

# The Impact of Shift Work on the Lifestyle and Well-being of Emergency Physicians: A Comprehensive Examination of Eating Habits and Health Behaviors

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## Abstract

**Aim:** Shift work causes unhealthy changes in sleep patterns, physical activity, and eating habits. We evaluated emergency physicians' eating habits and health behaviors and how shift work affects them.

**Materials and Methods:** A survey questionnaire consisting of 40 questions was administered to Turkish emergency physicians at the international emergency medicine (EM) congresses held in 2018 by Turkey's two major EM societies.

**Results:** A total of 278 emergency physicians were divided into the non-shift group (n=55) and the shift group (n=223). Most experienced depression (73.4%) and some reported sleep problems (45%) and irritability (34.2%). No shift effect was detected on most eating habits, body mass index, regular exercise, and self-perceived health status. The shift group statistically had fewer positive considerations about hospital food and was more likely to order or eat from different alternatives.

**Conclusion:** Emergency physicians in our study suffered from sleep problems, mood disorders, unhealthy dietary routines, and limited physical activity, which did not particularly differ by shift work. The generalizability of the findings is limited.

**Keywords:** Circadian rhythms, shift work, emergency physician, emergency department, eating behavior, snack consumption, lifestyle

## Introduction

Human physiological functions are regulated according to the timing of the day and night, as in many plants and animals. These behavioral day-night cycles, called circadian rhythm (diurnality), occur at the level of hormones, metabolism, and molecules. With the advent of industrialization and technology and the lifestyle changes associated with them, circadian rhythm disorders (i.e., biological rhythm desynchronization) have emerged. The acute form of these disorders is referred to as the "jet lag" phenomenon, whereas the chronic form is usually observed in shift workers who are exposed to different working hours that are incompatible with the circadian rhythm. Shift work increased significantly with the industrial revolution

and has become widespread enough to affect approximately 25-30% of the workforce (1,2).

The macroeffects of shift work are predominantly seen in sleep patterns, physical activity, and eating habits. Shift work-related nutritional disorders are important risk factors for shift workers' general health and well-being (3-5). Although the associated mechanisms are not fully understood, evidence shows that shift work increases the risk of obesity, diabetes, gastrointestinal diseases, cardiovascular diseases, metabolic syndrome, and even vulnerability to DNA damage (6-9).

Because the healthcare system frequently represents uninterrupted patient care, shift work in medicine is as common



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**Cite this article as:** Vural S, Coşkun F. The Impact of Shift Work on the Lifestyle and Well-being of Emergency Physicians: A Comprehensive Examination of Eating Habits and Health Behaviors. Eurasian J Emerg Med. 2024;23(2): 95-104.

**Received:** 08.06.2023

**Accepted:** 13.03.2024



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as in the industry. Health organizations have their own shift systems, which can differ among institutions and departments. It can have many patterns according to pattern recurrence (e.g., rotating or fixed) and work duration. The most common is a three-shift system (3x8 h) composed in morning, evening, and night shifts. Emergency departments (EDs) are the most prominent unit of healthcare where shift work occurs. The literature contains many reports on shift work effects. However, most of the populations in those papers are industrial workers, health care workers, or nurses (3-5,7-9). Studies conducted on physicians, on the other hand, are relatively limited (10-13). Accordingly, the present study aimed to explore the eating habits and health behaviors of emergency physicians (EPs) and to determine whether the eating habits and health behaviors differ between shift and non-shift-working EPs.

## Materials and Methods

### Study Design

This cross-sectional study was approved by the Yozgat Bozok University Institutional Ethical Committee (decision number: 2017-KAEK-189\_ 2018.09.128\_03, date: 12.09.2018). A survey questionnaire in Turkish consisting of 40 questions and body measurements was used to determine the lifestyle and eating habits of the study population (Supplementary 1). The survey included four main parts: (1) Demographic data, (2) General health and exercise status, (3) Food and food access in the workplace, and (4) Eating habits and lifestyle.

### Study Participants

The survey was conducted on volunteer physicians among Turkish participants of international emergency medicine (EM) congresses held by Turkey's two major EM societies. These congresses were the 5<sup>th</sup> International Emergency Medicine and Family Medicine Congress in Cyprus and the 6<sup>th</sup> Eurasian Congress of Emergency Medicine in Turkey in 2018. Surveys were distributed to willing physicians during breaks between sessions. Participants were asked to complete the survey. The inclusion criteria were working in an ED as a physician, actively shift working for shift working participants, and having quit shift work for more than five years for non-shift working participants. The participants who did not complete the entire survey were excluded from the study. A total of 320 participants completed the survey. Data from 42 participants were excluded because of incomplete responses. Analyses were conducted on 278 records.

