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The Relation of Shift Work to Nutritional Habits and Obesity Prevalence among Nurses in Assiut University Hospitals - Results from Cross-Sectional Study

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A B S T R A C T

Background: Rotating night shift nurses (RNS) are risky to unhealthy eating habits due to irregular work schedules, stressful environments, and unhealthy food choices. This may lead to obesity, a higher risk of medical conditions, and decreased productivity. **Objectives:** To identify the effect of shift work on nutritional habits and obesity among female nurses. **Methods:** A cross-sectional study was conducted at Assiut University Hospitals, including 108 nurses (54 RNS and 54 day shifts only), using an interview questionnaire including food frequency questionnaire on eating habits for recall of last month's consumption. Body mass index (BMI), and waist circumference were also measured. **Results:** The mean age was 30.15±4.96 years. Regarding eating habits of the nurses, day workers only had significantly more daily eating frequency and regular breakfast ($p<0.05$). Among all nurses, fresh fruits or vegetables and sweetened hot drinks were the most frequent snacks (60.2%, 59.3%, respectively). Fatty fast meal was the only food more frequent in RNS than day work (20.4 % versus 7.4%). Both groups had similar food groups, protein source variety, diet quality, and Mediterranean index. Moreover, 74% of nurses working included in the study were overweight and obese, and 88% had waist circumference >88 cm, which is significantly more prevalent among day workers. **Conclusions**: Despite the lack of difference in dietary consumption between RNS and day workers, except in fatty meals, most studied nurses were at high risk of developing obesity-related diseases based on their high waist circumference. The findings underscore the need for improving workplace nutritional habits.

INTRODUCTION

Shift work is defined by The International Labor Organization, 1990 as a method of organizing working time in which workers succeed one another at the workplace so that the establishment can operate longer than individual working hours. Working in shifts is a crucial part of the working life for hospital nurses because nursing is a career that requires 24-hour availability.[1] Healthcare workers make up the largest group of shift workers, accounting for nearly one-fourth of shift workers.[2] This challenges the healthcare sector, as shift work has been found to impact healthcare workers' health and quality of life.[3] Numerous studies have found a link between shift work and health issues; staff who work shifts tend to have problems caused by the de-synchronization of the endogenous physiological system of circadian rhythms.[2,4]

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Some of these problems relate to reduced job performance.[2,5] Other problems relate to increasing exhaustion and insufficient sleep.[6] Also, problems relate to their health; staff who work shifts are liable to suffer from poor general health, including physiological and psychological health.[7,8] According to studies, shift workers are more likely to be overweight or obese, particularly if they have abdominal obesity.[9] All bodily systems can be impacted by obesity or being overweight and the obesity epidemic places a growing global strain on healthcare services. One of the potential underlying mechanisms of how shift work contributes to weight gain has been suggested to be the disturbance of the circadian rhythm, and food consumption is one of the problems closely associated with irregular working hours. Irregular circadian timing of meals could harm digestion, nutrient absorption, metabolism, appetite, and satiety.[10] Additionally, shift work leads to an increase in the consumption of calorie-dense meals and alcohol and results in metabolic diseases. Moreover, exercise during free time is decreased.[10] Also, certain particular elements, such as stress or a lack of time off, may lead to unhealthy nutritional choices, and affect adherence to Mediterranean Diet pattern due to burn out.[9-11]. Obesity, diabetes, and MetS are closely linked to shift work,[12] and associated with several health risks.[13] Overweight and obesity were prevalent among nurses worldwide, 31.2% and 16.3%, respectively.[14,15] In Egypt, the prevalence of obesity among nurses was 23.4% .[15] Previous studies showed that night shift working nurses are more prone to obesity. A study conducted at Ain Shams University Hospitals, Egypt, showed that 16.3% of night-shift working nurses were obese compared to 4.7% of day-shift nurses.[16] Moreover, in 2020, a systematic review and meta-analysis showed that night shift working nurses were significantly at higher risk of obesity.[9] This can be explained by the fact that individuals experiencing sleep deprivation tend to choose sweet and savory flavors as well as high-fat, high-energy foods, which accounts for their preference for snacking over regular meals. Also, disturbed circadian rhythm might lead food patterns to change in favor of an unhealthy diet.[17] Another systematic review carried out to determine the eating habits of hospital nurses showed differences in diet quality among nurses with different shifts; night shift working nurses consume significantly less protein, fats, and carbohydrates each day than the day shift workers.[18] In Egypt a previous study conducted using FFQ for average eating frequency per week showed that 91.9% of night shift nurses consume semi-healthy diets, and 8.1% consume unhealthy diets.[16] We hypothesized that night shift working nurses would consume less healthy food choices and have lower adherence to the healthy diet. A deeper understanding of nurses' eating habits could help develop dietary recommendations for night shift workers and a better grasp of the foods they choose. Although the effects of shift work on nutritional habits have been widely studied, to our knowledge, no previous local studies have been done in this area.

