but some items are suggested such as reducing leisure time and physical activity, increasing alcohol consumption, the difficulty to stick to a healthy diet or increasing the consumption of foods with a high energy density to reduce fatigue and sleepiness. In general, night shift work causes stress and irregularity of the usual diet (9). Regarding previous studies investigating the relationship between eating behavior and night shift work in nurses, the present study was designed to assess the eating behavior and its relationship with night work and BMI of nurses in Shiraz hospitals, Iran.

Materials and Methods

The present study was a cross sectional one. Sample size was determined based on the scores of Dutch eating behavior questionnaire in a study by Kargar *et.al.*, (16). Considering $SD=0.65$, $\alpha=0.05$, and $d=0.15$, sample size was determined to be 80. Female nurses working in Shiraz hospitals were enrolled. The nurses who were pregnant or lactating, those with chronic diseases such as renal failure and any other conditions affecting the diet and BMI, as well as mental illness, depression, anxiety, and also eating disorders, were excluded from this study. The subjects were selected from different wards of Namazee and Shahid Faghihi hospitals in Shiraz, Iran.

Demographic information including age, marital status, working years, level of education, etc. were completed in a questionnaire for each person. The

information about the number of night shifts in the last month and the percentage of weight change over the past 6 months were also recorded. Weight was measured with a minimum clothes, with a precision of 0.1 kg, using Seca scale and height was evaluated by using a strip meter with a precision of 0.1 cm in a standing position without shoes, so that back of the heel, the buttocks, the shoulder, and back of the head were in touch with the wall, and the Frankfurt plate was in a horizontal plane. BMI was calculated by dividing weight (Kg) by square of height (m). The waist circumference was assessed by using non-stretchable tape, in the upper the iliac crest with a precision of 0.1 cm (17).

The Dutch eating behavior questionnaire (DEBQ) was used to assess eating behaviors. This questionnaire consisted of three sections: “emotional eating”, “restrained eating” and “external eating”. This questionnaire consisted of 33 questions and three sub-scales for measuring styles of “external eating” (10 questions), “emotional eating” (13 questions) and “restrained eating” (10 questions). Questions focussed on eating habits (for example, do you want to eat when you are angry?). So, the answers are ranked according to 5 grades that the lowest grade had the lowest score and the highest grade had the highest score (never=1, rarely=2, sometimes=3, often=4, very much=5). The subjects should have specified to what extent each question has indicated their status, and select one of the five options. The total score of each sub-scale constituted crude score of its sub-scale. A standard score was obtained by dividing the crude score into the number of answered questions of the same scale (18).

The ranking method of this questionnaire was based on the 5-point Likert scale, which is 1 for the minimum and 5 for the maximum, for example, in emotional eating scale, score 1 denoted to the fact that the person did not eat in response to his emotions and score 5 showed overeating based on emotional state like anger, joy or excitement. In external eating, the highest score indicated eating based on stimuli such as color, smell and taste of food, and score 1 revealed that the subject did not pay attention to these stimuli and only ate when they were really hungry. In restrained eating, the highest score showed that people had more control over their eating and tried to avoid eating (18). Validity and reliability of this questionnaire were evaluated by Kargar *et al.* (16). SPSS software (version 17, Chicago, IL, USA) was used for statistical analysis. Independent T-test was used to compare the scores of the three Dutch scales in the subgroup of normal weight, overweight and obese nurses and Pearson correlation coefficient was also applied to find correlation between variables.

Results

In this study, eighty female nurses working in Shiraz hospitals were enrolled. Basic and anthropometric information are presented in Table 1. In the analysis of Dutch eating behavior questionnaire, the subscale score of the restrained, emotional and external eating behaviors were $2.019.69 \pm 2.0$, 29.84 ± 3.0 , $35.3 \pm$ respectively. The findings of the correlations between the subscales of the eating behavior questionnaire, the number of night shift work and the anthropometric data are shown in Table 2. As shown in the table, there was a significant positive correlation between restrained eating score with weight, BMI and waist circumference. Also, emotional eating and external eating scores were positively and significantly correlated with weight and waist circumference indices, respectively.

Table 1: Basic and anthropometric characteristics of nurses

| Variable | Mean±SD |
|---------------------------|-------------|
| Age (years) | 30.57±6.10 |
| Work experience (years) | 6.91±5.76 |
| Night shifts (time/month) | 7.02±1.77 |
| Height (cm) | 162.63±6.02 |
| Weight (Kg) | 62.05±7.23 |
| BMI (Kg/m ²) | 23.51±2.69 |
| Waist Circumference (cm) | 85.18±6.59 |

BMI: Body mass index

It is worth noting that there was no significant correlation between the number of night shifts with anthropometric indices and subscales of eating behavior questionnaire. Comparing the subscale scores of the eating behavior questionnaire in the two groups of normal weight (BMI<24.9) and overweight and obese nurses (BMI≥25), it was observed that the score of restrained eating was significantly higher in overweight and obese nurses, compared with the normal weights (Table 3).

Discussion

The results of the present study showed that night work was not related to anthropometric indices or eating behavior. However, eating behavior had a significant positive correlation with weight, BMI and waist circumference. Moreover, it was observed that the score of restrained eating was significantly higher in overweight and obese participants than those with normal weight.