### Measurements

Measurements of height and body weight were used to calculate body mass index (BMI). The BMI thresholds of underweight, healthy, overweight, and obese were  $\leq 18.5$ , 18.5-24.9, 25-29.9, and

$\geq 30$ -39.9 kg/m<sup>2</sup>, respectively. In addition, the measurement of waist circumference was recorded. The threshold for abnormal waist circumference was set as >94 cm for men and >80 cm for women.

The measurements were completed according to the statements of the physicians who had these measurements taken within the last 3 months. If participants had not undergone these measurements in the last 3 months, the values observed by rater 1 (SV) were recorded using the same scale and tape equipment.

### Statistical Analysis

Continuous variables were expressed as median (interquartile range) and categorical variables as numbers (n) and percentages (%). Statistically significant differences between groups were calculated using the Mann-Whitney U test. The chi-square test was used to evaluate the differences between groups for categorical variables. All data were analyzed using SPSS statistics version 25.0 (SPSS Inc., IBM Corp., Chicago, IL, USA). A p value <0.05 was considered statistically significant.

## Results

### Demographic Data

Among the 278 participants whose data were analyzed, 265 (95.3%) had a degree in EM, whereas 13 (4.7%) were general practitioners. The demographic distribution of the study group and the subgroups were shown in Table 1. The median age was 34 (13) years, and the male/female ratio was 2.5. According to the working schedule, the study population was divided into the non-shift group (n=55, 19.8%) and the shift group (n=223, 80.2%). The shift group was younger than the non-shift group (p=0.001). No difference was found in terms of gender distribution among the subgroups (p=0.148). The non-shift group had a median of 6 (3) years of shift work history before a non-shift schedule during their professional life.

### Body Mass Index, Waist Circumference, and Weight Changes

The median BMI of participants was 25.5 (5) kg/m<sup>2</sup>, which did not differ for the subgroups (p=0.1) (Table 1). The prevalence of being overweight and obese were 43.5 vs. 14.7%, and the prevalence of having an abnormal waist circumference was 35.3%. The non-shift group had a higher waist circumference than the shift group [90 (26) vs. 82 (24) cm, p=0.025]. Approximately half of the participants (n=133, 47.8%) reported gaining weight [7 (5) kg] after starting ED work. Only 26 physicians (19.5%) claimed that their weight gain was intentional.

### Mood Alterations, Lifestyle Changes, and Health Status

While most of the physicians experienced depression (73.4%) after they began to work in the ED, some reported sleep problems (45%)

and irritability (34.2%) (Figure 1). Only 30.9% of the participants claimed that they had no lifestyle changes or mood alterations. However, no difference was found between the shift and non-shift groups regarding sleep problems, depression, or irritability ( $p=0.492, 0.055, \text{ and } 0.569$ ).

The rates of tobacco and alcohol use were 46.8% and 43.2%, respectively. The shift group had a higher smoking rate but a similar alcohol drinking rate compared with the non-shift group ( $p=0.024 \text{ and } 0.095$ , respectively).

The exercise was a routine activity for only 20.9% ( $n=58$ ) of the participants. In contrast, 28.8% ( $n=80$ ) reported no routine exercise in their life. Shift work did not differentiate EPs in terms of exercise ( $p=0.61$ )

The self-perceived health status of the physicians had a median of 7 (3) within a 10-point scale and did not differ across the shift groups ( $p=0.516$ ).

### Perceptions and Attitudes Toward the Food Provided by Hospital Catering Services

The survey included some questions regarding the perceptions and attitudes toward the food provided by the hospital catering service (HCS) and the accessibility of alternative food in the hospital environment (Figure 2). The general perceptions about hospital meals were mainly not positive, especially in the shift group. The shift group physicians were less likely to believe that HCS served healthy, nutritious, and tasty food or used high-quality ingredients with hygienic conditions than the non-shift group ( $p=0.001, 0.001, 0.001, \text{ and } 0.001$ , respectively). Moreover, EPs in the shift group reported that the timing of meals was not consistent with the work schedule more than in the non-shift group ( $p=0.001$ ). Some participants preferred to order in or eat outside for main courses (21.6%) and snacks (27.3%). These tendencies were more common in the shift group than in the non-shift group ( $p=0.001 \text{ and } 0.001$ ).