The aims of the current study were to identify the effect of shift work on nutritional habits, diet quality, and adherence to a healthy MDI diet, and to identify the percentage of overweight and obesity among nurses at Assiut University Hospitals.

METHODS

A comparative cross-sectional study was carried out at Assiut University Hospitals. The study was conducted in intensive care units (ICUs) and out-patient clinics at Assiut University Hospitals. ICUs included critical care unit, hematology care unit, internal disease critical care unit, trauma critical care unit, intermediate trauma care unit, general care unit, high efficiency care unit, chest disease care unit. Approvals of protocol from the Ethical Review Committee of Assiut Faculty of Medicine

Table 1: Socio-demographic characteristics and occupational history of studied nurses according to shift type, Assiut University Hospitals, 2022

Characteristics	Total N (%) (n=108)	Rotating night shifts N (%) (n= 54)	Day work only N (%) (n= 54)	P-value †
Age (age group)				
<30	57 (52.8)	32 (59.3)	25 (46.3)	0.177
≥ 30	51 (47.2)	22 (40.7)	29 (53.7)	
Mean ± SD	30.15 ± 4.96	29.26 ± 4.62	31.04 ± 5.16	0.062 ‡
Education				
Nursing school	43 (39.8)	15 (27.8)	28 (51.9)	0.025*
Nursing Institute	42 (38.9)	27 (50.0)	15 (27.8)	
Faculty of Nursing and Postgraduate	23 (21.3)	12 (22.2)	11 (20.4)	
Marital status				
Married	86 (79.6)	38 (70.4)	48 (88.9)	0.081
Unmarried	21 (20.4)	16 (29.6)	6 (11.1)	
Residence				
Urban	66 (61.1)	28 (51.9)	38 (70.4)	**0.048***
Rural	42 (38.9)	26 (48.1)	16 (29.6)	
Job title				
Nurse	88 (81.5)	45 (83.3)	43 (79.6)	0.620
Nurse supervisor	20 (18.5)	9 (16.7)	11 (20.4)	

*† Chi square test was used ‡ Student's t-test was used * p value significant <0.05*

and approvals from Executive Director of Assiut University Hospitals were obtained and sample was collected from 19th May till 25th October 2022.

Population: Females nurses working as night shift in different types of ICUs and as day only work in out-patient clinics. The minimum exposure duration to rotating night shifts is one year.[1] Nurses known to have autoimmune, endocrinal or neuropsychiatric disorders before joining job and pregnant nurses were excluded.

The sample size was calculated according to the G*Power 3 software,[19] the minimum sample was 108 persons (54 nurses with night shift and 54 nurses had day only work as a comparison group) needed to detect an effect size of 0.68 ,[8] 95 % confidence level. A total 54 nurses out of the 296 nurses who had rotating night shifts (RNS) were selected using the simple random sampling technique from the 8 ICUs, with proportionate representation from each unit. One out of 8 ICUs was selected randomly each time using shuffled cards in which the names of the eight ICUs were written. After that shuffled cards including the seven days of the week were used to choose two days to collect the sample from the targeted place until the required sample from each department was complete. A total 54 out of 103 nurses working as day work only were selected from out-patient clinics matched with age of the included RNS nurses.

