Assessment of Dietary Habits Among Healthcare Workers in Morning and Shift Work: A Cross-Sectional Study

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Abstract

Background: A proper diet plays a major role in preserving the quality of life and health for each individual. For healthcare workers, shift work can result in irregular and poor-quality dietary intake, which can lead to the development of health problems and chronic diseases.

Aim: This study aimed to analyse dietary habits among healthcare workers based on their work schedules (morning shifts vs. rotating/shift work) using validated dietary assessment tools.

Methods: A cross-sectional study was conducted from December 2023 to March 2024 in various departments of the Merkur Clinical Hospital. A total of 147 participants (physicians, nurses, and healthcare assistants) were surveyed using two validated instruments: the Mediterranean Diet Adherence Screener (MEDAS) and the Mediterranean Diet Serving Score (MDSS). Descriptive statistics and t-tests were used to compare dietary patterns between groups, with p-values <0.05 considered statistically significant.

Results: A statistically significant difference was observed in dessert consumption, with morning shift workers consuming sweets more frequently ($M = 3.67$, $SD = 2.39$) than shift workers ($M = 2.70$, $SD = 2.21$; $p < 0.05$). In contrast, shift workers consumed significantly more wine than morning shift workers ($M = 1.04$, $SD = 1.71$ vs. $M = 0.41$, $SD = 0.75$; $p < 0.05$).

Conclusion: The findings suggest that work schedules are associated with distinct dietary patterns among healthcare workers. Morning shift workers show a preference for sweets, while shift workers consume more alcohol. These results highlight the need for targeted workplace dietary interventions, including improved access to healthy meals and strategies to promote balanced eating across all shifts.

Keywords: dietary habits, healthcare workers, rotating/shift work, morning shifts, Mediterranean Diet

Introduction

A proper diet plays a crucial role in ensuring quality of life and preventing chronic diseases. Among various dietary models, the Mediterranean diet stands out for its health benefits, as it emphasizes unsaturated fats, vitamins, and fibre while limiting the intake of saturated fats (1). In healthcare settings, dietary habits of workers—particularly those working in rotating or shift schedules—are often suboptimal. Shift work disrupts regular meal patterns, promoting the consumption of high-calorie snacks such as crisps, chocolates, and vending machine foods. This behaviour may support short-term alertness but compromises nutritional quality. Inadequate water intake and excessive consumption of stimulants like coffee and tea are also common (2, 3).

Shift work in Croatian hospitals typically includes 12-hour day or night shifts, often followed by 48 hours off. However, some workers are also engaged in 8-hour shifts, 24-hour on-call duties, or split shifts. Despite this diversity, the most common arrangement remains the 12-hour rotation (4). Extensive research links shift work to various health risks, including metabolic disorders, sleep disturbances, gastrointestinal problems, and even malignancies such as colorectal and breast cancer. These health risks may be mediated in part by poor dietary habits that accompany irregular work hours (5-7). Yet, less attention has been paid to how dietary behaviours themselves may affect the overall wellbeing of healthcare shift workers. Evidence suggests that improper diet and lack of physical activity among shift workers can lead to obesity, micronutrient deficiencies, and increased risk of cardiovascular, gastrointestinal, and endocrine disorders (6, 8). Understanding the dietary habits of healthcare workers across different shift types is therefore essential. This study aimed to investigate differences in dietary behaviours among those working rotating/shift schedules and those on regular morning shifts. Specific attention was given to meal regularity, type of food consumed, and food preparation practices during working hours. The study also utilized validated instruments to assess adherence to the Mediterranean dietary pattern.

Methods

Study design

This was a cross-sectional study.

Ethics

The study was approved by the Ethics Committee of the Merkur Clinical Hospital, Zagreb (Reference number: 03/1-8954). Participants provided written informed consent and were assured of anonymity, research-only data use, and the right to withdraw at any time.

Participants and data collection

Participants were physicians, nurses and healthcare assistants from various departments of the Merkur Clinical Hospital, including the University Clinic for Diabetes and Endocrinology; the Clinic for Internal Medicine; the Clinic for Surgery; the Department of Urology; the Clinical Department of Medical Biochemistry and Laboratory Medicine; the Clinical Department of Diagnostic and Interventional Radiology; the Department of Otorhinolaryngology; and the Department of Anaesthesiology, Intensive Care Medicine, and Pain Management. Participants were eligible for inclusion if they were actively employed at the hospital during the study period, provided written informed consent, and completed the dietary questionnaire in full. Individuals were excluded if they declined to participate, submitted incomplete questionnaires, or held administrative or non-clinical roles.

