Senses Sci (Educ Sci Tech) 2021: 8 (2)1304-1323
doi: 10.14616/sands-2021-2-13041323

Article

A Systematic Review of nurses' eating habits on duty for a healthy workplace

Francesco De Lucia[1], Rosario Cocchiara[1], Giuseppe La Torre[1]

[1]Department of Public Health and Infectious Diseases, Sapienza University of Rome, Rome, Italy

*Correspondence: Francesco De Lucia, Dipartimento di Sanità Pubblica e Malattie Infettive, Sapienza Università di Roma Piazzale Aldo Moro 5 - 00185 Roma. E-mail: francescodelucia1987@gmail.com

Abstract

Background: Nurses are very exposed to not following a healthy diet at work. Their work-shift, stressful situations and wrong snacks during worktime may lead, easily, to overweight and obesity, major risk of disease and reduced productivity. Anyway, the workplace is the right place to start taking care of nurse's health and eating habits. *Objectives*: Aim of this study was to investigate the current evidence from scientific literature about the eating habits of hospital nurses, the modality for the developing of a healthy workplace, identifying barriers and facilitators to healthy eating for nurses on duty. *Materials and methods*: A systematic review of the scientific literature of the last 5 years, has been conducted in March 2020 through Medline (PubMed), Scopus, Web of Science (WOS) and Cinahl databases, in accordance with the criteria of PRISMA Statement guideline (Preferred Reporting Items for Systematic reviews and Meta-Analyses). The included studies are related to "hospital nurse's eating habits". *Results*: 21 articles are included. 17 are quantitative study (14 are cross-sectional, 1 cohort, 1 descriptive-correlational and 1 systematic review,) and 4 are qualitative study. *Conclusions:* The evidence from this Systematic Review has provided enough information to have a picture on the nurses' eating habits at work and to begin improving the workplace. Longitudinal studies with reproducible methodologies should be undertaken to achieve stronger results.

Keywords: eating habits, hospital nurses, diet, nurse on duty, workplace.

Background

Nurses constitute the largest group of healthcare professionals in most countries (1) and their health status has gained more attention in recent years (2): nurses face growing healthcare demands from an ageing population and an increasing burden of non-communicable diseases, so it needs a healthy lifestyle and diet to respond effectively to that task (2).

Nurses' increasing prevalence of overweight and obesity may depend by workplace conditions (2, 3). Nurses' work is often unpredictable and highly time sensitive, altering their eating practices to meet their work demands, which resulted in inappropriate dietary intakes, altered nutritional status and eating behaviours (4,5,6). Time constraint and urgent tasks pending are the reasons to buy fast foods which are unhealthy and lead to overweight (4).

As WHO reminds us, in a Technical Report Series in 2003, poor diet quality has considerable effects on the economy and health; poor diet quality has been linked to obesity, diabetes, cardiovascular diseases, osteoporosis, dental diseases and cancer (7).

Moreover, health problems associated with overweight or obesity such as cardiovascular disease, obesity, type II diabetes and dyslipidaemia caused an increase nurses' sick leave or their premature workforce exit. Poor health and lifestyle behaviour exhibited by nurses influenced their nursing performance and weaken nurse's health-promotion messages (4,5).

Given the nature of their profession, nurses should be viewed by the public as healthy role models, but their work increases stress by reducing opportunities to take part in social and family activities and causing health problems: shift work leads to health problems by causing behavioural changes, such as smoking, drinking and irregular meal patterns (5). Shift work is not in line with normal circadian rhythms and it troubles the normal sleep/wake cycle (8,9): shift work refers to all types of work done after normal daytime working hours (from 6a.m. to 7p.m.); evening shifts, night shifts, early morning shifts, and rotating shifts all fall into this category (8).

Health problems include sleep disorders like insomnia, digestive disorders, including loss of appetite and indigestion, damages caused by sleepiness and fatigue at work, cardiovascular diseases like stroke and myocardial infarction, breast cancer and musculoskeletal and needle stick injuries (5,8,10,11).

Although studies have found that periodic breaks can enhance short-term performance and reduce fatigue and physical discomfort, Jung HS and Lee B's study shows how more than one third of nurses rarely or never take meal breaks during their shifts. As a result, many nurses do not maintain a regular eating schedule and often rely on high-fat, sugary foods rather than consuming the recommended amounts of fruits and vegetables each day. These practices are contrary to what is considered healthy (10).

On the other hand, while nursing may appear to be physically demanding, the occupational physical activity levels of nurses providing patient care are largely low intensity (5).

Nowadays, research regarding workplace factors that contribute to health promoting behaviours in nurses are still limited, and it is not enough examined whether unfavourable schedules may

contribute to nurses' own participation in health-promoting behaviours (5). Literature which addresses barriers and facilitators to healthy eating should be improved and synthesized (2).

Aim

The aim of this study is to identify, through a systematic review of the literature, the current knowledge about the eating habits of nursing staff and diet-related health conditions on duty.

Objectives

The objective of the study is a systematic review of literature related to nurses' eating habits at work.

Materials and methods

During March 2020, a systematic review of the scientific literature was conducted according to PRISMA statement guideline (Preferred Reporting Items for Systematic reviews and Meta-Analyses) (12) to identify the eating habits of hospital nurses on duty (Figure 1).

The MEDLINE (PubMed), CINAHL, Web of Science (WOS) and SCOPUS databases have been used to search the articles. The string used in the databases is as follows:

"hospital nurses AND (eating habits OR nutrition OR diet) AND (at work OR on duty)".