Study tools: Data collection was performed by an interview questionnaire including *(1) Socio-demographic characters:* (Personal data, age, sex, educational level, marital status, residence, and job title). *(2) Food Frequency Questionnaire (FFQ):* This questionnaire was composed of questions on eating habits, and 23 food items were used to recall food consumed the last month before sampling, which had been modified in Egyptian food.[20] The researchers calculated the daily consumption of the six major food groups: fruits, vegetables, grains, legumes, dairy products, meat (chicken, meat, and fish), and fats from nurses' dietary data. An eight-point scale was used to assess the frequency of consumption of

Table 2: The effect of shift work on eating habits among the studied nurses, Assiut University Hospitals, 2022

	Total (n=108)	Rotating night shifts (n= 54)	Day work only (n= 54)	P-value†
Eating times per day				
Median (IQR)	2 (2 – 3)	2 (2 – 3)	3 (2 – 3)	**0.002**§
Main meal				
Breakfast	51 (47.2%)	25 (46.3%)	26 (48.1%)	
Lunch	49 (45.4%)	23 (42.6%)	26 (48.1%)	0.332
Dinner	8 (7.4%)	6 (11.1%)	2 (3.7%)	
Having breakfast regularly				
Yes	60 (55.6%)	23 (42.6%)	37 (68.5%)	
No	15 (13.9%)	12 (22.2%)	3 (5.6%)	**0.009**
Sometimes or rarely	33 (30.6%)	19 (35.2%)	14 (25.9%)	
Fruits and vegetables per day*				
≥ 5 servings per day	18 (16.7%)	11 (20.4%)	7 (13.0%)	0.302
< 5 servings per day	90 (83.3%)	43 (79.6%)	47 (87.0%)	
Fat type regularly consumed				
Polyunsaturated fatty acid	93 (86.1%)	44 (81.5%)	49 (90.7%)	0.164
Hydrogenated oil	74 (68.5%)	38 (70.4%)	36 (66.7%)	0.679
Ghee	94 (87.0%)	48 (88.9%)	46 (85.2%)	0.567
Olive oil	57 (52.8%)	30 (55.6%)	27 (50.0%)	0.563
Number of caffeinated drinks cups per day				
Median (IQR)	2.000 (0.250 – 3.000)	2.000 (1.000 – 3.000)	2.000 (0 – 3.000)	0.306§

Data were presented as number and percentage, unless mentioned otherwise. † Chi square test was used § Mann Whitney test was used ******* *According to World Health Organization (WHO) recommendations*

each food group: "4 or more times per day," "2 - 3 times daily," "once per day," "5-6 times per week," "2-4 times per week," "once per week," "1-3 times per month," and "never or less than once per month" The tool was modified based on previous FFQ.[20] The following values were assigned: never or less than once per month = 0, 1-3 times per month = 2/30, once per week = 1/7, 2-4 times per week = 3/7, 5-6 times per week = 5.5/7, once per day = 1, 2-3 times per day = 2.5, and 4 or more times per day = 4.[21] According to the World Health Organization (WHO), the recommended intake of fruits and vegetables suggests that an adult consume five servings daily.[22] The other two questions were about the type of snacks usually consumed between meals and the number of cups of caffeinated drinks consumed daily.

The questionnaire included the following food indices; *Diet Quality Index:* It represents a class of measures for healthy diets and is a composite, individual-level diet quality indicator. It is among the indicators accurate in various cultural settings with various food customs. This study used the variety index aspects of diet quality.[23] *Variety of food groups*: The food groups were divided into five categories: grains, fruits, vegetables, dairy/beans, and meat/poultry/fish/egg. Each category was assigned 0 or 3 points; if at least one item was consumed in each category, the researchers gave three points, if not, researcher gave 0, the total score range from (0 – 15).[23] *Variety of protein sources:* this was measured with regard to six protein sources (meat, poultry, fish, dairy, beans, and eggs). Five points are given for consuming three or more protein sources; three points are given for consuming two; one point is given for consuming one; and zero point are given for consuming no protein at all; the total

Table 3: The effect of shift work on food groups frequency of eating, diet quality and Mediterranean Diet Index adherence among the studied nurses, Assiut University Hospitals, 2022