The study was conducted between December 2023 and March 2024. Participants were selected through direct distribution of paper-based questionnaires in hospital departments during working hours. In this study, various forms of shift work were represented, reflecting the operational organization of the hospital. These included morning and afternoon alternating shifts (typically consisting of 8-hour shifts rotating weekly or biweekly), regular rotating shifts involving

12-hour day and night duties, and extended on-call shifts that may last up to 24 hours. Although these formats differ in duration and frequency, they share several common characteristics such as circadian disruption, irregular meal timing, and restricted access to balanced meals during work hours. For analytical purposes, these work patterns were grouped under the collective category of "rotating/shift work" (n = 107), in line with previous literature that treats these formats as similarly disruptive to health-related behaviours and metabolic regulation. The comparator group (n = 40) consisted of participants working standard 8-hour morning shifts, usually scheduled between 07:00 and 15:00. These workers followed more structured daytime routines and had greater opportunity for regular meal planning. The division into "morning shift" and "rotating/shift work" categories enabled comparison of dietary habits in relation to work schedule, particularly regarding adherence to the Mediterranean diet. Data were collected using paper-based questionnaires. The primary instruments employed in this study were the Mediterranean Diet Adherence Screener (MEDAS) and the Mediterranean Diet Serving Score (MDSS). MEDAS is a 14-item tool developed as part of the PREDIMED study, specifically designed to assess adherence to the Mediterranean dietary pattern. MDSS consists of 15 items that measure the frequency of consumption of various food groups. In this study, the MDSS demonstrated internal consistency with a Cronbach's α of 0.558, while the MEDAS exhibited higher reliability, with a Cronbach's α of 0.829, based on its validation in the Croatian context (1, 8). The following variables were systematically recorded: demographic characteristics, including age, gender, professional qualification, length of service, and work shift type. Additionally, dietary habits were assessed, encompassing meal regularity, food types consumed, frequency of vending machine usage, and adherence to the Mediterranean diet.

Statistical analysis

Two hypotheses were formulated for the study. The first hypothesis (H1) posits that healthcare personnel working rotating or shift work consume a greater quantity of sweets than those working exclusively morning shifts. The second hypothesis (H2) suggests that healthcare personnel working rotating or shift work consume more alcohol, specifically wine, than those working only morning shifts.

For statistical analysis, participants were grouped into two categories: morning shift (n = 40) and rotating/shift work (n = 107), combining all forms of shift-based schedules for comparative purposes. Descriptive statistics were used to summarize participant demographics and dietary variables. Differences between healthcare workers in morning shifts and those in rotating/shift work were assessed using independent samples t-tests. A p-value of < 0.05 was considered statistically significant. No effect sizes were calculated, and assumptions of the t-test such as normal distribution were not tested. Statistical analysis was conducted using IBM SPSS Statistics for Windows, version 26.0 (SPSS Inc., Chicago, USA).

Results

A total of 147 healthcare professionals participated in the study. Table 1 presents detailed sociodemographic characteristics, including age, gender, educational attain-ment, years of service, and type of work schedule. In terms of age, 30% of participants were 50 years or older, followed by the 19–29 years group (25%). Most respondents were female (78%), while 22% were male. Regarding education, only 6.8% of participants reported having a postgraduate degree, while the majority held a bachelor's or secondary degree in healthcare. Work experience varied: 35% had 0–10 years, 29% had 11–20 years, and the remainder had over 20 years of service. Types of work schedules included: morning shift only (27%), morning and afternoon rotating shifts (25%), regular rotating/shift work (28%), shift work combined with on-call duty (20%).

