

# Nutritional Status and Quality of Life in Shift Workers

Ülkü Demirci<sup>1</sup>, Ayşegül Kaptanoğlu<sup>2</sup>

<sup>1</sup>Department of Nutrition and Dietetics, Faculty of Health Sciences, Istanbul Aydın University, Istanbul, Turkey

<sup>2</sup>Department of Health Management, Faculty of Health Sciences, Istanbul Aydın University, Istanbul, Turkey

**Abstract.** *Background and aim:* In individuals working in shifts, the risk of metabolic disorders and diseases is amplified due to irregular meal timing, quality of nourishment received from the diet, and inadequate sleep. In this survey, we studied the nutritional status and quality of life (QoL) among shift workers and the factors affecting these characteristics. *Methods:* An online survey was conducted among 137 adult participants working in shifts in the Beylikduzu campus. The data were collected using the QoL assessment tool EQ-5D-5L questionnaire. *Results:* The mean score of EQ-5D-5L sub-dimensions, mobility (1.27±0.56); self-care (1.12±0.51); usual activity (1.14±0.42); pain-discomfort (1.43±0.69), and anxiety-depression (1.66±0.87) were low. In 48 (35.8%) participants, shift time deviated from their mealtime. A total of 74 (54%) participants ate two meals during the day shift, while 78(56%) ate one meal during the night shift. *Conclusions:* Working in shifts had a negative effect on mealtimes, nutrition, and meal frequency.

**Key words:** shift workers, nutritional status, QoL (QoL)

## Introduction

In recent decades there has been tremendous growth in the population of shift workers around the globe. Industrialization and various technological advances have led to the widespread adoption of 24-hour continuous operations in several industries. The business demand has increased the number of workers routinely engaged in shift work. Irregular working hours alter the eating habits of people working in shifts (1-3). Altered eating habits and other lifestyle factors, including reduced exercise, may lead to poor nutritional status (4). Working in shifts has become an occupational health hazard.

According to the 2019 report of the US Bureau of labor statistics, 16% of total workers worked in a non-daytime schedule, which included evening shift, night shift, rotating shift, a split shift, and irregular schedule (5). Whereas according to the fourth EU Survey on working conditions, the prevalence of shift work in Turkey is 6.4% (6).

Chronobiologically, the human species is active during the day. Thus, night-time eating disturbs intestinal motility, ultimately affecting digestion, absorption, and utilization of nutrients and pharmacological drugs (7,8). Individuals working in shifts are awake and active outside of normal chronobiological time, which might alter their eating and sleeping habits. The risk of metabolic disorders and diseases is increased in individuals working in shifts. The ailments include obesity, cardiovascular disease, peptic ulcers, gastrointestinal problems, failure to control blood sugar levels, and metabolic syndrome (9,10). These can be associated with the nutritional status and irregularities in mealtime. Other factors such as psychosocial stress, disrupted circadian rhythms, sleep liability, and low physical activity also contribute to the increased risk (9,10).

Since the 1960's researchers have been investigating the effects of working in the shift system on nutrition and health status in individuals. Lowden et al. reviewed 21 research articles published between 1967–2009 linking the shift work system to dietary

habits and demonstrated that shift work has significant effects on the distribution of eating, diet quality, and energy distribution in a day (8). In another review that included seven studies conducted between 1990 and 2007, it was reported that working in shifts adversely affected nutrition in the workers (11). Similarly, in a study conducted in Turkey to investigate the effects of shift work on nutritional status, it was observed that nurses working in shifts had inadequate iron intake and a higher frequency of eating fast food as compared to day nurses (12).

We sought to investigate how working in different shifts has affected the nutritional status and quality of life (QoL) of workers in the Beylikdüzü campus.

## Methods

This was an online survey conducted among 137 adult participants working in shifts in the Beykent University, Büyükçekmece Campus, Turkey. The participants were given 2 weeks to complete the online survey. They were informed about their right to refuse to participate or withdraw participation at any time. The ethics committee approved the study of Hurrem Sultan Hospital (November 23, 2021-48). Data were collected between November 24, 2021-8th December 2021 by an online survey method using the QoL assessment tool EQ-5D-5L questionnaire.

The EQ-5D-5L general QoL scale was developed in 1987 by the EuroQol group of the Western European QoL Research Society. The scale consists of two parts. The first part consists of the health profile of that day defined in five sub-dimensions: movement, self-care, usual activities, pain/discomfort, and anxiety/depression. The answer to each question has 5 options as “no problem”, “slight problem”, “moderate problem”, “severe problem”, and “extremely problem”. The second part of the scale consists of 13 questions about nutritional status and how the shift has affected it.