	Total (n=108)	Rotating night shifts (n= 54)	Day work only (n= 54)	P-value §
Food frequency questionnaire, median (IQR)				
Grains	2.390 (1.517 – 3.833)	2.465 (1.570 – 4.570)	2.290 (1.288 – 3.448)	0.133
Vegetables	1.430 (0.860– 2.640)	1.430 (0.860 – 2.640)	1.430 (0.860 – 2.160)	0.921
Fruits	1.000 (0.430 – 2.125)	1.000 (0.430 – 2.500)	1.000 (0.430 – 1.000)	0.382
Meat	1.29 (0.930 – 1.860)	1.290 (0.930 – 1.860)	1.280 (0.930 – 1.642)	0.512
Dairy	1.000 (0.430 – 1.000)	1.000 (0.430 – 1.000)	1.000 (0.140 – 1.000)	0.545
Fats	2.322 (1.320 – 3.430)	2.355 (1.480 – 3.332)	2.290 (0.965 – 3.895)	0.515
Legumes	0.430 (0.140 – 1.000)	0.430 (0.140 – 1.000)	0.430 (0.140 – 1.000)	0.698
Diet quality component, median (IQR)				
Variety of food groups	5.000 (5.000 – 5.000)	5.000 (5.000 – 5.000)	5.000 (5.000 – 5.000)	0.155
Variety of protein sources	15.00(15.000 – 15.000)	15.00 (15.00 – 15.00)	15.00 (15.00 – 15.00)	1.000
Diet Quality Index	20.00 (20.00 – 20.00)	20.00 (20.00 – 20.00)	20.00 (20.00 – 20.00)	0.155
Mediterranean diet index (MDI), n (%)				
High adherence ≥ 3	71 (65.7%)	33 (61.1%)	38 (70.4%)	0.311 †
Low adherence < 3	37 (34.3%)	21 (38.9%)	16 (29.6%)	

† *Chi square test was used* § *Mann Whitney test was used*

Table 4: The effect of shift work on BMI and waist circumference among the studied nurses, Assiut University Hospitals, 2022

	Total (n=108)	Rotating night shifts (n= 54)	Day work only (n= 54)	P-value†
Body Mass Index (BMI) classification				
Underweight (< 18.5)	1 (0.9%)	1 (1.9%)	0 (0.0%)	0.091
Normal weight (18.5- 24.9)	28 (25.9%)	16 (29.6%)	12 (22.2%)	
Overweight (25.0-29.9)	50 (46.3%)	28 (51.9%)	22 (40.7%)	
Obesity (≥30)	29 (26.9%)	9 (16.7%)	20 (37.0%)	
Waist circumference in cm				
> 88 cm	95 (88.0%)	42 (77.8%)	53 (98.1%)	**0.001**
≤ 88	13 (12.0%)	12 (22.2%)	1 (1.9%)	
Mean ± SD	40.12 ± 4.4	38.5 ± 4.26	41.74 ± 4.03	**<0.001**‡

† *Chi square test was used* ‡ *Student's t-test was used*

score of protein sources variety ranges from (0 – 5).[23] Then, the total score of the food group and protein sources variety was calculated to measure dietary quality.[23] *The Mediterranean Diet Index (MDI):* Adherence to MDI had beneficial effects on health.[24] Trichopoulou design was created using the total of the eight food groups to assess adherence to the MDI pattern.[25] Since no alcohol-consuming nurses and the fat ratio component could not be calculated using the data of this study, they were removed. Additionally, a junk food component was added, matching the recommendation of a prior study on MDI.[21] A value of 1 was given for consumption of fruits, vegetables, legumes, dairy products, whole grains, and fish if it exceeded the median consumption value among nurses, and 0 otherwise. The scores for junk food and meat were the opposite. The total score, ranging from 1 (lowest adherence) to 8 (highest adherence), was then calculated by adding the values for each category. When the total consumption of all food categories is greater than the median (≥ 3), we consider a higher degree of adherence to MDI.[21]

Table 5: Logistic regression for the association between night shift exposure, socio-demographic characteristics, working hours, and body mass index and waist circumference among studied nurses, Assiut University

	Above normal BMI (Overweight and obese)		High waist circumference (> 88 cm)	
	OR (95% CI)	p-value	OR (95% CI)	P-value
Age	1.047 (0.952: 1.152)	0.346	1.026 (0.894: 1.179)	0.712
Married nurses	.958(0.308: 2.980)	0.940	1.861 (0.441: 7.861)	0.398
Urban Residence	2.605 (1.019: 6.655)	**0.046**	0.523 (0.126: 2.165)	0.371
Higher Education	0.973 (0.619: 1.528)	0.904	0.849 (0.337: 2.141)	0.729
Working hours	0.994 (0.938: 1.054)	0.845	1.083 (0.976: 1.201)	0.132
Had night shifts	1.223 (0.418: 3.583)	0.713	0.044 (0.005: 0.413)	**0.006**
Higher Eating times	1.824 (0.810: 4.108)	0.147	2.416 (0.761: 7.674)	0.135