The dietary habits of healthcare workers were assessed using the Mediterranean Diet Serving Score (MDSS) questionnaire, which

evaluates the frequency of consumption of food groups associated with the Mediterranean dietary pattern. The results are presented in Table 2, which compares mean consumption frequencies of individual food categories between participants working morning shifts and those working rotating/shift schedules. A statistically significant difference was observed in dessert/sweet consumption, with shift workers consuming more desserts/sweets (M = 3.39, SD = 1.70) than morning shift workers (M = 2.35, SD = 1.51), t (145) = -3.4, p<0.01. This finding contradicts the initial hypothesis (H1), which assumed that morning shift workers would consume more sweets. No other statistically significant differences were found between the groups in the consumption of grains, vegetables, legumes, dairy products, meats, or other Mediterranean food components. However, a trend was observed toward higher consumption of nuts and fish among morning shift workers, although these differences did not reach statistical significance.

The dietary habits of healthcare workers were further assessed using selected items from the Mediterranean Diet Adherence Screener (MEDAS), which measures specific food and drink consumption behaviours. The results are presented in Table 3, comparing mean responses between participants working morning shifts and those engaged in rotating/shift schedules. A statistically significant difference was found in wine consumption, with shift workers reporting higher intake (M = 1.04, SD = 1.71) than morning shift workers (M = 0.41, SD = 0.75), t (141) = -2.2, p < 0.05. Additionally, a statistically significant difference was observed in the consumption of non-homemade sweets/cakes, which were consumed more frequently by morning shift workers (M = 3.67, SD = 2.39) compared to shift workers (M = 2.70, SD = 2.21), t (143) = 2.3, p< 0.05. No other statistically significant differences were found between the groups for other dietary behaviours included in the MEDAS questionnaire.

Table 1. *Sociodemographic characteristics of study participants (N=147)*

Variable	Category	Frequency (n)	Percentage (%)
Age	19-29 years	37	25
	30-39 years	34	23
	40-49 years	32	22
	50+ years	44	30
Gender	Male	33	22
	Female	114	78
Educational attainment	Secondary education	49	33
	Bachelor's degree	88	60
	Postgraduate degree	10	6.8
Years of service	0–10 years	51	35
	11–20 years	42	29
	21–30 years	35	24
	31+ years	19	13
Shift work concept	Morning shift	40	27
	Morning and afternoon shift	36	25
	Shift work	41	28
	Shift work and on-call duty	30	20

Note: Values are presented as frequency (n) and percentage (%). Work schedule categories were self-reported.

Table 2. *Mediterranean Diet Serving Score (MDSS) by Work Schedule (N Morning Shift = 40; N Shift Work = 107)*

Food Group	Morning Shift (M ± SD)	Shift Work (M ± SD)	t (df)	p-value
Grains	1.68 ± 0.80	1.93 ± 1.03	-1.4 (145)	> 0.05
Potato	3.98 ± 0.92	4.16 ± 1.18	-0.9 (145)	> 0.05
Olive oil	3.30 ± 1.71	3.47 ± 2.04	-0.5 (145)	> 0.05
Nuts	4.33 ± 1.80	3.76 ± 1.65	1.8 (145)	> 0.05
Fruit	2.13 ± 1.31	2.65 ± 1.67	-1.8 (145)	> 0.05
Vegetables	2.10 ± 1.01	2.13 ± 1.20	-0.1 (145)	> 0.05
Milk and dairy products	2.17 ± 1.15	2.39 ± 1.43	-0.9 (145)	> 0.05
Legumes	4.00 ± 0.93	4.13 ± 1.22	-0.6 (145)	> 0.05
Eggs	4.22 ± 1.23	3.80 ± 1.32	1.8 (145)	> 0.05
Fish	5.35 ± 0.86	5.02 ± 1.15	1.7 (145)	> 0.05
White meat	3.55 ± 0.90	3.48 ± 1.25	0.3 (145)	> 0.05
Red meat	3.83 ± 0.84	3.89 ± 1.22	-0.3 (145)	> 0.05
Desserts/sweets	2.35 ± 1.51	3.39 ± 1.70	-3.4 (145)	< 0.01
Juice	4.38 ± 2.15	4.87 ± 1.96	-1.3 (145)	> 0.05
Wine	5.73 ± 1.85	5.29 ± 1.83	1.3 (145)	> 0.05

Note: M – Mean; SD – Standard Deviation; t(df) – t-value with degrees of freedom; p – p-value from independent samples t-test

Table 3. *Selected Mediterranean Diet Adherence Screener (MEDAS) Items by Work Schedule (N Morning Shift = 40; N Shift Work = 107)*

