Relationship between Night shift work, Eating Habits and the Risk of Obesity among Nurses in Lebanon

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Abstract

Background The objective of this cross-sectional study was to evaluate the relationships between night shift work, eating habits and the risk of obesity among Lebanese nurses.

Methods A total of 307 nurses were randomly selected from five hospitals localized in Beirut. Data about demographic and professional characteristics, anthropometric measures, dietary habits and intakes were collected through a validated questionnaire. To study the relation between night shift works, eating habits and the risk of obesity, chi-square test, t-test and logistic regressions were used.

Results The majority of nurses (78.2%) had irregular meals timing with a significant decrease in the number of complete meals consumed during the day and an increase in the number of snacks consumed during night (p<0.05). The most consumed snacks during night were sweets and potato chips. The findings highlighted that Body Mass Index and waist circumference significantly increased with the number of years of work (r=0.175; p<0.05) and the cumulative number of night shifts hours over the entire work history (r=0.135/p<0.05).

Conclusion Night shift work contributes to abnormal eating patterns and increases the risk of obesity among Lebanese nurses. However the risk of obesity is not related to eating habits.

1. Introduction

Night shift work is frequent in some professional sectors such as in hospital, retail business, and transport. According to the Lebanese labour code, night shift work is defined as any job performed between 8 pm and 5 am from May 1st to September 30th and between 7 pm and 6 am from October 1st to April 30th, at least two times per week [1]. Night shift work disrupts biological rhythms, mainly sleep and eating patterns [2] and may
negatively affect health [3, 4]. Several studies have confirmed that night shift work is associated with an increase in Body Mass Index (BMI) and can lead to overweight and obesity [5, 6, 7, 8, 9, 10]. Cumulative night shift work is strongly related to an increase in Body Mass Index (BMI), waist circumference (WC) [11, 12, 13], hip circumference and waist to hip ratio [14]. In fact, weight gain associated with night shift work is probably the consequence of an excess of calorie intake and a lack of physical activity during night [15]. For example, night shift nurses have irregular meals timing, snack more, have some preference for high fat and high sugar foods and do not practice any physical activities [16, 17, 9, 18]. The frequent consumption of high sugar and high fat foods and the lack of physical activity associated night shift work can lead to an accumulation of subcutaneous fat [15, 19] with subsequent increase in body weight among night shift nurses [20, 18]. To our knowledge, no studies have yet been published and/or carried out on night shift work and its effect on eating habits among nurses in Lebanon. Therefore, this study allowed us to add some values to the scientific literature by evaluating, on one hand, the impact of night shift work on the diet of Lebanese nurses and on the other hand, to determine if there is a possible relationship between their diet and the risk of obesity.

2. Methods

2.1. Participants selection and recruitment

This cross-sectional study was performed between January and June 2017. Initially, a total of 334 nurses were recruited for interviews using a questionnaire. Participants were males and females, aged 24–45 years, with at least two years experiences and without any health problems. They were randomly selected from five hospitals in Beirut, with 67 nurses per hospital. Twenty-seven nurses declined to participate because they did not have enough time to fill the questionnaire. Thus the final number of participants was 307 nurses. A written informed consent was obtained from the participants prior to their
participation. For confidentiality reasons study participants have been anonymised.

2.2. Data collection

A total of 307 individual interviews were conducted using a pre-tested, face-to-face questionnaire adapted from two validated questionnaires including the Standard Shiftwork Index questionnaire [21] and the EPIC-Norfolk Food Frequency Questionnaire (FFQ) [22]. The questionnaire consists of thirty five questions divided into four sections: (1) personal information (age, sex, number of years of experience, number of night shift hours per month, level of physical activity, sleeping hours per day, smoking, alcoholism), (2) anthropometric measures (weight, height, BMI, waist circumference), (3) eating habits (number and type of meals and snacks, meal times, type of meal omitted), and (4) Dietary intakes estimated by a FFQ consisting of seven food groups (starch, fruits, vegetables, milk and dairy products, meat, fat, sweets) and five beverage items (caffeinated drinks, fresh juices, commercial juices, soda and energy drinks). The categories of frequency of use were: never or rarely, once per day, two to three times per day, four to five times per day, six and more times per day [22]. The frequencies used to measure the daily intake of each food and beverage portion were: never or rarely = 0, once per day = 1, two to 3 times per day = 2,5, four to five times per day = 4,5 and six and more times per day = 6. The frequencies of daily consumption were compared to the recommended frequencies set by the Lebanese Food pyramid guideline [23]. The frequencies of daily intakes considered adequate for the Lebanese population are six servings and more for starch, 2 servings for fruits, 2–3 servings for vegetable, 2–3 serving for fat, 3 servings for milk and dairy products, 5–6 servings for meat, 3–4 cups for caffeinated drinks and never or rarely for sweets, fresh juices, commercial juices, sodas and energy drinks [23]. The degree of exposure to night shift work was determined by the number of years of experience as a night shift worker and the number of night shift hours
over the entire work history. BMI and waist circumference were considered as the indicators of the risk of obesity. A BMI > 25 kg/m² and a WC > 88 cm in women and >102 cm in men were considered as abnormal results [24]. The level of physical activity was evaluated as follows: “inactive” for those who do not practice any physical activity, “moderately active” for those who practice at least two times per week and “very active” for those who practice for more than three times per week.

