

# Relationship between Shift Work Status, Eating Habits, and Body Mass Index among Nurses in Abha City, Saudi Arabia

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## Abstract

**Aim of Study:** To investigate the relationship between shift work status, eating habits, and body mass index among nurses.

**Methods:** This study followed a cross-sectional research design. It included all nurses with at least one year of experience in the nursing field, at all main governmental healthcare facilities in Abha City, Saudi Arabia. Eligible nurses were invited via e-mail to respond to a self-administered questionnaire in the English Language, which was generated using an online survey system (Google Form). The questionnaire consisted of an interface and three parts: sociodemographic characteristics, anthropometric measurements, and a validated food frequency questionnaire.

**Results:** The total number of participants was 403. The age of most participants (78.7%) was 30-40 years. They were mostly females (82.1%), Saudis (65%), and married (56.6%). Almost half of the participants (47.1%) had rotating work shifts, while 52.9% of them reported that they had fixed day work shifts. About one-third of nurses (32.5%) were overweight, while obesity and underweight were prevalent among 24.6%, and 3% of them, respectively. Chicken kabsa was the most commonly consumed type of meat (82.6%), while sausages were the least (18.1%). Biryani or red rice was the most commonly consumed type of bread and cereals food category (93.1%), while the least was maasoub (banana bread) (34%). Boiled egg sandwiches were the most commonly consumed (77.9%), while chicken sandwiches were the least (34.7%). White cheese was the most commonly consumed of dairy products (72.2%), while fat-free labneh was the least consumed (26.3%). Nuts were most commonly consumed in the sweets and snacks category (75.4%), while ice cream was the least (48.9%). Red tea was the most commonly consumed drink (85.4%), while caffeine-free coffee was the least consumed (34.2%). Dates were the most commonly consumed fruits (92.6%), while dried fruits were the least (41.9%). The green salad was the most

commonly consumed type of vegetable (91.3%), while the mushroom was the least (30%). The prevalence of obesity among participants with rotating work shifts was significantly higher than those in the fixed-day work shift (31.6% and 18.3%, respectively,  $p=0.001$ ). Moreover, means of consumed food categories were higher among participants with rotating work shifts than those with fixed days' work shifts. Significant differences were observed regarding participants' consumption of meat and fish ( $p=0.035$ ), bread and cereals ( $p=0.044$ ), and sandwiches and burgers ( $p=0.039$ ).

**Conclusions:** Prevalence rates of obesity and overweight are high among nurses. Rotating work shift nurses have poor eating habits, which might lead to an imbalance in their diet. They consumed more food categories with high energy values than those with fixed day shifts. Moreover, rotating work shift nurses tend to consume more snacks than complete meals.

**Key Words:** Nurses, Shift work, Eating habits, Body mass index, Saudi Arabia

## Introduction

Work shifts allow services to continue around the clock and help meet the demands of consumers in many businesses and industries, including health care (1). In most hospitals, nursing provides 24-hour patient care services on different shifts. They may prefer to work night shifts for various reasons, including family obligations, babysitting issues, returning to school, and night differential payment. However, they are often unaware of the likely negative health implications of night shifts (2).

Nutrition is a component of overall health, which could be influenced by the rotating shift work status of nursing staff. Changed dietary habits among them were frequently observed after starting shift work. These changes include increased incidence of overweight, poor dietary habits, and low physical activity. Moreover, shift-working nurses have increased their intake of sweet foods and other unhealthy dietary choices, with fast and fatty foods (3). During night shifts, nurses usually experience insufficient sleep, tiredness, and an inability to recover between shifts (4).

Insufficient sleep, even for one night, could cause metabolic imbalance and weight gain by creating a need to replace sleep loss and energy by consuming more food (5-7). In 2012, Nahm et al. (8) discovered that 53.8% of their participants missed meals because of busy work schedules. In addition, 72.2% of the respondents indicated that they felt they were not engaging in enough exercise (8). Moreover, Huth et al. (9) reported that 27.5% of night-shift nurses had a BMI of  $>30$  kg/m<sup>2</sup>. Marqueze et al. (10) added that night shift work was associated with greater weight gain than working day shifts (10).