MEDAS Item	Morning Shift (M ± SD)	Shift Work (M ± SD)	t (df)	p-value
Use olive oil as main fat source (1 = No; 2 = Yes)	1.40 ± 0.50	1.44 ± 0.50	-0.4 (145)	> 0.05
Olive oil consumed daily (spoonfuls)	2.75 ± 2.01	2.11 ± 1.90	1.8 (143)	> 0.05
Daily vegetable servings (200 g)	1.21 ± 0.73	1.15 ± 0.74	0.4 (132)	> 0.05
Daily raw vegetable servings (e.g., salad)	1.24 ± 0.74	1.02 ± 0.62	1.6 (117)	> 0.05
Daily fruit consumption (pieces or cups)	1.79 ± 1.67	1.47 ± 1.03	1.4 (143)	> 0.05
Red/processed meat consumption (servings/day, 100–150 g)	0.88 ± 0.49	1.04 ± 0.85	-1.0 (132)	> 0.05
Butter, margarine, cream (servings/day, 12 g)	0.59 ± 0.56	0.60 ± 0.69	-0.1 (128)	> 0.05
Sugary/carbonated drink consumption (servings/day)	0.54 ± 0.68	0.49 ± 1.05	0.3 (143)	> 0.05
Wine consumption (glasses/week)	0.41 ± 0.75	1.04 ± 1.71	-2.2 (141)	< 0.05
Legumes (servings/week, 150 g)	2.00 ± 1.05	1.73 ± 1.20	1.2 (140)	> 0.05
Fish or shellfish (servings/week, 100–150 g or 200 g shellfish)	0.76 ± 0.64	0.76 ± 0.64	-1.7 (137)	> 0.05
Non-homemade sweets/cakes (times/week)	3.67 ± 2.39	2.70 ± 2.21	2.3 (143)	< 0.05
Nuts including peanuts (servings/week, 30 g)	1.95 ± 2.08	2.36 ± 2.15	-1.0 (142)	> 0.05
Preference for poultry/rabbit over red/processed meat (1 = No; 2 = Yes)	1.73 ± 0.45	1.64 ± 0.52	0.9 (145)	> 0.05
Dishes with vegetables/olive oil (e.g., pasta, rice, sauces) – times/week	3.15 ± 1.73	2.68 ± 1.67	1.5 (145)	> 0.05

Note: M – Mean; SD – Standard Deviation; df – Degrees of Freedom; t – t-statistic; p – p-value from independent samples t-test

Discussion

This study explored the dietary habits of healthcare professionals in relation to their work schedules, with a focus on differences between morning shift and rotating/shift work. Using two validated tools—the Mediterranean Diet Serving Score (MDSS) and the Mediterranean Diet Adherence Screener (MEDAS)—the analysis revealed two statistically significant findings: morning shift workers reported higher consumption of non-homemade sweets, while shift workers consumed more wine. These findings partially confirm the study's hypotheses, with Hypothesis H2 (greater alcohol consumption in shift workers) supported, while Hypothesis H1 (greater sweet consumption in shift workers) was not. The higher sweet consumption observed among morning shift workers was unexpected and diverges from much of the literature, which often links shift work with irregular and less healthy dietary patterns, including greater intake of high-sugar snacks and processed foods (2, 3). A potential explanation may lie in the demographic structure of the morning shift group, where most participants were female and aged 50 and older. Hormonal changes during the premenopausal or menopausal period may contribute to increased cravings for sweet foods, especially in women (4). Additionally, individuals in this age group may be more likely to maintain structured daytime routines, which could include frequent but less nutritionally balanced snacking. Although our results did not show statistically significant differences in sweet consumption across age groups, this demographic skew suggests a potential association that warrants further targeted investigation. In contrast, the finding that shift workers reported significantly higher wine consumption aligns with previous research indicating that irregular schedules, job strain, and circadian disruption are associated with increased alcohol use among healthcare workers (9-11). Qualitative studies suggest that shift work may foster maladaptive coping behaviours, including alcohol consumption as a method to decompress or induce sleep after demanding or night shifts (10). Although moderate wine intake can be consistent with Mediterranean dietary principles, its association with irregular work patterns and potential for negative occupational outcomes warrants concern. Even low levels of alcohol intake may impair cognitive and psychomotor function, increasing the risk for clinical error (9). While no statistically significant differences were found in the broader MDSS categories such as vegetable, legume, or whole grain consumption, these specific behavioural differences in sweets and alcohol point to nuanced effects of work schedule on dietary patterns. This reinforces the argument that individual food choices may be more responsive to shift-related stress and availability than overall diet quality scores alone (5, 6). The lack of general dietary differences, despite differences in individual items, suggests that broader adherence to healthy eating models such as the Mediterranean diet remains low across groups—echoing findings from other regional studies (12-14). These findings contribute to the literature in several ways. First, the simultaneous application of two validated Mediterranean diet adherence tools in a Croatian hospital-based population is, to our knowledge, novel. Second, rather than finding a general degradation in diet quality among shift workers—as seen in some earlier studies that identify specific risk behaviours associated with each work schedule (15). Morning shift workers may be prone to routine-based sugar consumption, while shift workers may face greater risk of alcohol intake, particularly in the context of psychosocial stress or irregular sleep patterns. There is, however, some inconsistency in findings when compared to earlier research. For instance, Knutsson (15) found significantly higher intake of macronutrients such as carbohydrates, fats, and proteins in shift workers. Similarly, Molzof et al. (5) and Shrivastava et al. (14) noted increased consumption of unhealthy foods among those working night or extended shifts. The absence of such trends in our results may reflect cultural, institutional, or infrastructural differences in healthcare environments—such as meal break structure or food availability during different shifts.