2.3. Statistical analysis

The data obtained were analyzed using the SPSS 22 statistical package. Chi-square test, Odds Ratio and logistic regressions were used to determine the relationships between night work, eating habits and the risk of metabolic syndrome. T-test was used to compare the daily average consumption of the different food groups and beverage items with the daily average consumption of the same foods and beverages as recommended by the Lebanese food pyramid guideline. The threshold of significance was set at $p < 0.05$.

3. Results

The demographic, occupational and behavioral characteristics of the participants are presented in Table 1.

**Table 1:** Demographic, occupational and behavioral characteristics of the participant
| Characteristics | Participants (n=307) |
|-----------------|---------------------|
|                 | n (%)               | mean (SD)       |
| **Gender**      |                     |                 |
| Male            | 206                 |                 |
| Female          | 101 (32, 9)         |                 |
| **Mean age (years)** |                 | 31.18 (6.67) |
| **Working experience experience** | Mean number of night shift/month | 9.13 (6.06) / 12, 61 (3,797) |
| **Physical activity** |                 |                 |
| Inactive        | 258 (84%)           |                 |
| (4, 6%)         | 35 (11, 4%)         |                 |
| Very active     |                     |                 |
| Moderately active |                 |                 |
| **Smoking**     |                     |                 |
| Yes             | 128 (41, 7 %)       | No              |
| No              |                     |                 |

About 78.2% of nurses had an irregularity in meals timing which contributed to a significant decrease in the number of complete meals consumed during the day after a night shift work (\( p = 0.000 < 0.05 \)), and to an increase in the number of snacks consumed during night at work (\( p = 0.015 < 0.05 \)). Our findings highlighted that the most consumed snacks during night were sweets for 50% of nurses, potato chips for 34.4 %, fruits for 11.82% and baked goods for 3.76%. While the daily intake of fruits (\( t = 25,244 / p < 0.05 \)) and vegetables (\( t = 24,285 / p < 0.05 \)) was significantly lower than the daily recommended amounts set by the Lebanese Food pyramid guideline, the intake of fats, sweets, commercial juices, sodas and energy drinks was significantly higher (\( p = 0.000 < 0.05 \)) (Table 2). Of those who reported drinking excess caffeinated drinks overnight, 60.9% did so in order to stay awake. In addition, our results showed that 45.3% of nurses brought with them homemade dishes for dinner while only 29.6% preferred to consume fast food.

**Table 2:** Daily mean frequencies of consumption of the different group of foods and beverages of the study population compared to the recommendation set by the Lebanese food guide pyramid
Of the total of 307 nurses, 84% did not practice any physical activity (Table 1) and 56% gained weight since the beginning of work. Our results showed that 50.8% of nurses had a BMI > 25 kg/m² (table 3).