The articles found are 1248, respectively 1093 in MEDLINE (PubMed), 39 in CINAHL, 116 in Web of Science (WOS), but the string had not result in SCOPUS. Of these articles have been discarded those who were more than 5 years old and not published in English, obtaining 504, of which 425 with MEDLINE (PubMed), 20 with CINAHL and 59 with WOS.

The remained articles have been screened by eliminating 40 duplicates and checking whether full-text and nursing work environments topic were available.

Inclusion criteria are:

- participants were nurses who were working in any country and work setting,
- threats and opportunities to healthy eating in the workplace,
- quantitative and qualitative studies with any type of design.

Therefore, 31 articles which are found to be eligible according to these criteria, but 10 of these have been discarded because they were not properly related to the healthy eating in the workplace.

Quality appraisal

Included studies have been evaluated using three quality scores (Table 1). Newcastle-Ottawa Scale (13) to assess the reliability of cross-sectional and observational studies, rating studies to a maximum score of 10. Qualitative studies have been assessed using the Critical Appraisal Skills Programme (CASP) (14) with 9 Yes/can't tell/ No question appraisal tool. Finally, we have used the AMSTAR scale (Assessing the Methodological Quality of Systematic Reviews) (15) to evaluate the systematic review.

Figure 1. PRISMA Statement 2009 (12). Flowchart of studies

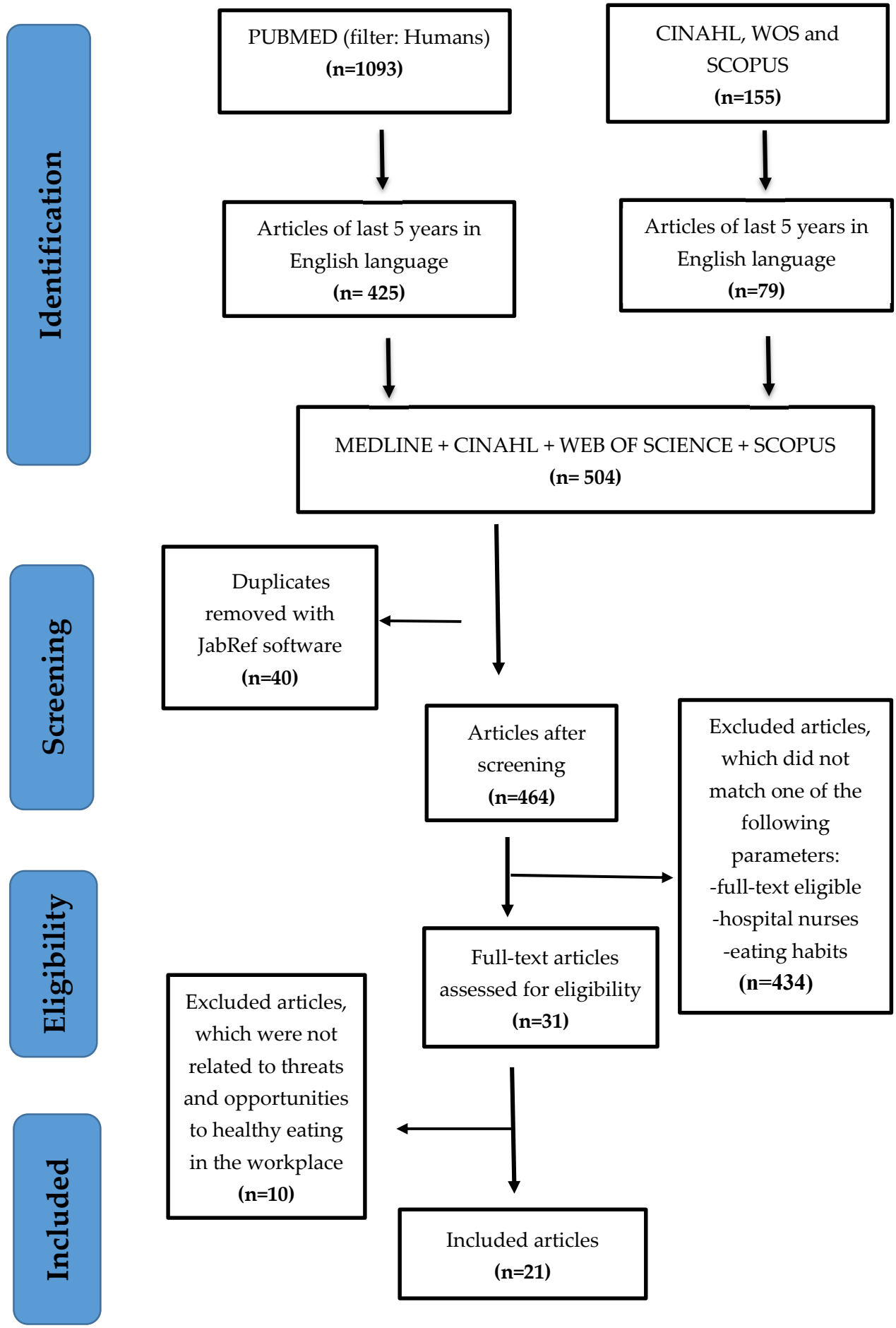

Table 1. Summary of the characteristics of the selected studies

Cross-sectional studies

Del Carmen Perez-Fuentes M 2019 (18)	**Beebe D 2017 (7)**	**Almajwal AM 2016 (19)**	**First author year (bibl.)**
Andalusia, Spain	2 midwestern community hospital in Saint Louis	2 major hospitals in Riyadh Saudi Arabia	**Setting & country**
A sample of 1073 nurses	Data on nurses (n = 103) working either a day or night shift from two Midwestern hospitals were obtained from	A sample of 395 non-Saudi female nurses	**Sample**
Rosenberg General Self-Esteem Scale, Pittsburgh Sleep Quality Index (PSQI), and Three-Factor Eating Questionnaire-R18	Diet History Questionnaire and Pittsburgh Sleep Quality Index from August 2015 to February 2016	Questionnaire completed from November 2013 to January 2014	**Data collection method**
Poor sleep quality lowered self-esteem through emotional eating and emotional eating facilitated uncontrolled eating, this relationship had no significant effect on self-esteem. This study suggests that hospital management should implement employee health awareness programs on the	There were not statistically significant differences between nurses working day or night shift and sleep quality (P = 0.0684), as well as diet quality (P = 0.6499). There was a significant difference between both body mass index (P = 0.0014) and exercise (P=0.0020) about diet	For all eating styles, stress, and shift duty influenced the amount of food consumed, but was more significant under a restrained eating style. Under this eating style, a significantly higher percentage of nurses reported eating more fast food, snacks, and binging, while fruits and vegetables were the least likely to be eaten under stress. High stressed nurses were more likely to present with abnormal restrained eating, emotional and external	**Results**
7/8	6/8	7/8	**Quality appraisal***

Panczyk M 2017 (5)	Nejman M 2017 (2)	Hong HS 2019 (8)	Han K 2015 (4)	Fradkin L 2019 (21)	Fang L 2018 (25)	First author year (bibl.)
Centre for Postgraduate	Teaching Hospitals in	Malaysia	University hospital in	Tel Aviv medical Center, in Tel Aviv,	Hospital in south Taiwan	**Setting & country**
1107 nurses had followed a specialty training programme. Data	A total of 126 nurses (women: 100% of all)	280 nurses	340 hospital nurses	132 female RNs who work rotating shifts in surgical or internal medicine	237 registered nurses recruited by stratified random sampling	**Sample**