Anthropometric measurements: BMI and WC were obtained by trained personnel; each nurse stood in the center of the scale, barefoot, wearing light clothing, with one foot on each side, face up, and arms to the sides in order to assess their weight using a standardized, balanced scale. Following each weighting, reset the scale to zero using the reading recorded to the nearest kilogram.[26] Using a standard measuring tape, participants' height was measured. They were instructed to remain barefoot and to fix themselves tightly to the wall at their shoulders, backs of knees, and heels with their feet together. They were also instructed to keep their knees straight and to look forward rather than up. The external auditory meatus and the lower border of the orbit must be in the plane parallel to the floor, and the height was measured in centimeters.[26] Body Mass Index (BMI) was calculated using the following equation: BMI = weight (kg) / height (m2) and classified according to the Centre of Disease Control and Prevention (CDC) as Underweight (BMI is less than 18.5), Normal weight (BMI is 18.5 to 24.9), Overweight (BMI is 25.0 to 29.9), Obesity class 1 (BMI is 30.0 or higher). A high BMI can indicate high body fat, and a low BMI can indicate too low body fat.[27]

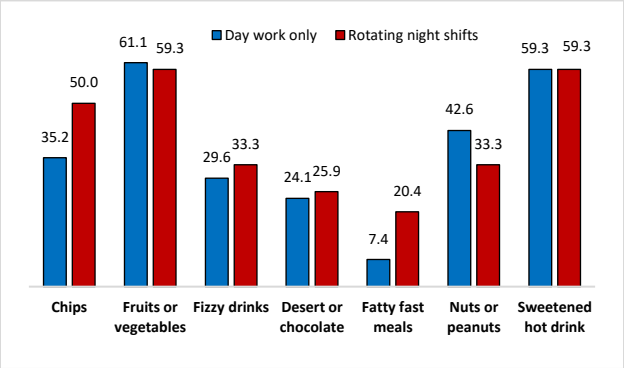

Figure 1: Kind of snack consumption between main meals associated with shift work status for nurses working at Assiut University Hospitals, 2022 *Chips (P-value=0.120), fresh fruits or vegetables (P-value= 0.844), fizzy drinks (P-value= 0.679), desert or chocolate (P-value= 0.824), fatty fast meals (P-value= 0.050), nuts or peanuts (P-value= 0.321), sweetened hot drink (P-value= 1.000).*

Using a non-stretchable measuring tape, the subject's waist circumference was measured to the nearest 0.1 cm as they stood with their feet together, their arms at their sides, and their abdomen relaxed, snug but not compressing the skin; the tape was wrapped horizontally around the waist in the middle and positioned slightly above the hipbones, This measurement served as

a screening tool for body fatness, A women whose waist circumference is > 88 cm is at risk of developing obesity-related disease according to CDC.[27]

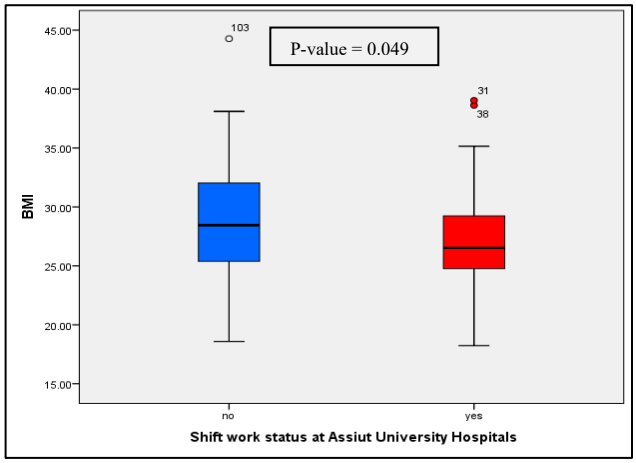

Figure 2: BMI among the studied nurses associated with shift work status for nurses working at Assiut University Hospitals, 2022

Statistical analysis: Data were analyzed using SPSS software package version 24 (SPSS inc. Chicago. Illinois. USA). Descriptive statistics were performed with frequency and percentages for categorical variables: mean, standard deviation, median, and interquartile measures for continuous data. The chi-square test was used to compare independent categorical variables, data explored by the Shapiro test to detect normality of data, Student T test was used for normal distributed one, while Mann Whitney was used for non-parametric data. Adjusted binary logistic regression was used to estimate the predictive factors and associations between night shift exposure and the occurrence of obesity and high waist circumference. The p-value was set at <0.05 to be significant.