**Table 1. The demographic distribution of the study group and the subgroups**

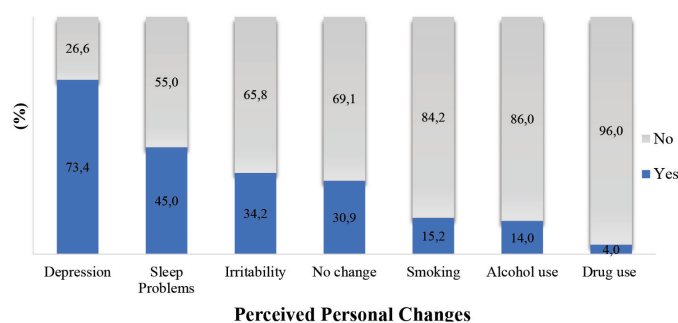
	Non-shift group (n=55)	Shift group (n=223)	The total (n=278)	p value
<b>Sex (n, %)</b>				
- Male	43 (78.2)	156 (70)	199 (71.6)	0.148
- Female	12 (21.8)	67 (30)	79 (28.4)	
<b>Age [median (IQR)]</b>	46 (39.3-49.8)	32 (28-37)	34 (29-42)	<b>0.001</b>
<b>BMI [median (IQR)]</b>	27.8 (23.5-29.8)	25.4 (23.5-28.4)	25.5 (23.5-28.4)	0.1
- Underweight ( $\leq 18.5$ ) (n, %)	0	5 (100)	5 (1.8)	
- Normal range (18.5-24.9)	20 (18)	91 (82)	111 (39.9)	
- Overweight (25.0-29.9)	24 (19.8)	97 (80.2)	121 (43.5)	
- Obese ( $\geq 30$ )	11 (26.8)	30 (73.2)	41 (14.7)	
<b>Waist circumference</b>	90 (77-104.3)	81 (72-96)	84 (73.5-98)	<b>0.025</b>
<b>Number of night shifts</b>	-	8±3		
<b>Living condition (n, %)</b>				
- With someone	42 (76.4)	157 (70.4)	199 (71.6)	0.241
- Alone	13 (23.6)	66 (29.6)	79 (28.4)	
<b>Workplace</b>				
- University faculty	34 (31.5)	74 (68.5)	108 (38.8)	
- Teaching hospital	2 (2)	98 (98)	100 (36)	
- State hospital	3 (7)	40 (93)	43 (15.5)	
- Others	16 (59.3)	11 (40.7)	27 (9.7)	
<b>Working position</b>				
- Academician	31 (56.4)	24 (10.8)	55 (19.8)	<b>0.001</b>
- Non-academic	24 (43.6)	199 (89.2)	223 (80.2)	
<b>Total working in ED (year)</b>				
- Less than 1	0 (0)	17 (7.6)	17 (6.1)	
- 1-5	5 (9.1)	86 (38.6)	91 (32.7)	
- 5-10	17 (30.9)	83 (37.2)	100 (36)	
- More than 10	33 (60)	37 (16.6)	70 (25.2)	

ED: Emergency departments, BMI: Body mass index, IQR: Interquartile range

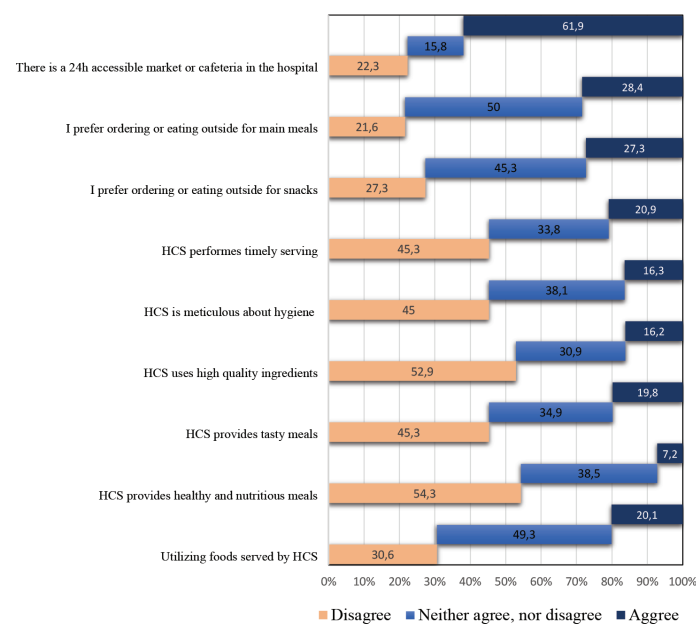
### Snack Consumption and Missing/Skipping Meals