## Statistical Analysis

Statistical analysis was performed by SPSS version 24. Data were presented as mean±SD and frequency (%). The collected data were analyzed using

the Mann-Whitney U test, Kruskal Wallis test, and Spearman correlation analysis. The reliability of the EQ-5D-5L general QoL scale was tested using the Cronbach Alpha coefficient. P values less than 0.05 were considered to be significant.

## Result

The total number of participants in the study was 137. There were 78 (56.9%) female participants and 59 (43.1%) male participants. The mean age of participants was 32.2 years, and the mean work experience was 7.05 years. Of 137 participants, 53 (38.7%) were customs officers.

The prevalence of the consumption of alcohol and daily cigarette smoking of respondents were 1.50% and 10.01%, respectively. The subjective data on health status were normal.

There was no statistically significant relationship between the EQ-5D-5L general QoL scale and the working year, age, gender, or occupation of the participants ( $p>0.05$ ). The reliability of the EQ-5D-5L general QoL scale was tested using the Cronbach Alpha coefficient. The Cronbach Alpha coefficient was 0.953, indicating good reliability of the scale. The mean score of EQ-5D-5L sub-dimensions; mobility ( $1.27\pm 0.56$ ), self-care ( $1.12\pm 0.51$ ), usual activity ( $1.14\pm 0.42$ ), pain-discomfort ( $1.43\pm 0.69$ ), and anxiety-depression ( $1.66\pm 0.87$ ) were low (Table 1).

In the second part of the questionnaire, for the question “Does the shift system have a negative impact on your nutrition, and if so, how?”, 48 (35.8%) of the participants stated that it deviates from their meal-time, while 22 (16.1%) participants stated it does not have any adverse effects. Statistically significant differences were found between the Pain sub-dimension ( $p=0.018$ ) and the overall scale ( $p=0.022$ ) (Table 2).

There was a considerable difference in the number of participants eating one, two, or three meals during the day shift, night shift, and rest time (Table 3). A total of 74(54%) participants ate two meals during the day shift, while 78(56%) ate one meal during the night shift and 49(35.8%) ate one meal during the rest time. For the question of “how many meals do you have during the day shift”, statistically significant differences were found between Ordinary Affairs ( $p=0.024$ ) and

**Table 1.** Euro Quality of Life – Five Dimension – Five Level Scale Means

	n	Means (X)	Standard Deviation (S.D.)
Mobility	137	1.27	0.56
Self-care	137	1.12	0.51
Usually Activity	137	1.14	0.42
Pain-Discomfort	137	1.43	0.69
Anxiety-Depression	137	1.66	0.87
<b>EQ-5D-5L</b>	137	1.32	0.48

**Table 2.** The Effect of Shift on Nutrition

		n	%
Does the shift system have a negative effect on your nutrition, and if so, how?	Does not have adverse effects	22	16.1
	skip meals	37	27.0
	eat less	9	6.6
	eat a lot	20	14.6
	Deviation at meal times	49	35.8

**Table 3.** Effect of Shift on Number of Meals

		n	%
How Many Meals Do You Have During the Day Shift?	1 Meal	31	22.6
	2 Meals	74	54.0
	3 Meals	24	17.5
	None	8	5.8
How Many Meals Do You Have While You're on the Night Shift?	1 Meal	78	56.9
	2 Meals	36	26.3
	3 Meals	8	5.8
	None	15	10.9
How Many Main Meals Do You Have During Rest Time?	1 Meal	49	35.8
	2 Meals	44	32.1
	3 Meals	16	11.7
	None	28	20.4

Pain sub-dimensions ( $p=0.003$ ) and the overall scale ( $p=0.030$ ). While for the question “which main meals do you consume during the day shift,” the mean for the chores sub-dimension was quite low but slightly higher for the worry-morale sub-dimension. Whereas for the question “which main meals do you consume during the nightshift,” the mean for the self-care sub-dimension was low but slightly higher for the

anxiety-morale sub-dimension, whereas for the question “which main meals do you consume during the rest time”, the mean for chores sub-dimension was quite low, while it was slightly higher for the worry-morale sub-dimension.

The main meal supply (Table 4) was from the cafeteria for most of the participants during the day shift (59.9%) and during the night shift (48.2%), while during rest time, most participants (67%) brought it from home. A statistically significant difference was found for the main meal supply during the night shift for the Pain sub-dimension ( $p=0.004$ ) for “I eat from the canteen” and “I eat from the cafeteria”, “I bring it from home” and “I do not eat”. Similarly, statistically significant differences were found for the overall scale ( $p=0.011$ ) for “I am eating from the canteen” and “I am not eating from the canteen”.