RESULTS

Table (1) demonstrates differences in socio-demographic characteristics of the studied nurses according to shift work status at Assiut University Hospitals. There was no statistical difference between the two groups regarding age, marital status, and job title, while they were different in their educational level and residence, as day nurses were more from urban areas than RNS (70 % vs 51 %). Also, half of the RNS nurses had a nursing Institute educational level, while half of the day nurses had nursing school. Table (2) shows the differences in eating habits among the studied groups, and it showed that day work nurses had statistically significant more regular breakfast than RNS nurses (68.5% versus 42.6%), also day workers had more eating times. There was generally high consumption of unhealthy snacks among all included nurses, as sweetened hot drinks were the most frequent snacks (65%), followed by packed potatoes chips (42.6 %), fizzy drinks (31.5 %), and fatty fast meals (14%). Fatty fast meals were the only significantly different snacks and were higher among RNS than day-only workers (Figure 1). Although nurses of both groups reported a high choice of fruits and vegetables as snacks, only 16.7 % consume ≥ 5 servings per day according to WHO guidelines. Nearly two-thirds of included nurses (68.5%) reported regular consumption of halogenated fats. There was a generally high prevalence of high waist circumference > 88 cm (88%) and overweight and obesity (74 %) among all studied nurses, as shown in Table 4. Despite the presence of no differences in food group consumption and protein source variety, snack types, diet quality, and Mediterranean index between RNS and day work nurses, as shown in Table 3, high waist circumference (> 88 cm) prevalence and high BMI were both recorded to be statistically higher among day work nurses than RNS (p<0.05) (Figure 2).

By performing adjusted binary logistic regression (Table 5), urban nurses had two and half times the risk of being overweight and obese (body mass index ≥25 kg/m2); OR = 2.605, 95% CI 1.019 to 6.655). Moreover, night shift workers had decreased odds of high waist circumference (WC > 88 cm); OR= 0.044, 95% CI 0.005 to 0.413).

Conversely, nurses with more frequent eating times were nearly twice the risk of obesity and high waist circumference (AOR = 1.824 & 2.416, respectively), and higher educated nurses were protected from obesity and high waist circumference by 3 % and 17 %, respectively.

DISCUSSION

The disturbance of typical circadian cycles resulting from shift working, particularly the night shift, profoundly modifies biological processes. This has an impact on an individual's physical and psychological health as well as their productivity at work. This study evaluated how shift work affects eating habits and obesity development risks among nurses employed by Assiut University Hospitals. All included nurses were females as most of the nurses working at Assiut University Hospitals were females; their ages ranged between 22 and 39 years old, and to achieve matching between both groups, most nurses who take night shifts were usually younger. 61% were urban residents, as it was easier to have night shifts due to easier transportation and arrival on shift time. It was found that day-working nurses eat significantly more daily; 69 % had breakfast regularly versus 42.6% of rotating night shifts. This was matched with another research done at Ain Shams University Hospital, which showed that 48.8% of nurses on rotating night shifts reported eating breakfast rarely.[28] The current result showed a high consumption of unhealthy caloric snack types among all nurses, which may justify the high prevalence of obesity among them. Despite consuming two-thirds of included nurses to fresh fruits or vegetables as snacks, most of them fell below the WHO recommendation for fruit and vegetable consumption (83.3%). The high fat consumption among RNS nurses indicates that they are more inclined to consume junk food as an easy option during their night shifts.[29]

We found no difference in MDI, that was matched with other study in Spain indicated no differences in adherence to the MDI depending on the work shift.[30] Also this was confirmed with another study conducted in Dutch found no difference in MDI and diet quality with shift work.[31] Moreover both groups had nearly similar frequency for all main asked food groups and diet quality scores. This study is in line with similar previous studies that found no difference in diet type or quality, as a study by Beebe and others in the US, who used The National Cancer Institute (NCI) Diet History Questionnaire.[32] Likely other in Taiwan, where they found that macronutrient intake across each shift was not significantly different.[33] Regarding Caffeine consumption, both groups were nearly similar. Unlike previously conducted studies, such as a study conducted among US nurses using Nurses' Health Study (NHS) II and another one among Norwegian nurses using the survey of shift work, Sleep and Health (SUSSH), which demonstrated higher coffee consumption among the nursing staff working night shifts.[34,35] However, another study at Ain Shams revealed that just 2.2% of rotating night-shift nurses had a healthy diet.[28]