Positive Health Behaviours Scale (PHBS)	A questionnaire and a method for assessing a periodic diet	Malay version of Dutch Eating Behaviours questionnaire	Survey in May 2012	Food diaries were analysed on Tzameret Nutrition Analysis Software	Questionnaire which included personal background, ERI scale, Social Support Scale	**Data collection method**
Most of the nurses (65-82%) abstained from health-risk behaviours. Shift work had a statistically significant negative impact in nutrition (β=-	A detailed analysis of diets of the study group of nurses demonstrated that their everyday diet contained a series of nutrition errors.	Results showed that 68.5% of the nurses were either overweight (37.1%) or obese (31.4%). This research showed that there was no association between emotional andexternaleating	Nurses with rotating night shift schedules were more often underweight than nurses without night shifts and had more unhealthy dietary	Compared to dietary intake on a day the nurse worked the day shift, intake of the following nutrients increased significantly on the day she worked the night shift: energy;	this study showed that regular exercise frequency lower than or equal to 2 days a week, rotating nights shifts greater than or equal to 4 times a month, nursing working hours higher than 44 hours a week,	**Results**
8/8	5/8	8/8	8/8	6/8	8/8	**Quality appraisal***

First author year (bibl.)	Yoshizaki T 2016 (20)	Seychell J 2016 (1)	Ross A 2018 (23)
Setting & country	General Hospital in the centre of Ome City, western side of Tokyo (Japan)	Accident and Emergency Department of the main general	NIH Clinical Centre, Maryland (USA)
Sample	162 Japanese female nurses were studied (39day workers and 123 rotating shift workers, aged 21–63years) in September 2012 within 2 weeks	123 nurses were recruited and 110 completed the study.	335 RNs
Data collection method	Morningness/eveningness score (ME)	Questionnaire to investigate shift work, lifestyle, anthropometric measurements, and a food frequency questionnaire (FFQ); the EPIC-Norfolk FFQ adapted to reflect the	Survey based on Nurses' Worklife and Health Study, Professional quality of life (ProQOL). 4-item International Physical Activity Questionnaire (short form) and 7-item fruit and vegetables subscale from
Results	The scores for meal contents and temporal eating patterns in rotating shift workers were significantly higher than those in day workers. The Morningness/eveningness (ME) score of rotating shift workers was significantly lower, indicating greater eveningness/less morningness among rotating shift workers. Multivariate linear regression revealed that the ME score was	Shift working nurses had significantly higher intakes of total energy (p=0·04), protein (p=0·04), fat (p=0·05) and fibre (p=0·007) compared to day nurses. Day nurses were more likely to smoke (p=0·009). 40 % of nurses had fat intakes higher than the	More than half were overweight (34.1%) or obese (23.4%), and 80.1% were " sedentary" (≥3 hr sitting/day), particularly those working outside of direct patient care in management, research and education. Only 47.2% consumed 5+ servings of fruits/vegetables daily. Nurses who
Quality appraisal*	8/8	6/8	8/8

* Newcastle-Ottawa Scale

Cohort study

Vesterlund GK 2017 (24)	**First author year (bibl.)**
Employed nurses in Denmark	**Setting & country**
Sub-sample of 6188 female nurses from the Danish Nurse Cohort (nurses who participated in	**Sample**
3 questionnaires in 1993, 1999 and 2009.	**Data collection method**
A linear trend in weight gain was seen in nurses who were often busy in 1999 between those who were rarely v. sometimes v. often busy in 1993 (P=0·03), with the largest weight gain in individuals with sustained high busyness in both years. Loss of influence between 1993 and 1999 was associated with larger subsequent weight gain than sustained high	**Results**
8/8	**Quality appraisal***