Researchers are focusing on the occupational-related weight gain associated with shift work. For example, Asaoka et al. (11) found connections between shift work and weight gain among female night shift nurses in Japan. A study conducted in Brazil concluded that the problems of shift work nursing were poor sleep quality and reduced access to quality food choices. Shift work could also lead to unhealthy weight gain and weight-related medical conditions among female nurses (10).

Since norms about food and body weight vary from culture to culture (12), it is important to investigate the Saudi cultural population concerning weight gain among shift nurses. Weight gain can lead to obesity. Obesity has become one of the most common health problems worldwide. Having a BMI of 25 kg/m<sup>2</sup> or higher constitutes being overweight and having a BMI of 30 kg/m<sup>2</sup> or higher constitutes obesity (13).

Because of the increased prevalence of unhealthy dietary patterns among shift work nurses, recent research on the occupational-related weight gain associated with shift work concluded that most shift work nurses have unhealthy dietary habits and are susceptible to health-related problems, such as overweight and obesity (10-11).

However, researchers have to focus on nurses and shift work as it relates to weight gain. Therefore, in this quantitative study, the researcher will examine the connections between shift work and weight gain among nurses to determine whether overweight/obesity and shift work are related in the nursing population.

Information on shift work and weight gain among nurses is lacking in the literature although it is needed to identify potential health problems associated with shift work and weight gain in the nursing population. Therefore, this study may lead to changes in policies and working conditions to promote the health and well-being of the nursing workforce. Promoting the health of nurses, especially those assigned for work shifts, is expected to prevent the development of numerous conditions associated with weight gain, such as heart diseases, hypertension, diabetes, stroke, and some forms of cancer (14-15).

In 1996, Costa (16) noted that shift work, especially night work, may negatively impact the health and well-being of workers. It is associated with disturbed circadian rhythms of workers' psychophysiological functions; interferes with their work performance and efficiency, with increased incidence of errors and accidents; facing difficulty with maintaining social relationships and negative influences on marital relations and child-care; disturbed sleeping and eating habits; and gastrointestinal and neuropsychiatric disorders, in addition to cardiovascular dysfunctions. More specific adverse effects can be associated with women's health, both in relation to their particular hormonal and reproductive function, and their social role.

Atkinson et al. (17) reviewed the behavioral and biological disturbances accompanied by shift work. They noted that meal frequencies were generally reduced while snacking increased during night shifts. They explained these findings by the unavailability of preferred foods at workplaces, lack of time, and reduced desire to eat at night. They added that 'normal' eating habits with the family become disrupted and the metabolic responses to food become altered by shift work.

In Turkey, Varli and Bilici (18) conducted their study to assess the nutritional status of 110 shift-working female nurses at a university hospital in Ankara, Turkey (56 nurses in the control group, and 54 nurses in the study group). Results showed that the mean daily energy intake of nurses in the study group was higher than that of the control group (1756±659 kcal and 1694±431 kcal, respectively), while the carbohydrate intake and fat intake were also higher in the study group, but the protein and iron intake were higher in the control group. The study recommended that to improve shift nurses' performance and nutritional status, it is essential to provide accessible, healthy, and quality food services.

In Poland, Nejman and Gotlib (19) conducted their cross-sectional study to assess the influence of 126 female nurses' shift work in Warsaw hospitals on their dietary habits. Participants were categorized into Group (A) which

included 87 nurses working in a 2-shift system for 12 hours, and Group (B) which included 39 nurses working in a single-shift system for 7.35 hours. The detailed analyses of participant nurses' dietary habits revealed that their everyday diet comprised several nutritional errors, but their diets were sufficient. There was a significant correlation between shift work and both regularity and variety of nurses' meals. Group B nurses ate more regularly compared with nurses in group A.

Persson and Mårtensson (20) conducted their study to describe situations with a remarkable effect on healthy diets among 27 community nurses working the night shift. They followed a qualitative descriptive design with a Critical Incident Technique. Results of 143 situations were identified and comprised 2 main areas, i.e., coping ability at work and during leisure hours. Coping ability at work showed that the nurses' diet and exercise habits were influenced by social interaction with colleagues at work. Coping ability during leisure hours showed that diet and exercise habits were influenced when the nurses recovered from the disruption to their circadian rhythm and when they took advantage of the freedom of action offered by night work. They recommended identifying factors that influence diet among nurses working the night shift.