The nutritional status of participants working in day shift compared to rest days was unaffected in 40.9% of participants while decreased in 29.2% of participants and increased in 28.5% of participants.

Furthermore, the nutritional status of participants working night shifts compared to rest days decreased 42.3% of participants (Table 5).

The main meal of the participants during the day shift was lunch (42.7%); during the night shift, it was dinner (49%); and during the rest time, it was dinner (36%) (Table 6).

About 20% of participants working the night shift ate packaged products (cake/biscuits), toast/pastry, or fruits when they got hungry. About 15% of participants ate sandwiches, 12% drank soup, and 11% of participants ate vegetables (Table 7). Most participants (35.8%) found that the shift system negatively affected their nutrition and deviated their mealtimes. Some participants also reported that the shift system was responsible for skipping meals (27%), eating more (14.6%), and eating less (6.6%).

## Discussion

This survey was conducted to evaluate the nutritional status and QoL of shift workers. We found that the nutritional status was disturbed in shift workers. The altered mealtime suggests disturbances in nutritional status and QoL among the participants of this

**Table 4.** Effect of Shift on Main Meal Supply

		N	%
How Do You Get Your Main Meals During the Day Shift?	I bring it from home	30	21,9
	I'm eating from the cafeteria	82	59,9
	I eat out	18	13,1
	I'm eating from the canteen	4	2,9
	I don't eat	1	,7
How Do You Get Your Main Meals on the Night Shift?	I bring it from home	25	18,2
	I'm eating from the cafeteria	66	48,2
	I eat out	20	14,6
	I'm eating from the canteen	6	4,4
	I don't eat	17	12,4
How Do You Provide Your Rest Day Main Meals?	I bring it from home	93	67,9
	I'm eating from the cafeteria	7	5,1
	I eat out	29	21,2
	I'm eating from the canteen	1	,7
	I don't eat	5	3,6

**Table 5.** Differences Between Rest Day and Shift Eating

		n	%
How is your nutritional status affected during the day shift compared to your rest day?	Decreases	40	29,2
	Constant	56	40,9
	Increases	39	28,5
How is your nutritional status affected during the night shift compared to your rest day?	Decreases	58	42,3
	Constant	35	25,5
	Increases	42	30,7

study. Although sleep characteristics and nutritional differentiation were not assessed in this study, dietary patterns and meal timing were well characterized. Our study results can help develop future studies with strategies to analyze meal timing, physical activity, eating habits, and sleep patterns.

Irregular working hours are closely related to food consumption irregularities inconsistent with the circadian clock (12). The daily routine of the people working in shifts is interrupted, making it difficult to maintain regular eating and sleeping habits. Irregular

**Table 6.** Average Values of Main Meal Consumed by Shift Time

		n	%
Which Main Meals Will You Consume During the Day Shift? (As Many Options Can Be Selected)	Breakfast	88	35.8
	Lunch	105	42.7
	Dinner	49	19.9
	None	4	1.6
Which Main Meals Will You Consume During the Night Shift? (As Many Options Can Be Selected)	Breakfast	47	24.7
	Lunch	36	18.9
	Dinner	94	49.5
Which Main Meals Will You Consume on the Rest Day? (As Many Options Can Be Checked)	Breakfast	96	34.9
	Lunch	66	24.0
	Dinner	100	36.4
	None	13	4.7

**Table 7.** Average Values of Main Meal Consumed by Shift Time

		n	%
What do you usually eat when you get hungry on the night shift? (As Many Options Can Be Checked)	Toast / pastry etc. I am eating.	50	20.4
	I'm eating vegetables.	27	11.0
	I am eating fruit.	49	20.0
	I'm eating a sandwich.	37	15.1
	I eat packaged products (cake/biscuit).	51	20.8
	I'm drinking soup.	31	12.7

and delayed meals due to working in the shift disturb the circadian rhythm of individuals working in shifts (10). They tend to have irregular eating habits and have a divergent quality, quantity, and frequency of food intake.

A study conducted among nurses working on the shift highlighted that nutritional status was affected in 94.6% of the participants, and in 53.6% of participants, the food intake was increased due to changes in sleeping patterns during shifts (13). Our study results were consistent with these findings. In the present study, approximately 84% of participants reported that their nutritional status was affected as they ate less, ate a lot, skipped meals, or deviated the mealtime. Only 16% of participants reported that their nutritional status remained unaffected by the shift.