Sixty-two EPs (22.4%) stated that they did not consume any snacks at work. Among the respondents who consumed snacks, the most popular snacks were high calorie foods (e.g., chips, biscuits, chocolate, cracker, or dessert - 38.6%) and fast food (17.3%). In contrast, only 21.7% reported consuming salad, fruit, or fiber-containing foods. Regarding the snacks they consumed at home, most participants preferred salad, fruit, or fiber-containing foods at home (62.6%). The shift and non-shift groups did not differ regarding snack consumption at work and home (p=0.61 and 0.081, respectively).

Missing or skipping meals was common in the workplace (40.3%) but not during the daily routine outside work (15.5%). The shift group



**Figure 1.** The stacked bar chart of the perceived personal lifestyle changes of the physicians after starting to work in the emergency departments



**Figure 2.** The stacked bar chart of the perceptions, attitudes towards the food provided by hospital catering service, and accessibility of alternative food in the hospital environment in the emergency departments

HCS: Hospital catering service

had a statistically higher rate of missing or skipping meals than the non-shift group (p=0.006). The main reasons for missing or skipping meals in the workplace were the ED workflow (n=245), disliking hospital food (n=215), and the intention to lose weight (n=57).

### Discussion

Our findings indicated that EPs had a high BMI and an overweight range. In addition, the smoking rate was very high, and routine exercise was not a common lifestyle choice for EPs. Healthy snacking was mainly achievable at home compared with the workplace. Moreover, BMI did not differ by shift work status as well as self-perceived health status, mood alterations, physical activity, consumption of food provided by HCS, or snack consumption. However, the shift group had more negative perceptions about the food supplied by HCS and was more likely to skip or miss meals at work.

EDs are the most chaotic and stressful hospital units that must provide acute, qualified, and unbiased health care. To provide this service uninterrupted, healthcare workers in EDs generally work in shifts. There is no national or international age cut-off for eliminating overnight shifts for EPs, but we believe that shift work is not effectively sustainable throughout the entire working life. Strategies for keeping experienced and academic EPs in acute patient care are mandatory with a more feasible working schedule. Our demographic data represented some insights into the EP profile. First, most of our sample consisted of shift-working non-academic physicians working in EDs for less than 10 years. On the other hand, the non-shift group had a more balanced distribution across academics and non-academic physicians with a higher age median (46 vs. 33 years old) and with more ED working experience, more than 10 years, probably due to including more academics.

The adverse health effects of shift work have been reported from many aspects, such as body composition, chronic diseases, sleep quality, psychological disorders, well-being, physical activity, and eating habits (1-11). As for the physicians' weight, to begin with, the literature has some contradictory findings. An animal study showed that shift work, imitated by a rotating light cycle, promoted weight gain and hepatic lipid accumulation (14). BMI  $\geq 30 \text{ kg/m}^2$  for obesity was reported to have a positive relationship between obesity and shift work by a recent meta-analysis (5). Similarly, a cross-sectional survey reported that the duration of shift work was positively associated with the prevalence of overweight/obesity in nurses (15). However, they found no association between current shift work and BMI. Similar to this finding, we did not find a difference in BMI between shift- and non-shift-working physicians. Studies comparing health professionals' weight to general populations generally report

that obesity and overweight status are similar to the general population. For example, Horton Dias and Dawson (16) reported that the overweighted shift working nurse ratio was similar to that of the general American population. A Medscape lifestyle report on EPs showed that 42% were overweight to obese, with an obesity prevalence of ~7% (17). Our findings showed a similar overweight ratio, but only obesity was much more common in our population. Compared with the 2019 national BMI data in the Turkish population, physicians in our study tended to be overweight (18). However, obesity was less common among physicians compared with the national distribution.