Madide (21) conducted their cross-sectional study to evaluate the relationships between shift work, eating habits, and body mass index (BMI) among 307 Lebanese nurses. Results showed that 78.2% of participant nurses had irregular meal timing with a significant decrease in their number of completely consumed meals during the day and an increased number of snacks consumed during the night ( $p < 0.05$ ). The most frequently consumed snacks during night shifts were sweets and potato chips. Moreover, BMI and waist circumference significantly increased with nurses' duration of work ( $r=0.175$ ;  $p < 0.05$ ) and the number of night shift hours over their work experience ( $r=0.135$ ;  $p < 0.05$ ). The study concluded that night shift work is positively associated with abnormal eating patterns and BMI, but the increase in BMI was not related to nurses' eating habits.

Although most nurses are expected to have adequate knowledge regarding health education, health promotion, and healthy nutritional habits, they may not be fully aware that they are at high risk for obesity (22). Moreover, nurses may be unaware of the negative effects of shift work on their health (23). Therefore, this study is expected to help nurses understand that shift work may be negatively associated with several health concerns.

This study aimed to investigate the relationship between shift work status, eating habits, and body mass index among nurses in Abha City.

## Methods

This study followed a cross-sectional research design. The study settings consisted of all main governmental healthcare facilities in Abha City including Aseer Central Hospital, Abha Maternity and Children Hospital, Abha Mental Health Hospital, Prince Faisal bin Khalid Cardiac Center, and primary healthcare centers in the Abha sector.

This study included all nurses (i.e., males, females; Saudi and non-Saudi) at governmental healthcare facilities in Abha City, with at least one year of experience in the nursing fields.

The sample size for our study was calculated according to the formula  $(n = z^2 \cdot p \cdot q) / d^2$  (24), where (n) is the minimum sample size; (z) statistics = 1.96, assumed prevalence (p) of 50% for overweight/obesity among nurses, and an acceptable error level (d) of 5%, then the minimum sample size was calculated to be 382 participants. However, the sample size was increased to 400 to compensate for missing data. The data were collected during the period from April until May 2022.

The total number of nurses in the study setting is 1,650. Selecting participants that fulfill the necessary sample size was based on a simple random sampling technique, using the Excel program function “=RANDBETWEEN(1,1650)”. This function was applied to obtain 450 random numbers.

Eligible participants were invited via e-mail to respond to a self-administered questionnaire in English, which was generated using an online survey system (Google Form). The questionnaire consisted of an interface and three parts including sociodemographic characteristics, anthropometric measurements, and a validated food frequency questionnaire. The interface of the questionnaire explained the aim of the study and additionally assured the participants on confidentiality grounds. Informed consent for participation was obtained on the interface of the questionnaire via a statement informing the respondents that their positive response was considered informed consent. The questionnaire was filled out anonymously.

- Sociodemographic characteristics: A total of nine items related to sociodemographic factors were assessed. They included age, gender, nationality (Saudi, or non-Saudi), qualification, experience in nursing, marital status, monthly income, type of work shift, and any associated comorbidity.

- Anthropometric measurements: Body mass index (BMI), which is the ratio of weight in kilogram to height in meter square, was used to assess body mass status. Participant nurses were asked to provide their own height and weight measurements. Hence, participants' BMI was calculated according to their reported weight (in kg) and height (in meters). According to the World Health Organization (WHO), participants were classified based on their BMI as underweight (BMI < 18.5), normal (BMI = 18.5- 24.9), overweight (BMI = 25-29.9), or obese (BMI ≥ 30). (25)

- Dietary habits were assessed using The Saudi Food Frequency Questionnaire (SFFQ) (See Annex) originally developed by Gosadi et al. (26) in Arabic language. It is a semi-quantitative food frequency questionnaire suitable for the Saudi population. It has a high reliability and reasonable validity and is suitable for use in large-scale nutritional epidemiological investigations. It was developed in the Arabic language with 140 food items included, where a closed-ended approach was used. Moreover, nine answering options are present for each question as follows: never or less than a month, 1 - 3 per month, once a week, 2 - 4 per week, 5 - 6 per week, once a day, 2 - 3 per day, 4 - 5 per day, 6+ per day. Open-ended questions were added at the end of the questionnaire to collect information about other food items that may not be listed. In addition, questions regarding the type of cooking fat, visible fat consumption, consumption of salt, and vitamins were added (27).