**Table 3:** Means (SD) of anthropometric measures and prevalence of overweight/obesity in the study population

| Participant (n=307) | Daily Recommended value | mean | t  | p  |
|---------------------|-------------------------|------|----|----|
| Starch              | 6                       | 5.83 | 1.623 | 0.106 |
| Fruits              | 3                       | 1.15 | 25.24 | 0.000 |
| Vegetables          | 3                       | 1.25 | 24.285 | 0.000 |
| Milk and milk products | 3                   | 0.95 | 36.359 | 0.000 |
| Meat and meat products | 5                     | 3.62 | 19.195 | 0.000 |
| Fats                | 3                       | 4.96 | 31.008 | 0.000 |
| Desserts            | 0                       | 1.76 | 16.751 | 0.000 |
| Caffeinated beverages | 4                     | 2.36 | 13.294 | 0.000 |
| Commercial juices   | 0                       | 0.52 | 9.244  | 0.000 |
| Sodas and energy drinks | 0                    | 1    | 10.932 | 0.000 |
| Participants (N=307) | |
|----------------------|------------------|
| **n(%)** | mean (SD) |
| **BMI (kg/m²)** | 25,53 (4,83) |
| Normal weight (BMI< 24, 9 Kg/m²) | 151(49,2) |
| Overweight (25 <BMI< 29, 9 Kg/m²) | 97(31,6) |
| Obese (BMI≥30 Kg/m²) | 59(19,2) |

| WC (cm) | Women | |
|------------------|------------------|------------------|
| Normal (≤ 88 cm) | 86,23 (2,97) | 128 (62,1%) |
| Overweight (≥ 88 cm) | 78 (37,9%) | 99,31 (3,56) |
| Normal (≤ 102 cm) | 60 (59,4%) | 41 (40,6%) |

BMI and WC in both women and men increased proportionally with the number of years of experience and the cumulative number of night shift hours over the entire work history (p <0.05) (table 4). However, no significant relationships were found between BMI / WC and the level of physical activity (p = 0.729 / p = 0.218), the number of meals consumed during the day (p = 0.476 / p = 0.572), the irregularity in meals timing (p = 0.684 / p = 0.816), the number of snacks (p = 0.615 / p = 0.256) and type of snacks (P = 0, 794 / p = 0.924) consumed during night.

**Table 4:** Association between night shift work characteristics and anthropometric measure in the study population

| Night shift work characteristics (Men) | coefficient of correlation (r) (p value) |
|---------------------------------------|----------------------------------------|
| BMI | WC (Women) | WC |
| Number of year of experience | 0,175(0,002) | 0,346(0,000) | 0,178 (0,045) |
| Cumulative number of night shift hours over the entire work history | 0,135(0.018) | 0,284 (0,000) | 0,250 (0,012) |
4. Discussion

This cross-sectional study aimed to evaluate the relationship between night shift work, eating habits and the risk of obesity among nurses in Beirut. The findings indicated that night shift work affects eating habits among Lebanese nurses. Similar to other authors [25, 16, 26, 2], our results revealed that irregularity in meal timing, excessive snacking during night and consumption of high-fat and high sugar foods were common among night shift nurses. We found that night shift nurses tended to consume less complete meals during the day but more snacks during night. The findings showed that 45.3% of the participants were bringing homemade dishes for dinner, while only 29.6% consumed fast food. However, according to a study performed on 395 nurses in Saudi Arabia [27], night shift nurses consumed mostly fast food. In addition, our results identified that 60.6% of nurses consumed caffeinated drinks during night in order to stay awake (p <0.05). Reeves et al, [19] in their study reported similar results. They confirmed that night shift nurses tended to consume more stimulants such as alcohol, coffee, and tobacco to be more active during night. However, when it comes to smoking and alcohol consumption our findings showed that night shift work is not the main reason for which some nurses smoke or drink alcohol. In fact, on a total of 307, 128 (41.7%) nurses had started smoking long before they were hired and those who drank alcohol did so only occasionally. Furthermore, our results revealed that the study population consumed less fruits, vegetables and more fat, sweets, commercial juices, sodas and energy drinks(p <0.05) than the recommended daily amount set by the Lebanese food pyramid guideline [23]. Night shift work leads to an unbalanced diet and reduce the level of physical activity among night shift nurses. Indeed, Persson and Martensson [18], in their study reported that night shift nurses do not perform any physical activity even when they have time to do so because of the fatigue associated with their work. According to our findings, taken into consideration the age and
gender of the study population, BMI and WC tended to increase with the number of years of work and the cumulative night shift hours over the entire work history (p <0.05). Several studies showed similar results and confirmed that night shift work contributes to an increase in BMI and WC [14]. In this study, our findings have shown that night work leads to a perturbation of eating habits and can increase the risk of obesity. However, unlike previous researches [15, 14, 18, 19, 28], our results highlighted that the risk of obesity associated with night shift work was not related to the eating habits of nurses. Nutritional interventions would certainly prevent and/or reduce the physical symptoms associated with night shift work. It is important to develop and implement strategies that will allow nurses and all night shift workers to adopt a more structured and balanced diet.