*** Newcastle-Ottawa Scale**

Qualitative studies

Monaghan T 2017 (9)	**Dias CH 2020 (16)**	**First author year (bibl.)**
13 hospitals in 9 New Jersey (USA), counties	Hospitals in South Carolina, USA	**Setting & country**
20 female nurses who have been working for their current hospital employer	21 Registered Nurses working 10- to 12-hour shifts in 2018	**Sample**
Social Ecological Model (SEM) semi-structured interview	Guided by the Theoretical Domains Framework and using analysed	**Data collection method**
Nurses' perceived inability to take breaks was due to patient load, unpredictability of patient needs, reluctance to burden other nurses, a tendency to prioritize patient care over self-care, and the repercussions of working longer hours to complete	Nursing roles and responsibilities restrict freedom of movement and minimize individual control over dietary practices; the hospital food environment is oppressively unhealthy; free food is	**Results**
8/10	9/10	**Quality appraisal***

First author year (bibl.)	**Setting & country**	**Sample**	**Data collection method**	**Results**	**Quality appraisal***
Torquati L 2016 (17)	3 hospitals in the Brisbane metropolitan area, Australia	17 nurses aged 25–59 years	4 focus group of 4 to 10 nurses per each one	Work environment was the main barrier for healthy diet behaviours. Long working hours and lack of breaks challenged nurses' self-control and self-regulation when making dietary choices. Fatigue was the main barrier for physical activity (PA). Feeling energised before work and better sleep after working night shifts motivated	7/10
Williams GM 2017 (6)				To effect change, hospitals and other employers of night shift nurses will need to make adjustments, such as the use of full spectrum lighting, increasing availability of healthy eating options, and making exercise more feasible. Nurses already know the dangers	Not evaluable

*** Critical Appraisal Skills Programme (CASP)**

Descriptive-correlational study

First author year (bibl.)	Setting & country	Sample	Data collection method	Results	Quality appraisal*
Jung HS 2016 (10)	3 large hospital in Seoul and Gyeonggi	1431 nurses who worked rotating shifts	Korean Occupational Stress Scale (KOSS), Body Mass Index (BMI), Rome III criteria	The results of this study indicated that gender, body mass index, the number of night shifts worked, work-related stress, and regular dietary patterns were related to functional dyspepsia and	7/8

*** Newcastle-Ottawa Scale**

Systematic review study

First author year (bibl.)	Setting & country	Sample	Data collection	Results	Quality appraisal*
Nicholls R 2016 (11)		21 papers from CINAHL, MEDLINE, PROQUEST Health and Medicine,	Papers published in English between 2000–2016.	Most studies reported barriers to healthy eating related to adverse work schedules, individual barriers, aspects of the physical workplace environment and social eating practices at work. Few facilitators were reported. Overall, studies found the workplace exerts a	9/11

Results

The articles included in the analysis are 21, of which 17 are quantitative studies (14 are cross-sectional, 1 cohort, 1 descriptive-correlational and 1 systematic review,) and 4 are qualitative studies. The articles included in the analysis give us a good picture of nurses' eating habits at work.

Eating habits

From the studies emerges a total lack of options and a lot of difficulty in purchasing healthy foods at work (2,4,16). In a focus group interview all nurses consider taking meals and snacks as the best strategy to healthy dietary practices, but the abundance of tempting foods, social aspects of free food, boredom with the same packed lunch, and the inability to take a break can't guarantee consumption of healthy foods from home (16).

Nurses recommend bringing a variety of healthy, quick, and easy foods to increase the likelihood that they consumed them and eating products with high nutritional value would improve their nutritional status (2,16).

An analysis of health-related behaviours conducted by *Warchoł-Stawińska* shows that most of the nurses eating habits depend on the present needs and financial resources (2).

Nurses retain to be responsible for their patients' health and safety during the entire shift, including breaks. Therefore, nurses could not leave their assigned patients without getting another nurse to cover their responsibilities during that time (9,16). Usually, there is an expectation from other disciplines, peers, and patients that the nurse should always be available, that influence how far away from the unit the nurse can go and the break duration (2,16,17). Burdening other nurses as well as insufficient time to complete reports for physicians' orders and prepare for shift change are the main reasons because nurses neglected breaks (9).

Usually, regulatory requirements prohibit eating or drinking in patient care areas due to infection control concerns: nursing responsibilities keep nurses at or near the bedside, creating a burden to go somewhere to get food or drink (16). As a result, nurses report not eating for long periods and dehydration (4,9,16).

Due to the nurses' responsibilities and busy and uncertain workflows, sitting down and eating at a normal pace is often not possible, affecting the types and number of foods consumed (16). Even if the nurses were able to hydrate adequately, the time-burden of having to go to the bathroom more frequently is perceived as an unwelcome consequence (9,16).

When nurses become very hungry but have not the time or ability to step away, foods are stored in pockets, bags, or drawers at the nurses' station. These are typically dry, quick, cold, and easy-to-eat foods while on the go (2,4,9,11,16).

Most snacks (70% of overall snacks) are unhealthy, such as chocolate, chips, and sweetened beverages, whereas only 30% of overall snacks are heathy snacks (e.g., fruits, vegetables, yogurt and nuts) (3).

In *Monaghan et al*. study most of nurses indicate that they usually receive food donated by patients' families, which are, typically, high in sugar and fat (donuts, cookies, cake etc.) and readily available in the break room (9).