Some studies have reported that quantity and frequency of food intake are divergent in shift workers. Compared to day shift workers, food quantity was smaller in night shift workers (14-17). Although this study did not compare the quantity and quality of meals among participants, we found that more than half of the participants (56%) ate only one meal during the night shift, while more than half of participants (54%) ate two meals during the day shift. This is consistent with the findings of a study conducted among nurses working in shifts in which it was observed that the frequency of consumption of main meals in day workers was higher compared to the shift workers (13). Further, the researchers reported a higher mean daily energy and fat consumption in shift workers compared to day workers and a higher mean daily protein consumption in day workers compared to shift workers. They attributed the higher protein consumption in day workers to more frequent consumption of main meals. Moreover, higher energy, carbohydrate, and fat consumption in shift workers were attributed to a lower mean number of main meals (13). A study evaluated the eating pattern, physical activity, and daytime sleepiness levels of 33 shift workers and 17 workers in the day shift. The researchers reported that total energy intake was comparable in shift workers and day workers, but shift workers had lower carbohydrate and higher protein intake, decreased diet quality, an irregular eating pattern, and delayed meal timing (17).

A study conducted by Knutsson et al. reported that shift workers consumed high-carbohydrate snacks more frequently than day workers (18). In our study, the proportion of participants consuming toast/pastry or packaged products was higher than those consuming vegetables, sandwiches, or soup. Nutritional contents of the food items and frequency of consumption were out of the focus of analysis in this study, so we could not compare the food consumed by the participants were high in carbohydrates, fat, or energy.

We also observed that more than half of the participants from the day shift and nearly half of the participants from the night shift were eating in the cafeteria. Therefore, to improve the nutritional status of shift workers, it is important to provide nutritious, accessible, and quality food in the workplace cafeteria.

Vitale et al. reported that irregular sleep was the most important reason for health problems among shift workers (19). Our study did not focus on analyzing

sleep patterns or overall sleep quality in participants. So, we were unable to establish any relationship between these factors with the nutritional status and QoL of shift workers.

Additionally, some studies have assessed workplace health promotion interventions (that included advice on diet and/or physical activity or environmental manipulation) on the health and dietary outcomes of workers (20-23). The researchers upheld healthier food and/or physical activity to improve nutritional status and quality of life in shift workers.

Time and constituents of meals both are important in maintaining nutritional balance in the shift workers to maintain the circadian rhythm of digestive and metabolic processes (24). However, irregular meal-times may affect the metabolic process like digestion of food, absorption of nutrients along with alteration in sensations of hunger and appetite (25). A study evaluated the effect of meal timings on glucose, insulin, and triglyceride levels in shift workers and reported that irregular nighttime meal consumption impaired glycaemic profile but not triglyceride levels (19). Furthermore, a review of studies reported that comprehensive nutritional education programs reduced LDL-cholesterol levels after six months in the night shift workers, but it was ineffective in reducing weight (26).

## Limitations

We could not collect the data from face-to-face interviews or meetings due to COVID-19 restrictions. If we had a chance to interview the participants along with the EQ-5D-5L questionnaire, the results would have been more descriptive and comprehensive.

The sample group was lower than the targeted sample group. There are about 150 shift workers on the Beylikdüzü campus. Due to COVID-19 restrictions and difficulty reaching shift workers, we could only include 137 participants.

Although the study focused on the effects of working in shifts on the meal frequency, mealtime, and source of the meal, the quality of meals and nutritional values received from the meals were not considered. The study does not present an analysis of food items, macronutrient composition, energy percentage, vitamins, minerals, nutrients, or energy density.

Another important aspect that was out of focus of the study was a comparison between night shift/rotation and day shift to know the pattern of effect on nutritional status and eating habits of the participants. The comparison between control groups might have provided precise data on the effect of shift work on various aspects of nutrition and eating habits.

## Conclusion

Working in shifts negatively affected the nutritional status and QoL. The findings of the present survey indicated that the major problem among participants working in shifts was mealtime irregularity, improper meal frequency that is inconsistent with the circadian clock, frequent consumption of snacks or packaged food, and a decreased eating status. The present study measured the collective effect on the nutritional status; however, differential analysis of the nutritional intake and energy intake compared to a control group would provide clear insight for a recommendation. Further studies in this area in a larger population with descriptive dietary/nutritional assessment tools are warranted.

**Conflict of Interest:** No potential conflict of interest relevant to this article was reported by the authors.

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**Correspondence:**

Ülkü Demirci, Faculty of Health Sciences  
Department of Nutrition and Dietetics,  
Istanbul Aydın University, Istanbul, Turkey  
E-mail: [ulkudemirci@aydin.edu.tr](mailto:ulkudemirci@aydin.edu.tr)  
<https://orcid.org/0000-0002-2842-920X>