Physicians are expected to have favorable or healthy lifestyle habits because of their medical education and role models for patients. One study showed that non-smoking physicians who exercised at least one day a week were more likely to recommend lifestyle interventions described by the National Hypertension Guidelines (12). It may suggest that the healthier the physician, the more rational and health-oriented the patient lifestyle counseling will be. However, the smoking rates reported in Bahrain, Japan, and the United States ranged from 5.7% to 16.2%, which were much lower than those in our study population (19-21). A recent meta-analysis reported that the smoking prevalence among physicians was around 21%, which was still lower than our results (22). Unfortunately, the smoking rate among Turkish EPs was higher than that in the general population of Turkey (23). The other parameters regarding health behaviors also have contradictory results. For example, the literature showed higher alcohol consumption rates among physicians than in our sample, which may be related to religious tendencies (19,21).

Regular exercise is undoubtedly an essential step for a healthy life. In the United States, 57-77% of EPs exercise routinely and rate their health 93%, which were far higher than our findings (17). In addition to the physical aspect, Rosa et al. (24) emphasized psychological consequences, such as anxiety, stress, and depression, apart from physiological consequences in their systematic review. Another recent report reported that shift work was associated with considerable impacts on sleep, depressed mood and anxiety, substance use, impairments in cognition, lower quality of life, and even suicidal ideation (25). We found that most EPs experienced depression, sleep disorders, or irritability after working in EDs, regardless of shift work. While depression is seen in 5% of the adult population in Europe and 9% in Turkey, it may be an alarming finding that this rate was 73.4% in EPs (26).

In our study, we also comprehensively evaluated the eating habits of EPs. Evidence suggests that individuals working shifts are more prone to a sedentary lifestyle and to gain excess weight due to unbalanced food and nutrient intake (27). Chen et al. (28) found that shift work in health care workers

was associated with increased calorie intake with higher fat and higher carbohydrate diets and sleep deprivation. Another similar study emphasized that shiftwork rostering, missed scheduled work breaks, and high work demands influenced the food patterns of all nurses and may have impacted fatigue as well as food intake, selection, and relative hydration (29). A study monitoring 24-h food intake during a shift and the preceding daytime found that emergency healthcare workers working during night shifts have a lower amount and quality of nutrient intake (30). Hospital food policy should support and strengthen the eating habits of the staff, but our findings showed that hospital food was not considered either desirable or nutritious. Negative perceptions about hospital food were more prominent in the shift group. The shift group had more skipping or missing meals and stated that they preferred to reach alternative food sources compared with the non-shift group. Nevertheless, multidisciplinary strategies are required to promote healthier behaviors among physicians. According to the current evidence, not all consequences of shift work should be perceived as inevitable (31-33). However, these efforts should include shift-specific measures.

### Study Limitations

Our study has some limitations. First, although we set specific inclusion criteria for the non-shift group, very few physicians working in the ED work with regular daytime shifts and have a history of working in shifts. This can be considered a confounding factor, but a perfect matching control group for shift working EPs is challenging. In addition, the previous history of shift work can be suggested as one of the possible reasons why shift work does not affect many eating habits and lifestyles in this study. Second, self-reported behaviors and perceptions can be inconsistent. Lastly, the sample size may be relatively small to represent the EP community in the country.

### Conclusion

Our cohort was more likely to be overweight and have an unhealthy lifestyle regarding regular exercise, self-perceived health status, and smoking. No shift effect was detected on most eating habits and BMI, regular exercise, and self-perceived health status, which can be attributed to previous shift work history. Conversely, hospital foods were not perceived as healthy, nutritious, tasty, or hygienic by EPs, which were more prominent in the shift group. This single-center study limits the generalizability of the findings. Further multicenter and international studies are required.

### Ethics

**Ethical Committee Approval:** This cross-sectional study was approved by the Yozgat Bozok University Institutional Ethical

Committee (decision number: 2017-KAEK-189\_ 2018.09.128\_03, date: 12.09.2018).

**Informed Consent:** Survey questionnaire study.

### Authorship Contributions

Surgical and Medical Practices: S.V., F.C., Concept: S.V., F.C., Design: S.V., F.C., Data Collection or Processing: S.V., F.C., Analysis or Interpretation: S.V., F.C., Literature Search: S.V., F.C., Writing: S.V., F.C.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Financial Disclosure:** There are no financial conflicts of interest to disclose.