Dietary behaviour is positively associated with cardiometabolic health risks. Snacking frequency is positively associated with body fat percentage. Higher energy and carbohydrate intake are associated with worse tension–anxiety, depression–dejection, fatigue–inertia, vigour–activity and TMD scores (18).

Health influences of night shifts and long shifts

Shift work is the major barrier to healthy eating behaviour (2,4,5,9,16,17) and for having a positive sleep score (7). Participants who worked day shift are more likely to have better sleep quality compared with those that work night shift (2,4,18). Nurses complain about headaches as well as irritation after having a night shift (2).

From a study, day shift nurses are more likely to be older than night shift nurses, to have a lower BMI, to be married, to earn more than $75000 annually, and have a roommate (18,19,20).

Those working more than 3-night shifts per month are more inclined toward restrained eating compared with other groups; BMI and frequency of night shifts per month are associated with restrained eating (2,4,9,18,19,20,21,22,25).

Night shift workers eat more snacks than day workers and are more likely to snack through a night shift (nurses continuously consume high-energy snacks, like chocolate and crisps, to help them stay awake during their night shift) than eat a complete meal, have higher food intakes but eat fewer meals, with poorer food choices which contributes to nutritional deficiencies and drink caffeine during busy workflows and during slow workflows to ward off boredom or sleepiness (1,2,3,4,11,16,17,23). For example, the study by *Bilski* has showed that only 10% of nurses on duty eat a hot meal on a night shift (2).

The proportion of night shift nurses with abnormal LDL is significantly higher than the corresponding proportion among day shift nurses (22).

Obesity and weight-linked illnesses are rapidly on the rise in nurses (6); explanations for the shift-related increase in weight centred on changes in normal eating habits, particularly, for late-shift workers, who eat more, later and have fewer meals than the comparative day shift group (4,11).

Even with the optimum hours of sleep per night, disturbance of the "natural" circadian rhythm disrupts metabolic rates. Nurses report that they recovery from this circadian disruption when freedom of action (the ability of nurses to use leisure time to mitigate stressful effects of shift work) is allowed during night work (6).

Most nurses eat when they return home, and due to the time constraints imposed by long shifts, they go to bed with a full stomach. Subsequently, nurses can suffer from poor sleep-quality, gastric reflux, and weight gain (4,16).

Physical activity

The night shift is reported as one of the major extrinsic barriers for participating in physical activity (PA); working long hours and being tired are the main factors that influence the PA; nurses, also mention factors as lack of time or having competing priorities (such as family or social commitments) (2,17).

Shift work is an extrinsic barrier towards nurses' ability to keep active, mostly because of the associated fatigue. Even those nurses who are regularly physically active mention these barriers (2,17).

The participants with insomnia spend fewer days engaging in moderate-intensity physical activities and eat meals more irregularly than those without that condition (10).

In *del Carmen et al.* study emerges that more than 50% of shift nurses do not practice any physical exercise. There is a statistically difference between exercise and diet quality: those that exercise have better diet quality compared with those that do not exercise (18,25).

Some nurses mention their willingness to integrate PA with work when possible, by actively commuting to work or doing exercise before shifts. However, the lack of shower facilities at work is an extrinsic barrier, as the cost associated with using the onsite gym (17).

The *Torquati et al.* study, indicate that social support can promote PA engagement: exercising with colleagues is described "as a way to socialise outside work, have fun and promote team building".

Some nurses report that they try to use social media (like Facebook) to improve their diet and PA; the apps are perceived as a strategy that can help them to stay motivated and receive weekly reminders. Anyway, self-monitoring is suggested as a simple way to improve current diet and PA behaviours. Having a pedometer to count daily steps accumulated is one of the strategies suggested to promote PA at work and at home (17).

Psychological elements and stress

In *Terada et al.* study the indicators of psychological health such anger–hostility, fatigue–inertia, confusion–bewilderment, are significantly worse in shift-working nurses when compared to non-shift-working nurses (3).

For example, workers with poorer sleep quality have higher rates of emotional and uncontrolled eating (7,11,17,18): a deficit in sleep quality implies more emotional eating, which negatively affects self-esteem. In response to those negative emotional signals, nurses tend to eat more to feel better (3,4,17,18).

Individuals that facing with weight gain, feel greater dissatisfaction with their body image and this negatively affects their self-esteem and their psychosocial quality of life (3,17,18).

The BMI is significant and positively correlated with restrained eating, emotional styles, and stress (17.19). Emotional eating facilitates uncontrolled eating, although it does not affect self-esteem, even though these two different dimensions of eating behaviour are closely related (3,18).

The participants' overweight or obesity are associated with their work stress (25). Nurses with high work stress are 5 times more likely to be overweight or obese (17,25). There are, also, significant correlations between participants' overweight or obesity and their degree of support from family, friends, and colleagues (25).

The constant pressure of maintaining responsibility at every moment during a long shift exacerbates busy workflows and causes extra stress which heavily influences the nurses' dietary behaviours (2,11,16).

In *Nicholls* study results that it is statistically significant the portion of overweight and obese nurses who do not perceive themselves as such, and the knowledge of obesity-related health risks is limited among these nurses (11).
Nurses lack motivation to lose weight or eat fruit and vegetables, despite pressure to be good role models for their patients. For example, in a hospital staff in the UK (a sample of 490 nurses), 92% believed it would be 'pretty tough' or 'almost impossible' to change their current health behaviours, although 513% would like to improve their diet (11).