The SFFQ questionnaire was translated to English language by a certified translation office and back-translated into Arabic by another language expert to ensure accuracy. A pilot study was conducted using the bilingual copy of the questionnaire on 20 nurses, to assess the wording as well as clarity of the study tool.

Data were collected during the period from April to May 2022. Collected data were statistically analyzed using the Statistical Package for Social Sciences (IBM SPSS, version 25). Descriptive statistics (i.e., frequency and percentage for categorical data; and mean and standard deviation for quantitative data) were calculated. Testing significance of differences was applied using the Chi-square ( $X^2$ ) test for qualitative variables and the independent samples t-test for comparing quantitative variables. P-values less than 0.05 were considered statistically significant.

The Institutional Review Board (IRB) ethical approval was obtained from the Scientific Research Committee at King Khalid University (ECM #2022-1304), (Appendix 2), as well as the General Directorate of Health in Aseer Region (Appendix 3).

## Results

A total of 450 nurses were invited to participate in the present study. However, after several communications through emails and phone calls, the researcher received only 403 responses (response rate = 89.6%).

Table (1) shows that the age of most participants (78.7%) was 30-40 years. They were mostly females (82.1%), Saudis (65%), and married (56.6%). More than half of the participants (53.1%) were Diploma-qualified, while 39.7% had BNS degrees and 7.2% had MNS degrees.

Table (2) shows that most participants were working at a hospital (67.5%). More than half of the participants (54.1%) were nurse assistants/technicians, while 39% were nursing specialists. The work experience was mainly 10-20 years (67.2%), and the monthly income of 54.6% of the studied subjects was 10,000-15,000 SR.

Figure (1) shows participants' type of work shifts during the last month. It is obvious that 47.1% of participants reported that they had rotating work shifts, while 52.9% of them reported that they had fixed day work shifts.

Table (3) and Figure (2) show that 40.0% of the studied subjects reported that they had normal body weight and 32.5% of them reported that they were overweight, while obesity and underweight were prevalent among 24.6%, and 0.3% of them respectively.

Table (4) shows that chicken kabsa was the most commonly consumed type of meat (82.6%), while sausages were the least (18.1%). Biryani or red rice was the most commonly consumed type of bread and cereals food category (93.1%), while the least was maasoub (34%). Boiled egg sandwiches were the most commonly consumed (77.9%), while chicken sandwiches were the least (34.7%). White cheese was the most commonly consumed of dairy products (72.2%), while fat-free labneh was the least consumed (26.3%). Nuts were most commonly consumed in the sweets and snacks category (75.4%), while ice cream was the least (48.9%). Red tea was the most commonly consumed drink (85.4%), while caffeine-free coffee was the least consumed (34.2%). Dates were the most commonly consumed fruits (92.6%), while dried fruits were the least (41.9%). Green salad was the most commonly consumed type of vegetable (91.3%), while mushroom was the least (30%).

Table (5) shows that participants' work shift type differed significantly according to their age groups, marital status, and qualification ( $p < 0.001$  each), with the highest frequencies of rotating work shifts among nurses who are younger, single, and BNS qualified.

Table (6) shows that participants' work shift type differed significantly according to their workplace, position, and monthly income ( $p < 0.001$ ,  $p = 0.008$ , and  $p < 0.001$ , respectively). Only those who worked at hospitals had rotating work shifts. Moreover, the highest frequencies of rotating work shifts were observed among senior nursing specialists and those with monthly incomes less than 10,000 SR.

Table (7) shows that the prevalence of obesity among participants with rotating work shifts was significantly higher than those in the fixed day work shift (31.6% and 18.3%, respectively), while the prevalence of overweight was almost equal between both groups (32.1% and 32.9%, respectively). Moreover, prevalence rates for underweight and normal weight were significantly higher among those in the fixed-day work shift group than among participants with rotating work shifts. The difference between participants' body mass index and their work shift group was statistically significant ( $p = 0.001$ ).

Table (8) shows that the means of consumed food categories were higher among participants with rotating work shifts than those with fixed days' work shifts. Significant differences were observed regarding participants' consumption of meat and fish ( $p = 0.035$ ), bread and cereals ( $p = 0.044$ ), and sandwiches and burgers ( $p = 0.039$ ).