This study showed that obesity was recorded to be 27% and overweight 46% among all included nurses. Day shift workers recorded significantly higher BMI and waist circumference than RNS workers. Also, the odds of high waist circumference were lower among nurses with rotating night shifts. Moreover, urban nurses were 2.6 times more likely to be overweight and obese compared to rural residents, which may be attributed to their dietary habits and lower level of physical activity; as day shift workers were all working in outpatient clinics, which recommend less physical activity than others areas, while included rotating shift were working in different ICU units which demand higher physical activity and effort, or due to presence of potential confounders. This agrees with a study conducted

among Korean nurses that stated higher BMI among day working nurses.[36] In contrast to the present study, a study carried out at the Ain Shams University Hospitals in Egypt revealed that nurses working night shifts were more likely to be obese and overweight than those working day shifts.[16] This was also matched with another study among Japanese nurses, which was justified by the higher consumption of sweetened beverages and shorter sleep duration among shift working nurses.[37] In Northern Taiwan, there was no statistically significant difference in the mean BMI between shift work nurses and the day working group, which may be attributed to their eating habits.[38]. Also, this was contrasted to a systematic review and meta-analysis, which revealed shift working nurses had a higher risk of obesity, and when the type of shift work subgroups was considered, the risk estimates for obesity were significantly higher in night shift workers.[9] There was great heterogeneity among the studies, though, with studies involving both male and female subgroups, shift-working nurses were found to have a slightly higher risk of obesity than non-shift workers; however, similar to the current study, this association was not statistically significant when the meta-analysis was restricted to studies involving female nurses alone.[9] The variability of the instruments employed for nutritional evaluation, the study populations' sizes, ages, and lengths of night shifts, variations in eating habits, physical activity levels, socio-demographic characteristics, and work environments all had a significant impact on the results regarding the influence of shift work on eating habits among nurses.

***Strengths and Limitations*:** An important strength of our study was the absence of previous research on eating habits among nurses at Assiut University Hospitals, as far as our knowledge extends. Furthermore, aligning with sustainable development goals, it is crucial to prioritize maintaining good health and well-being, especially among high-risk individuals such as nurses, given the challenging nature of their work, which can impact their eating habits. One notable limitation was the difficulty matching day shift working nurses within the same age groups for comparison. Most day shift workers were above 50 years old, necessitating a comprehensive coverage of eligible nurses to address this limitation, as well as type of study and small sample size.

CONCLUSIONS

Although the Night shift system seems to have had no effect on food group and protein source variety, snack types, diet quality, and Mediterranean index among the studied nurses in Assiut University Hospitals, fatty fast meal consumption was higher among RNS. This underscores the importance of giving them healthy food options on their night shift. Despite a preference for fruits and vegetables as snacks, their consumption remained below the WHO recommendation for most individuals. Additionally, the prevalence of obesity and high waist circumference was notably high, particularly among morning shift workers. This highlights the need to incorporate nutritional educational sessions in the occupational health clinic to promote healthier lifestyles and enhance work performance.

Ethics approval: The protocol of the study was reviewed and approved by ethical committee of faculty of Medicine, Assiut university, IRB no 17101536, also was recorded in clinical trial with no NCT04813536, The hospitals' administrative heads gave permission to collect data from each Hospital. The study was conducted following the declaration of Helsinki. Each study participant signed voluntary, informed and written consent before they participated in the study. The data collected were kept confidential and private.

***Abbreviations*:** BMI, Body Mass Index; CDC, Centre of Disease Control and Prevention; FFQ, Food Frequency Questionnaire; ICU, Intensive Care Units; MDI, Mediterranean Diet Index; MetS, Metabolic Syndrome; NHS II, Nurses' Health Study II; RNS, Rotating Night Shift; SUSSH, The Survey of Shift Work, Sleep, and Health; WC, Waist Circumference; WHO, World Health Organization.

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