Compassion satisfaction is the only workplace factor that predicts fruit or vegetable consumption and physical activity. Higher compassion satisfaction score predicts higher physical activity level and more fruit/vegetable consumption (23).
In a Danish longitudinal study results that compared with nurses with lower job speed, those with the highest job speed have a higher BMI and lower influence. Loss of influence is also associated with larger subsequent weight gain. Job strain and job speed are not related to weight gain (24).

Workplace environment and social influences

The food landscape inside the hospital is a major influencer on nurses' dietary behaviours due to the disproportionate availability of unhealthy food options respect to healthy ones (16,17).
Usually, there are three main channels of food access in the hospital:

- food for purchase, which includes cafeteria and vending,
- brought-in food (e.g., packed lunches),
- free food, which is any kind of food, candies or beverage available at no financial cost (16).

Free food is frequently available in the hospital environment and is usually found near nurses (e.g., the nurses' station), influencing consumption.
Leadership offers free food to nurses as a reward, incentive, consolation, and for celebrations. Free food is also used as a bribe for attendance at meetings, to lure staff into management's office, and to boost morale on the unit.

Patients and families offer free food to nurses to show their appreciation. Typically, free foods included candies, cookies, pizza, chips, cake, and donuts (16).
Healthy choices available for purchase are generally limited to a baked option or salad bar in the cafeteria. Healthy options tend to be more expensive, compared to unhealthy food (11,16).
The cafeteria in smaller facilities, might be closed at night or in the weekend (16). In a study 85% of nurses report that their cafeterias offered healthy options and 60% say they do not eat in the cafeteria, primarily due to time constraints (9).
Outside of the cafeteria, foods for purchase are obtained from vending machines, gift shops, fast food restaurants (inside or outside the hospital) and restaurant delivery. Vending machines are the main food source available on site 24/7, typically on or near the nursing units, and stocked with processed, calorie-dense, low-nutrient snacks and candies. When nurses are pressed for time, tired, and hungry, vending machine foods became the easiest option (11,16).

For staff, space to refrigerate, heat and prepare food is often considered inadequate, either because of the lack of access to fridges or microwaves, or because the catering facilities or break room are too far from their work area (9,11). In addition, catering facilities are often shared with patients and visitors and this is perceived as a problem because of frequent interruptions (11).
The more significant issue could be the water restriction (9).

Nearly all nurses perceived their supervisors or managers unable to provide break coverage due to supervisory responsibilities, furthermore most nurses report that management encourages them to take a break (9).

Many nurses are not convinced of a need that employers should provide them with meals (2). Social support for diet and PA, appear to be a strong extrinsic motivator for nurses (17).
Eating behaviours are reported as both positively and negatively influenced by nurses' interactions with colleagues; meals are often shared and conversations about diet and exercise can strengthen the motivation to adopt healthier habits. On the other hand, nurses also influence each other to eat junk food, such as cakes and pizza, and colleagues make each other feel guilty if they do not eat that food (11).

Discussion

This systematic review has shown how the nurses' workplace environment is complex.
From the witness of many nurses, hospital food environment results particularly challenging to healthy eating (4,9,11,16,17). In hospital is used to find an abundance of unhealthy foods that are accessible or for free and a lack of healthy food options (16). Junk food is more easily accessible and cheaper than healthy alternatives, which are often unavailable as canteens are closed outside office hours and food preparation areas are inadequate or inaccessible (11). These factors require nurses to bring food from home if they want to eat healthfully, but the challenge with bringing healthy meals and snacks to work is the lack of time required for their planning and preparation (2,9,16).
Shift work and busy workflows, in hospitals, are major contributors to unhealthy dietary practices by nurses (1,2,5,9,10,11,16,17,20,23,24) and irregular meal consumption is one of the factors leading to obesity and this is found to be significantly higher among night shift than day shift workers (1,2,4,17,20,22,25). Factors, such as time availability, social contest, and financial resources play an important role in determining food intake during shift work (2,5,9,11,13,17,19,21). Usually, age is significantly higher in day workers (20). Shift duty is associated with headaches as well as irritation after having a night shift, non-communicable diseases including diabetes, cardiovascular disease and gastrointestinal disorders (1,2,10,19,21,24) and with abnormal restraint eating behaviour: nurses usually eat cold meals, fast food, snacks and few vegetables, but in order to work properly on a night shift it is important to eat a hot and complete meal, which reduces drowsiness and improves performance (2,4,11,16). For example, nurses working the night shift, eat dinner too early before leaving for duty and eat truly little food and they then try to compensate by snacking. The rate of skipping breakfast on days on the day shift in rotating shift workers is significantly high. The daily intake of carbohydrates, protein, and fats are significantly lower during the night shift than the day shift and the number of full meals, appetite, and eating satisfaction are significantly lower during the night shift, predisposing individuals to overweight and obesity due to metabolic derangements associated with sleep cycle disruption (1,10,21,22).

Nurses' job strain has been shown to be associated to higher levels of the stress which induces hormone cortisol and predisposes to obesity (19,24,25). Studies have shown how job stress can lead to binging on alcohol and increased consumption of foods high in fat, sugar and salt, and chronic stress is associated with increased abdominal adiposity, weight gain and obesity, as an emotional

coping strategy (1,4,11,16,19,23). Conversely, higher levels of compassion satisfaction are associated with lower levels of stress in nurses (23), because compassion satisfaction might improve nurses' participation in health-promoting behaviours; nurses who are happier and less stressed may have fewer food cravings and more energy to exercise (23).