Table 1: Participants' personal characteristics

Personal Characteristics	No.	%
<b>Age groups</b>		
• <30 years	52	12.9
• 30-40 years	317	78.7
• >40 years	34	8.4
<b>Gender</b>		
• Male	72	17.9
• Female	331	82.1
<b>Nationality</b>		
• Saudi	262	65.0
• Non-Saudi	141	35.0
<b>Marital status</b>		
• Single	151	37.5
• Married	228	56.6
• Widow/Divorced	24	6.0
<b>Qualification</b>		
• Diploma	214	53.1
• BNS	160	39.7
• MNS	29	7.2

Table 2: Participants' work characteristics

Work characteristics	No.	%
<b>Workplace</b>		
• Healthcare Center	131	32.5
• Hospital	272	67.5
<b>Position</b>		
• Midwife	10	2.5
• Nurse Assistant/Technician	218	54.1
• Nursing Specialist	157	39.0
• Senior Nursing Specialist	18	4.5
<b>Years of experience</b>		
• <10 years	125	31.0
• 10-20 years	271	67.2
• >20 years	7	1.7
<b>Monthly income</b>		
• <10,000 SR	108	26.8
• 10,000-15,000 SR	220	54.6
• >15,000 SR	75	18.6

Figure 1: Participants' type of work shift during the last month