5. Study Limitations

The sample size representative of the general population for this study was to be recruited from all hospitals localized in Beirut. Some hospitals refused to collaborate for administrative reasons and others were excluded from our study because they had a limited number of nurses. Thus only five hospitals were retained. However these five participating hospitals are among the largest hospitals in Beirut and include a significant number of nurses, so our sample size was not significantly affected.

6. Conclusion

This study showed that night shift nurses have poor eating habits which lead to an imbalance in their diet. They consume more foods with high energy values but fewer fruits and vegetables. In addition, they tend to consume more snacks than complete meals and do not practice any physical activity. However, weight gain and increased BMI and waist circumference observed among night shift nurses is not due to their eating habits. It seems appropriate to carry out more advanced research in order to better understand the
process by which night work leads to weight gain and to an increase in the risk of obesity.

List Of Abbreviations

BMI: Body Mass Index
WC: waist circumference
FFQ: Food Frequency Questionnaire

Declarations

Ethic approval
This research project was evaluated and approved by the ethics and research committee of the Holy Spirit University of Kaslik (USEK) and each of the five participating hospitals in order to conduct this study in the best conditions and to have access to the sample of the study.

Availability of data and materials
Data will not be shared. For having this data, please contact ZS at zeinabsamhat@hotmail.com

Competing interests
All authors declare that they have no competing interests.

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Author contributions
ZS, RA and YS contributed to the conception, design, data collection, statistical analysis, data interpretation, manuscript drafting, and approval of the final version of the manuscript and agreed for all aspects of the work.

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Disclosure

All authors have read and approved the final article.

References

[1] Organisation Internationale du Travail (OIT) : Liban- Code du travail. http://www.ilo.org/dyn/natlex/docs/WEBTEXT/39255/64942/F93LBN01.htm (1996). Accessed 12 Feb 2017

[2] De Assis M AA, Nahas M V, Bellisle F, Kupek E. Meals, snacks and food choices in Brazilian shift workers with high energy expenditure. Journal of Human Nutrition and Dietetics. 2003 ;16 (4) : 283-289 ;doi: 10.1046/j.1365-277X.2003.00448.x

[3] Ntawuruhunga E, Chouanière D, Danuser B, Praz-Christinaz S M. Effets du travail de nuit sur la santé. Revue Médicale Suisse. 2008; 4:2581–2585.

[4] Von Treuer K, Fuller-Tyszkiewicz M, Little G. The impact of shift work and organizational work climate on health outcomes in nurses. Journal of occupational health psychology. 2014; 19(4): 453-461; Doi: 10.1037/a0037680.

[5] Macagnan J, Pattussi M P, Canuto R, Henn R L, Fassa A G, Olinto M T. Impact of nightshift work on overweight and abdominal obesity among workers of a poultry processing plant in southern Brazil. Chronobiology international. 2012; 29 (3): 336-343; Doi: 10.3109/07420528.2011.653851.

[6] Proper K, Van De Langenberg D, Rodenburg W, Vermeulen R, Van Der Beek A, VanSteeg H, Van Kerkhof L. The relationship between shift work and metabolic risk factors: A systematic review of longitudinal studies. American Journal of Preventive Medicine. 2016; 50 (5): 147-157; Doi: 10.1016/j.amepre.2015.11.013.
[7] Di Lorenzo L, De Pergola G, Zocchetti C, L’Abbate N, Basso A, Pannacciulli N, Cignarelli M, Giorgino R, Soleo L. Effect of shift work on body mass index: results of a study performed in 319 glucose-tolerant men working in a Southern Italian industry. International Journal of Obesity. 2003; 27 (11):1353–1358; doi: 10.1038/sj.ijo.0802419.

[8] Zhao I, Turner C. The impact of shift work on people’s daily health habits and adverse health outcomes. Australia Journal of Advanced Nursing. 2008; 25(3): 8–22.

[9] Griep R H, Bastos L S, Fonseca M J M, Silva-Costa A, Portela L F, Toivanen S, Rotenberg L. Years worked at night and body mass index among registered nurses from eighteen public hospitals in Rio de Janeiro, Brazil. BMC health services research. 2014; 14(1): 63; Doi: 10.1186/s12913–014–0603–4.