Nurses tend to have a healthier lifestyle than the general population, are knowledgeable and motivated to practice healthy behaviours (2,4,11) and to engage in PA (17), due to their high level of education health knowledge and their better self-care strategy (4). It's shown how individuals who exercise are more likely to have lower BMIs (7,8,22,25) and better sleep quality (10): about 20 minutes of aerobic exercise before going to work can help workers to wake up and will improve their cardiopulmonary function. Shift workers should avoid working out up to three hours before going to bed, since this activity can make it difficult for them sleeping (10).

Nurses with higher BMIs have poorer sleep quality, short-sleep duration has been associated with an increase in weight gain and obesity and higher rates of emotional and uncontrolled eating due to alterations in hormones associated with appetite and body weight including insulin, leptin, ghrelin, growth hormone and thyroxin (7,21,25). Furthermore, there is a significant positive correlation found between age and BMI (8). This phenomenon may be explained by changes to metabolic rate that gradually decline due to aging. Moreover, high restraint eating behaviour may be due to the nurses attempting to lose weight with the aim to achieve the ideal body weight or body shape: the attempt may be successful for a short period, but on the long run, dietary restraint became difficult to maintain in their daily lives, showing that restraint eaters tend to overeat when exposed to attractive food cues as compare to unrestraint eater: these unhealthy behaviours can lead to weight gain after 4 years (8).

It is a different case for senior nurses who are working as nurse supervisors may increase their sedentary routine work and rise their risk of becoming overweight or obese (8,10,22,23).

A study has shown how lower occupational status is linked to higher BMI and lower job influence (24).

High BMI and obesity increase both direct costs, such as health care costs, and indirect costs such as absenteeism and presentism which cause individuals to be more likely to skip work and less productive when they are at work (7). A lower self-esteem due to overweight or obesity could reduce nurses' job performance and the quality of service to patients. Emotional eating is provoked by an absence of adapted emotional regulation (7), but snack consumption is not predicted by emotional eating but rather on the habit of the eater (8).

Individual factors are also identified as significant: poor motivation and moderate self-efficacy related to healthy eating, inadequate nutrition knowledge and, for many, failure to recognize their own overweight/obese status (11). Nursing responsibilities, which are unique and constant, influence dietary behaviours (9,10,16). Beyond feeling obligated, nurses are in fact legally required to remain with patients and address needs. Nurses are responsible to address all immediate needs, including physical, emotional, and spiritual, and they are always expected to remain in proximity, ensuring quick response (2,9,16). Furthermore, nurses are typically involved in patient mealtimes and often provide dietary education, therefore, improving nurses' knowledge and personal-dietary practices could improve efficacy of patient counselling (16).

To improve nurses' conditions the articles, suggest that organizations should implement health awareness programs for workers emphasizing the importance of quality sleep to prevent health problems, as well as educational programs to facilitate tools that improve the quality of their diet

(17), even if some nurses reported that having the necessary knowledge of healthy behaviours is insufficient to counteract these barriers (17).

Given that nurses are the most numerous of health care professionals in hospitals, workplace dietary interventions should first target the food-choice barriers specific to nurses (11), they should be organized nutrition training programmes focus on consuming nutrient-dense foods such as fruits, vegetables, whole grains and lean meats, and limiting the intake of saturated and trans fats, added sugars and cholesterol to improve nurses' diet quality (1,3,4,7,11,16,17,18,21,25).

The social environment of the workplace should be changed unhealthy norms and supported by policy reforms (6,11,17). For example, on water at the desk nurses generally prefer an accommodation for water (9) or providing free healthy snacks (6). Evidence-based guidelines for shift nurses are needed regarding when, what and how much they should eat and exercise (4).

On this way of actions, nurse's managers have a vested interest in promoting and fostering wellness and self-care among employees (4,23): managers might initiate walking or standing meetings, using standing desks, encouraging self-care in their staff, bringing in sugar-laden treats, eating lunch at their desk, working long hours with few breaks or sending emails late at night or on vacation (23). By prioritizing their own health and well-being, nurse leaders are giving their staff permission to engage in their own self-care (4,18,23).

Psychological and social support (colleagues, family, friend), teamwork and dietary counselling may assist nurses who are suffering from high psychological and dietary distress (3,6,11,17): the lower is the social support, the more likely the nurses are overweight or obese (25).

PA should be promoted both as a stress coping and weight management strategy, and employers should create spaces for exercises in the workplace (5,6,17).

Other strategies could include goal setting and self-monitoring, for example through mobile apps (4,17).

Limitations

The main limit of this review is that in many cases the data collected are self-reported, which mean that there is the possibility of social desirability bias; some people may have over or underreported about their eating habits or their life quality at work, etc.

Quantitative studies are all descriptive, cross-sectional in design, and only one is a longitudinal study (24), unfortunately this one is not based on a random sample. Per counter, 4 of the included quantitative studies have a large sample sizes (more than 1000 nurses) and are from several health facilities in many different nations of the world, strengthening the evidence of association.

The intrinsic limit of the cross-sectional studies is that are not able to study the causal relationship between nurses eating behaviour and any variable as BMI, or stress, or work efficacy during the time.

Many studies found relied on convenience sampling, but in 2 studies (4,8) where nurses were selected randomly.

Response rates varied a lot from a study and another depending on the complexity of the questionnaire and interviews, raising the issue of recruitment bias in some studies. Moreover, comparing features of responders and non-responders is attempted only in a small number of the studies.