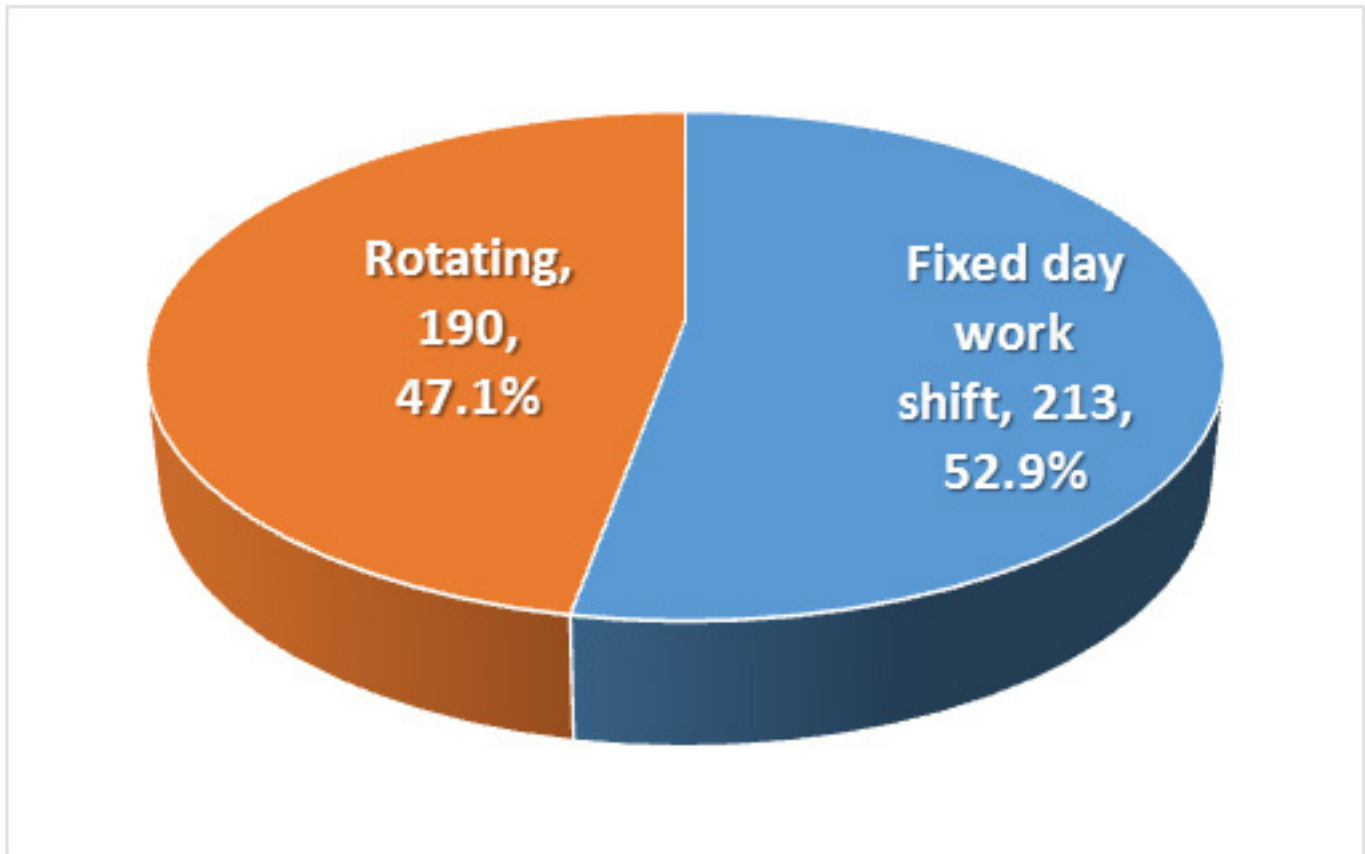


Table 3: Body mass index categories among participants

Body mass index categories	No.	%
Underweight	12	3.0
Normal weight	161	40.0
Overweight	131	32.5
Obese	99	24.6
Mean±SD	26.2±6.1 kg/m <sup>2</sup>	

Figure 2: Body mass index categories among participants

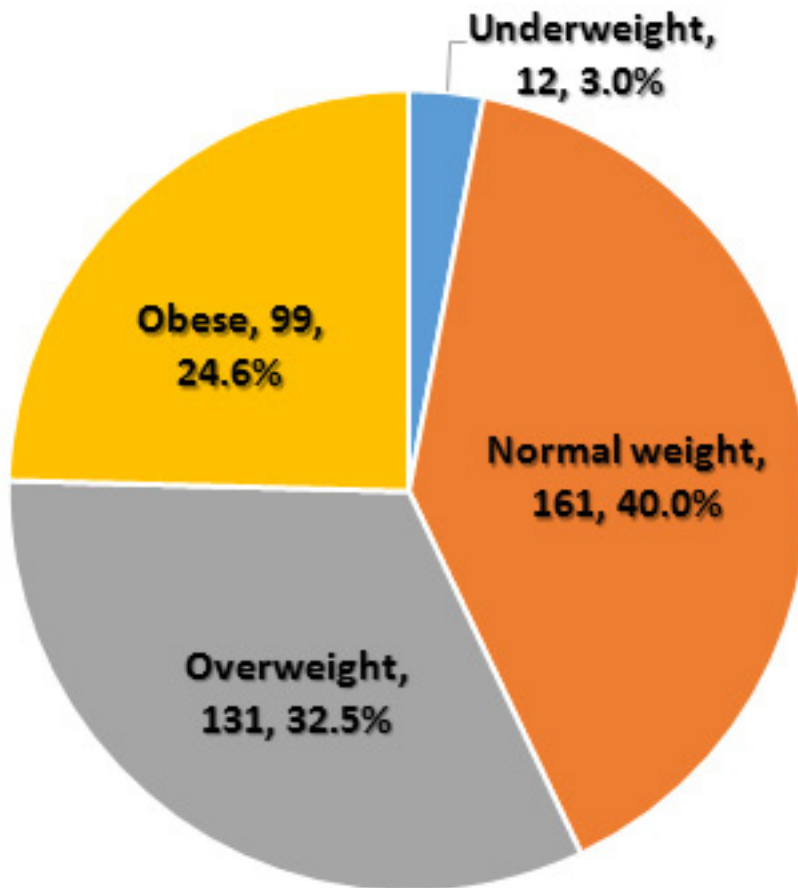


Table 4: Participants' consumptions of different food categories ‡

Food categories	Highest Consumption			Lowest Consumption		
	Food item	No.	%	Food item	No.	%
Meats	Chicken kabsa	333	82.6	Sausages	73	18.1
Bread & cereals	Biryani/red rice	375	93.1	Maasoub	137	34.0
Sandwiches	Boiled eggs	314	77.9	Chicken	140	34.7
Dairy products	White cheese	291	72.2	Fat-free labneh	106	26.3
Sweets & snacks	Nuts	304	75.4	Ice Cream	197	48.9
Drinks	Red tea	344	85.4	Caffeine-free coffee	138	34.2
Fruits	Dates	373	92.6	Dried fruits	169	41.9
Vegetables	Green salad	368	91.3	Mushroom	121	30.0