[10] Kim M, Son K, Park H, Choi D, Yoon C, Lee H, Cho E, Cho M. Association between shift work and obesity among female nurses: Korean Nurses’ Survey. BMC public Health. 2013; 13 (1): 1204; Doi: 10.1186/1471-

[11] Lee G, Kim K, Kim S, Kim J, Suh C, Son B, Lee C. Choi, J. Effects of shift work on abdominal obesity among 20–39-year-old female nurses: a 5-year retrospective longitudinal study. Annals of Occupational and Environmental Medicine. 2016; 28 (1): 69; Doi: 10.1186/s40557-016-0148-6.

[12] Buchvold H V, Pallesen S, Øyane N M F, Bjorvatn B. Associations between night work and BMI, alcohol, smoking, caffeine and exercise—a cross-sectional study. BMC public health. 2015; 15: 1112; doi: 10.1186/s12889–015–2470–2.

[13] Smith P, Fritschi L, Reid A, Mustard C. The relationship between shift work and body mass index among Canadian nurses. Applied Nursing Research. 2013; 26 (1): 24–31; Doi: 10.1016/j.apnr.2012.10.001.

[14] Peplonska B, Bukowska A, Sobala W. Association of Rotating Night Shift Work with BMI and Abdominal Obesity among Nurses and Midwives. PLoS ONE. 2015; 10 (7): 1–14; DOI:
10.1371/journal.pone.0133761.

[15] Geliebter A, Gluck M, Tanowitz M, Aronoff N, Zammit G. Work-shift period and weight change: Applied nutritional investigation. Nutrition. 2000; 16 (1): 27–29; doi: 10.1016/S0899–9007(99)00228–2

[16] Délèze C, Trummer T. Les influences du travail de nuit sur la qualité de vie des infirmières. Thèse pour l’obtention du diplôme Bachelor of Sciences HES-SO en soins infirmiers, HES-SO Valais.2010.

[17] Freitas E, Canuto R, Henn R L, Olinto B A, Macagnan J B A, Pattussi M P, Busnello F M, Olinto M T A. Alteration in eating habits among shift workers of a poultry processing plant in southern Brazil. Ciência&SaúdeColetiva. 2015; 20(8): 2401; DOI: 10.1590/1413–81232015208.18642014.

[18] Persson M, Martensson J. Situations influencing habits in diet and exercise among nurses working night shift. Journal of Nursing Management. 2006; 14 (5): 414–423; Doi: 10.1111/j.1365–2934.2006.00601.x.

[19] Reeves S, Newling-Ward E, Gissane C. The effect of shift-work on food intake and eating habits. Nutrition & Food Science. 2004; 34 (5): 216—221; Doi: 10.1108/00346650410560398.

[20] Ulhôa M A, Marqueze E C, Burgos L G A, Moreno C R C. Shift Work and Endocrine Disorders. International Journal of Endocrinology. 2015: 1–11; DOI: 10.1155/2015/826249.

[21] Barton J, Spelten E, Totterdell P, Smith L, Folkard S, Costa G. The Standard Shiftwork Index: a battery of questionnaires for assessing shiftwork-related problems. Work and stress. 1995; 9 (1): 4–30.

[22] University of Cambridge. EPIC-Norfolk Food Frequency Questionnaire and FETA Software. http://www.srl.cam.ac.uk/epic/epicffq/. (2003). Accessed 6 April 2017.

[23] American University of Beirut (AUB). The Lebanese cedar food guide.
https://www.aub.edu.lb/fafs/nfsc/Documents/LR-e-FBDG-EN-III.pdf. (2013). Accessed 7 April 2017.

[24] World Health Organization (WHO). Obesity and overweight.
http://www.who.int/mediacentre/factsheets/fs311/en/. (2016). Accessed 14 Feb 2017

[25] Rohmer O, Bonnefond A, Muzet A, Tassi P. Etude du rythme veille/sommeil, de l’activité motrice générale et du comportement alimentaire de travailleurs postés obèses: l’exemple des infirmières. Le travail humain. 2004; 67 (4):359—376.

[26] Cain S, Filtness A, Phillips C, Anderson C. Enhanced preference for high-fat foods following a simulated night shift. Scandinavian journal of work, environment & health. 2015; 41 (3): 288—293; doi: 10.5271/sjweh.3486

[27] Almajwal A. Stress, shift duty, and eating behavior among nurses in Central Saudi Arabia. Saudi Medical Journal. 2016;37(2): 191-198; Doi: 10.15537/smj.2016.2.13060.

[28] Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. PLoS Med.2004; 1 (3): 62.