Other limits are:

-many questionnaires used in these studies are not standardized or validated, or no information about these is provided,
-workers who have failed to adapt to shift work and developed health problems could quit or transfer to day shifts, in these cases nurses who dropped out of shift work could distort the information collected.
About the 4 qualitative studies, the relationships between the researchers and their participants are not treated exhaustively. Besides, one of the qualitative studies is only a point-of-view of a Medical Physician about the instruments to improve the wellness of nurses at work, based on the data of past research.
The only review found in this study has offered a good picture of nurses' conditions in workplace, in line with the cross-sectional studies.
Eventually, all the studies analysed are unable to be generalized, but they have provided a good picture of nurses' eating habits, their health, and about the barriers and facilitators in their workplace.

Conclusion

The evidence from this Systematic Review has provided enough information to have a picture on the nurses' eating habits at work and to start promoting a better workplace.

This study explains how complex the nurses' condition at work is, their improper alimentation and on the other hand evidence where it could act to transform the workplace in a better environment, with a strategy both educational and political/organizational.
Anyway, they are suggested other longitudinal studies with reproducible methodologies in order to achieve stronger results.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

No conflict of interest was declared by the authors in relation to the study itself.

References

1. Seychell J, Reeves S. The effect of shift work on the diet of accident and emergency nurses at the main general hospital in Malta. Proceedings of the Nutrition Society. 2016; 75 (OCE1), E36; doi:10.1017/S0029665115004693
2. Nejman M, Gotlib J. Impact of Nurses' Shift Work on Their Nutrition Attitudes. Piel Ęgniarstwo Polskie. 2017; 1(63) DOI: https://doi.org/10.20883/pielpol.2017.1
3. Terada T et al. Dietary Behaviour Is Associated with Cardiometabolic and Psychological Risk Indicators in Female Hospital Nurses—A Post-Hoc, Cross-Sectional Study. Nutrients. 2019; 11, 2054; doi:10.3390/nu11092054

4. Han K, Choi-Kwon S & Kim KS. Poor dietary behaviors among hospital nurses in Seoul, South Korea. Applied nursing science. 2016; 30: 38-44
5. Panczyk M et al. Health-enhancing behaviours of nurses in Poland and their association with shift work and age. Collegian. 2018; 25: 255-261
6. Williams GM. Obesity Among Night Shift Nurses: Time to Intervene. AJPH. January 2017; 107(1) doi: 10.2105/AJPH.2016.303511
7. Beebe D et al. Diet quality and sleep quality among day and night shift nurses. Journal of Nursing Management. 2017; 25: 549–557.
8. Hong SH et al. Eating Behaviour and Its Associations with Overweight among Nurses on Shift Duty in Teaching Hospital. Med & Health Jun 2019; 14(1): 68-77
9. Monaghan T et al. Factors Influencing the Eating Practices of Hospital Nurses During Their Shifts. Workplace Health & Safety. 2017; 66(7); DOI: 10.1177/2165079917737557
10. Jung HS, Lee B. Factors associated with the occurrence of functional dyspepsia and insomnia in shift-working nurses. IOS press Work. 2016; 54: 93–101 DOI:10.3233/WOR-162283
11. Nicholls R et al. Barriers and facilitators to healthy eating for nurses in the workplace: an integrative review. Journal of Advanced Nursing. 2017; 73(5): 1051–1065. doi: 10.1111/ jan.13185
12. Moher D et al. The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097 www.prisma-statement.org
13. Wells GA et al. The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomised Studies in Meta-analyses. Ottawa: Ottawa Hospital Research Institute.
14. Clisby N. and Charnock D. DISCERN/CASP Workshops 2000. Final Project Report. Critical Appraisal Skills Programme, Institute of Health Sciences, Oxford. 2000
15. Shea BJ et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol. 2007;7(1):10
16. Dias CH, Dawson RM. Hospital and Shift Work Influences on Nurses' Dietary Behaviors. Workplace Health & Safety. 2020; 20(10); DOI: https://doi.org/10.1177/2165079919890351
17. Torquati L et al. International Journal of Health Promotion and Education. 2016; 54(6): 268-282; DOI: 10.1080/14635240.2016.1169943
18. del Carmen Pérez-Fuentes M et al. Association with the Quality of Sleep and the Mediating Role of Eating on Self-Esteem in Healthcare Personnel. Nutrients. 2019; 11, 321; doi:10.3390/nu11020321
19. Almajwal AM. Stress, shift duty, and eating behavior among nurses in Central Saudi Arabia. Saudi Med J. 2016; 37 (2): 191-198 doi: 10.15537/smj.2016.2.13060
20. Yoshizaki T et al. Association of eating behaviours with diurnal preference and rotating shift work in Japanese female nurses: a cross-sectional study. BMJ. 2016; 6:e011987. doi:10.1136/bmjopen-2016-011987
21. Fradkin L et al. Nurses who work rotating shifts consume more energy, macronutrients and calcium when they work the night shift versus day shift. Chronobiology International. 2019; 36(2): 288-295; DOI: 10.1080/07420528.2018.1538155

22. Gadallah M et al. Association of rotating night shift with lipid profile among nurses in an Egyptian tertiary university hospital. EMHJ 2017; 23(4)
23. Ross A et al. Nurses and health-promoting self-care: Do we practice what we preach? J Nurs Manag. 2019; 27:599–608. DOI:10.1111/jonm.12718
24. Vesterlund GK et al. Changes in job strain and subsequent weight gain: a longitudinal study, based on the Danish Nurse Cohort. Public Health Nutrition. 2017; 21(6): 1131–1138; doi:10.1017/S136898001700355X
25. Fang L et al. the associations with work stress, social support and overweight/obesity among hospital nurse: A cross-sectional study. Contemporary nurse. 2018; 54 (2): 182-194