‡ Multiple food categories can be stated



Table 5: Participants' work shift type according to their personal characteristics

Personal Characteristics	Fixed Day		Rotating		$\chi^2$ Statistic	P Value
	No.	%	No.	%		
<b>Age groups</b>						
• <30 years	6	11.5	46	88.5	44.23	<0.001†
• 30-40 years	192	60.6	125	39.4		
• >40 years	15	44.1	19	55.9		
<b>Gender</b>					1.12	0.291
• Male	34	47.2	38	52.8		
• Female	179	54.1	152	45.9		
<b>Nationality</b>					0.54	0.461
• Saudi	142	54.2	120	45.8		
• Non-Saudi	71	50.4	70	49.6		
<b>Marital status</b>					19.04	<0.001†
• Single	60	39.7	91	60.3		
• Married	142	62.3	86	37.7		
• Widow/Divorced	11	45.8	13	54.2		
<b>Qualification</b>					20.86	<0.001†
• Diploma	129	60.3	85	39.7		
• BNS	63	39.4	97	60.6		
• MNS	21	72.4	8	27.6		

† Statistically significant

Table 6: Participants' work shift type according to their work characteristics

Work Characteristics	Fixed Day		Rotating		$\chi^2$ Statistic	P Value
	No.	%	No.	%		
<b>Workplace</b>					173.13	<0.001†
• Healthcare Center	131	100.0	0	0.0		
• Hospital	82	30.1	190	69.9		
<b>Position</b>					11.85	0.008†
• Midwife	6	60.0	4	40.0		
• Nurse Assistant/Technician	131	60.1	87	39.9		
• Nursing Specialist	70	44.6	87	55.4		
• Senior Nursing Specialist	6	33.3	12	66.7		
<b>Years of experience</b>					5.16	0.076
• <10 years	58	46.4	67	53.6		
• 10-20 years	153	56.5	118	43.5		
• >20 years	2	28.6	5	71.4		
<b>Monthly income</b>					21.52	<0.001†
• <10,000 SR	38	35.2	70	64.8		
• 10,000-15,000 SR	124	56.4	96	43.6		
• >15,000 SR	51	68.0	24	32.0		

† Statistically significant

**Table 7: Participants' body mass index according to their work shift type**

Body Mass Index	Fixed days' work shift (n=213)		Rotating work shift (n=190)		$\chi^2$	P value
	No.	%	No.	%		
Underweight	11	5.2	1	0.5	16.03	0.001+
Normal weight	93	43.7	68	35.8		
Overweight	70	32.9	61	32.1		
Obese	39	18.3	60	31.6		

† Statistically significant

**Table 8: Means of food categories consumed during work among participants during the last year according to their work shift type**

Food categories	Rotating work shift (n=190)		Fixed-day work shift (n=213)		t value	P Value
	Mean	SD	Mean	SD		
Meat and fish	23.9	11.7	21.8	11.3	2.42	0.035+
Bread and cereals	26.3	10.2	24.6	10.4	2.35	0.044+
Sandwiches & burgers	11.8	7.8	10.6	6.3	2.48	0.039+
Dairy and fat products	27.0	18.3	24.1	17.1	1.93	0.051
Sweets and snacks	30.6	23.1	29.6	19.3	0.85	0.330
Drinks	23.4	11.3	22.3	10.5	0.62	0.158
Fruits	26.8	18.0	24.3	16.6	1.83	0.072
Vegetables	35.4	20.9	32.7	21.7	1.76	0.097

† Statistically significant

## Discussion

Due to the various factors related to the healthcare sectors, the patterns of work of nurses are an essential point for most clinical researchers (28). Shift work is common in several professional sectors, especially hospitals (29). Therefore, the present study aimed to investigate the relationship between shift work status, eating habits, and body mass index among nurses.

Results of the present study showed that almost half of the participants (47.1%) had rotating work shifts, while 52.1% had their work shifts as fixed day shifts. Participants' work shift type differed significantly according to their age groups, marital status, and qualification, with the highest frequencies of rotating work shifts among nurses who were younger, single, BNS-qualified, senior nursing specialists, and those with monthly income less than 10,000 SR.

Similarly, the multi-national study of Camerino et al. (30) found that types of work shifts differed significantly according to nurses' characteristics (e.g., age, gender, and seniority) in different European hospitals.