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## Supplementary 1. Study survey

### A. Demographic Data

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This section is necessary to associate and analyze the opinions obtained in the research with the characteristics of the participants who contribute to the research, such as age, institution, gender, etc. The information you provide will only be used within the scope of this research.

1. Your age is \_\_\_\_\_

2. Your gender

Male  Female

3. In the house I live in is \_\_\_\_\_

I live alone

I have parent/spouse/child/friend/partner

4. Currently Please tick the institution you work for.

State University  training and research Hospital

Private Hospital  State Hospital  Private University Hospital

Other is \_\_\_\_\_

5. What is your roster position?

Assistant  Expert

The university is:  Dr. Lecturer Member  Associate Professor  Professor

EAH is:  Clinic Chief  Education Officer

6. What is your working system?

Day only  Night only  With shifts (day-night)

Day + watch  24-hour watches

7. Your Shift Hours...

6-8 hours  12 hours  16 hours

24 hours  Other \_\_\_\_\_ Hours

8. Number of night shifts per month? is \_\_\_\_\_ night/month

9. How long have you been working in the emergency department?

Less than 1 year  1 – 5 years  6-10 years  More than 10 years

10. Fill in your body measurement values. If you don't know, get help from the pollsters.

	Value
Weight	..... kg
Height	.....cm
Waist Circumference	.....cm
BMI (to be calculated later)	

**B. General Health Status**

11. Please tick the disease or diseases you have been diagnosed with.

In this section, you are expected to answer questions about your general health condition. The information you provide will only be used within the scope of this research.

- Diabetes mellitus     Hypertension     Hyperlipidemia
- Kidney disease     Liver Disease     Peptic ulcer
- Anorexia     Bulimia     Depression
- Gastritis, ulcer     Anxiety     Other is \_\_\_\_\_

12. Write down the medication(s) you use regularly.

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13. Since I started practicing medicine in the emergency department...

- I lost weight    .....kg     voluntarily     involuntarily
- I gained weight    .....kg     voluntarily     involuntarily
- I am the same weight

14. Have you been diagnosed with a new disease since you started working as an Emergency Department physician?

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15. How long after you started practicing Emergency Department medicine did you receive this diagnosis?

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16. Have there been any changes in the dosages of medication you use since you started working as an Emergency Department physician?

- It did not happen     The dose was increased     There was a dose reduction

17. (For women) What were your menstrual cycles like before you started ED?

- It was orderly     It was irregular

18. (For women) How did the pattern of your menstrual cycles change after you started ED?

- It has become regular     It has become irregular     It continues as it was before



19. What changes have occurred in your life since you started working in the Emergency Department?

- I have insomnia problems                       I started using alcohol  
 I became a very angry person                       I started using substances  
 I feel depressed                       None, life goes on as it is.  
 I started smoking                       Other: is\_\_\_\_\_

20. How healthy do you feel overall?

(1=very unhealthy, 10=very healthy)

1 .....5.....10

**C. Food Services Provided in Your Hospital**

In this section, we will ask you to share with us your opinions about the food services provided in your hospital, as a factor that affects your diet and eating habits, especially at your workplace. Rate, from 1 to 3, how much you agree with the following sentences and/or how often you say them.

1= Strongly Disagree / Never

2= Neither Agree nor Disagree / Occasionally

3= Strongly Agree / Always / Often

If you think about the food services at the hospital you work in	1	2	3
21. I always benefit from the food services provided in the hospital.			
22. I find the food served at the hospital healthy and nutritious.			
23. I think the food served in the hospital is not to my taste.			
24. I think the ingredients used in the meals served at the hospital are not good.			
25. I think that not enough attention is paid to the presentation and hygiene of the meals served in the hospital.			
26. For main meals, I order or eat food from outside instead of hospital meals.			
27. For snacks, I order or eat food from outside instead of hospital meals.			
28. The hospital where I work has a canteen that is open 24 hours a day and is accessible to me.			
29. Food services are provided in accordance with my working schedule.			

30. Tick the meals provided in your hospital.

- Breakfast     Lunch     Dinner     Snack

**D. Nutrition and Lifestyle**

In this section, we will generally ask questions about your eating habits and lifestyle both at your workplace and outside of it.

31. How many meals a day do you eat on working days?

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32. How many meals a day do you eat on days when you are not working?

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33. Do you skip meals on days you are not at work?

- Often     Sometimes     Never