In the present study, night shift work did not have any correlation with weight and BMI. Some studies have confirmed the positive correlation between night work and obesity (12, 13). The prevalence of obesity among night workers was higher than

Table 2: Correlations between variables

| Variable | Restrained Eating* | Emotional Eating | External Eating | Night shift |
|---------------------------|--------------------|------------------|-----------------|---------------|
| Weight (Kg) | 0.250 (0.026) | 0.221 (0.048) | 0.165 (0.144) | 0.189 (0.094) |
| BMI (Kg/m ²) | 0.344 (0.002) | 0.189 (0.093) | 0.181 (0.108) | 0.113 (0.317) |
| Waist circumference (cm) | 0.280 (0.012) | 0.078 (0.491) | 0.263 (0.018) | 0.109 (0.338) |
| Night Shifts (time/month) | -0.120 (0.289) | 0.036 (0.754) | 0.093 (0.411) | - |

*Pearson correlation coefficient (P-value)

Table 3: Eating behavior in BMI groups

| Variable | Normal weight (BMI<24.9) | Overweight & obese (BMI≥25) | P value* |
|-------------------|--------------------------|-----------------------------|----------|
| Restrained Eating | 2.169±0.84 | 2.622±0.81 | 0.033 |
| Emotional Eating | 2.129±0.61 | 2.330±0.88 | 0.242 |
| External Eating | 3.300±0.51 | 3.450±0.47 | 0.237 |

*Independent t-test

daytime workers in a study conducted on workers of the chemical industry in Italy (19). Similar studies have also shown positive relationship between shift work and obesity in male workers (20, 21). BMI changes of workers were also studied over one year in Korea, the increased rate of BMI in night shift workers was higher than daytime workers over a year (20). The same result was also obtained in the study of BMI changes in male workers over 14 years (21). However, some studies have failed to show this relationship among male workers (22, 23).

The suppression of melatonin at night shift leads to insulin resistance, glucose intolerance and sleep disorders that cause obesity (11). The most common method for assessing obesity is BMI. Although there is a strong correlation between this index and body fat percentage, there are also some limitations, especially in people with moderate BMI (11). Moreover, the evaluation of obesity by BMI may not exactly correspond to the degree of obesity (11). But, direct measurement of total body fat is a better indicator of obesity and is closely associated with the cardiovascular and metabolic risk factors (24).

The relationship between shift work and obesity was positive and significant among workers in the study conducted by Son et. al. in 2015 (11). The important point that should be considered in this study was to estimate the percentage of total body fat to determine obese people, while in the present study, BMI index was used for this purpose and because of the limitations of this indicator, the possible reason for non-observance of the relationship in this study could be due to the lack of a more accurate index such as body fat percentage to determine overweight or obese people.

In the study conducted on 724 nurses and midwives aged 40 to 60 years, there was a significant positive correlation between the numbers of night shift work and the BMI and waist circumference,

and the number of night shift work was positively associated with obesity (10). In the present study, neither waist circumference nor BMI were associated with night work, while the reason could be attributed to the age range that affected the BMI and waist circumference, as the average age was 48 years old in the above-mentioned study and greater percentages of participants were post-menopause, while in the present study, the average age was 30 years and the subjects were before menopause.

In the present study, there was no relationship between night work and eating behavior scores. Awakenings during the night was shown to lead to changes in eating behavior compared to family eating habits (11). Irregular eating pattern, like eating at night, affects the person's thermogenic response and leads to weight gain (11). Therefore, the time to eat meal affects the thermogenic response (11). On the other hand, the distribution of sleep and wake cycle causes the distribution of the cortisol rhythmic balance, which leads to increased activity of the hypothalamus-pituitary axis that finally causes high levels of cortisol over a prolonged time and the occurrence of overweight and obesity (11).

In a study on 395 non-Saudi female nurses, there was a positive correlation between night shifts and restrained and emotional eating behaviors, but a negative correlation was noticed between night shift and external eating behavior (25). In another study by Wong et.al., on 378 nurses, there was a positive correlation between night shifts and abnormal scores of Dutch eating behavior questionnaire (DEBQ) (9). According to the two mentioned studies, the possible reason for non-observance of the relationship in this study could be the small sample size and this correlation may be observed in a larger sample size.

In the present study, there was a significant positive correlation between eating behavior and weight, BMI and waist circumference that indicates

central obesity. Moreover, the score of restrained eating was significantly higher in overweight and obese people compared to those with normal weight. Identification of people's eating style should be considered for a proper treatment planning and also as a factor predicting people's eating behaviors and the success rates for their weight loss. Emotional eating style is a good predictor of overeating in emotional situations. Therefore, people with this eating style draw towards sweets, chocolates and cakes in response to their stress (26).

Restrained eating style cannot predict overeating in emotional and stressful situations. Behavioral and physiological data only show that the person with high score for restrained eating, is predisposed to weight gain after weight loss (27). External eating is associated with an increase in the consumption of lipids, carbohydrates and a high amount of energy intake, while there is no such a relationship in emotional and restrained eating behavior (28). Restrained eating is the desire of people to limit food intake in order to lose weight or prevent weight gain (2). However, some studies have shown an inverse relationship between the severe food constraints and the risk of obesity, and suggested that the chronic and severe constraints are considered as a risk factor for weight gain and obesity (2).

In a study conducted on adult women and not men, it was observed that higher levels of food constraints at the beginning of the study was related with higher increase in BMI at the end of the 3-year follow-up (29). In clinical trials, there was an inverse correlation between eating behavior scores due to limitation and total energy intake (30). As a limitation to the present study, the small sample size could be mentioned. We also did not assess the quality of sleep among nurses. The strength of this study was the investigation of the relationship between eating behavior and its affective factors such as emotional, external and restrained factors. It is suggested that sleep quality be also considered in the future studies in order to assess the relationship between eating behavior and sleep quality independent of night shifts. Also, the study of physical activity can be useful in interpreting the results.

Conclusion

There was no statistically significant correlation between anthropometric indices or eating behavior with night work, but there was a statistically significant correlation between eating behavior with weight, BMI and waist circumference. In particular, the score of restrained eating was significantly higher in overweight and obese nurses compared to the normal weights.

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Conflict of Interest

None declared.

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