These findings indicate that differences in the distribution of work shifts among nurses significantly take into account the social and personal conditions of nurses, with rotating work shifts being carried out mostly by the younger, and non-married.

Results of the present study showed that almost one-third of participants were overweight, while almost one-quarter were obese.

In agreement with the current study findings, Elabd et al. (31) reported that about one-third of healthcare workers at King Faisal Specialist Hospital and Research Centre in Riyadh, Saudi Arabia were obese. However, the high prevalence of obesity among nurses is a part of the generally high prevalence among the whole population in the Kingdom of Saudi Arabia, which recently witnessed a dramatic increase in the prevalence of obesity (32).

The high prevalence of obesity among participants in the present study may be clearly explained by the main food categories consumed by participants, with high-calorie content being the main characteristic of most consumed food categories. Chicken kabsa (which is mainly composed of rice) was the most commonly consumed type of "meat", while Biryani or red rice was the most commonly consumed type of "bread and cereals". Moreover, fat-free labneh was the least consumed among the "dairy products". In addition, nuts were most commonly consumed in the "sweets & snacks" category.

Similarly, Gosadi et al. (26) reported that most of their participants consumed a high-frequency of food items with high calorific values. They found a high frequency of chicken kabsa and white bread consumption.

The means of all consumed food categories were higher among participants with rotating work shifts than those with fixed days' work shifts. Consequently, the prevalence of obesity among participants with rotatory work shifts was statistically significantly higher than that among day work shifts.

The reason why nurses with rotating work shifts consumed more food categories than those with fixed days' work shifts may be attributed to the fact that the hospital workload during evening and night shifts is usually less than that during the day (21). Therefore, nurses during their rotating work shifts may have more free time to eat and have several snacks.

Allan et al. (33) argued that, given the high prevalence of obesity and overweight among the nursing population, there has been increased interest in the development and implementation of weight management interventions for nurses. Since most nurses are active enough on work days, it is suggested that any workplace-based weight interventions aimed at nurses may be better focused on reducing their dietary intake than on increasing their activity levels while on shift. It is possible that nurses are more likely to engage in unhealthy behaviors during the hours of their shifts than during the fixed day work shift. Therefore, it is essential for the development and appropriate targeting of weight-management interventions for nurses that future research pinpoints when, where, and why nurses are most likely to consume unhealthy foods or be inactive.

Atkinson et al. (17) argued that during shift work, meal frequency may be generally reduced, but snacking usually increases during night shifts. The commonly unavailable preferred foods in the workplace, a lack of time, and a reduced desire to eat during the night may explain these findings. 'Normal' eating habits with the family are also disrupted. Moreover, the metabolic responses to food become frequently altered by shift work-mediated disruptions to sleep and circadian rhythms. Whether any interactions in human metabolism exist between the timing or content of food intake and physical activity during shift work is still not known.

Samhat et al. (29) added that weight gain associated with night shift work may be the result of an excess calorie intake and a lack of physical activity during the night. Their study has shown that night work leads to a perturbation of eating habits and to an increase in BMI, which can lead to overweight and obesity due to night shift nurses having irregular meal timing, snacking more, and having some preference for high fat and high sugar foods. Power et al. (34) explained that nurses may be particularly likely to eat unhealthy convenience foods during their shift work, especially during busy or stressful shifts.

In conclusion, prevalence rates of obesity and overweight are high among nurses. Rotating work shift nurses have poor eating habits, which might lead to an imbalance in their diet. They consumed more food categories with high-

energy values than those with fixed day shifts. Moreover, rotating work shift nurses tend to consume more snacks than complete meals.

It is recommended that interventions such as educational programs should be provided at nurses' workplaces for weight control and stress management to reduce their caloric intake during their work shifts. Nurses are frequently at risk of eating unhealthy convenient foods during their shift work, especially during their busy or stressful shifts. Future studies should investigate the patterns of nurses' activities during their shift work and over multiple days to determine when and where nurses are most likely to be inactive. Moreover, it can be suggested to carry out more advanced prospective research in order to better understand the factors affecting overweight and obesity among rotating work shifts. It is also suggested that the hospital management could arrange healthy balanced food deliveries for night shift workers from a commercial supplier, to be delivered late on the day so the food would be fresh and nurses could be given menu choices.

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