At the same time, several limitations should be acknowledged. The categorization of shift types lacked granularity; for instance, participants working combined 8-hour morning shifts and on-call duties were grouped under "morning shift," potentially blurring distinctions in actual dietary exposure. Similarly, no differentiation was made between 12-hour day and 12-hour night shifts, which may affect physiological and behavioural outcomes differently. The use of self-reported dietary data is subject to recall bias and social desirability bias, and the sample was not demographically balanced—with a predominance of older female participants and Bachelor-educated healthcare workers—potentially limiting generalizability. The study utilized a convenience sample, potentially introducing selection bias and limiting the generalizability of findings. The sample had gender and shift distribution imbalances, and dietary data were based on self-reported tools, which may introduce recall bias. Furthermore, no regression analysis or control for confounding variables (e.g., age, gender, profession) was performed. Despite these limitations, the study offers important practical implications. The observed differences in alcohol and sweet consumption point to the need for work-schedule-sensitive interventions in healthcare environments. Hospitals and institutions should consider providing healthier meal and snack options during all shift hours, including night shifts, and implement educational programs focused on stress-related eating, alcohol moderation, and healthy food preparation. These initiatives could be integrated into broader occupational wellness frameworks and tailored by age, gender, and professional role. Moreover, further institutional investment is warranted to assess the quality and availability of food in hospital cafeterias and during off-peak hours. An important clarification must also be made. While an earlier statement suggested no significant differences in dietary habits between groups, this applied specifically to overall Mediterranean diet adherence. In contrast, our results clearly indicate statistically significant behavioural differences in the consumption of wine and sweets. These differences may have important implications for staff well-being, occupational health planning, and dietary education. This study also draws attention to potential gender and age influences on eating behaviours, which may intersect with work schedule. While our results did not find statistically significant age-based differences in sweet consumption, the sample's demographic skew—toward older female workers in the morning shift—highlights a potential area for further investigation. Existing studies have found that younger participants are more likely to consume fast food and sugary snacks (16), which contrasts with our findings and suggests that workplace environment and cultural norms may moderate such age-related trends.

Conclusion

This study provides evidence that work schedules significantly influence specific dietary behaviours among healthcare professionals. By comparing morning shift workers with those working rotating or extended shifts, two statistically significant patterns were identified: greater consumption of non-homemade sweets among morning shift workers and increased wine consumption among shift workers. While overall adherence to the Mediterranean diet did not differ significantly between groups, these behavioural differences suggest that the structure and demands of different work schedules affect how, when, and what healthcare workers eat. These findings emphasize that dietary habits are not merely a matter of individual choice but are shaped by institutional factors such as shift timing, meal break structure, and access to food during working hours. Morning shifts may promote routine eating patterns that include sweet snacks, particularly among older female employees, while rotating and night shifts may contribute to alcohol use as a coping mechanism for fatigue and disrupted sleep. These results have direct implications for hospital management and occupational health policy. Institutions should consider implementing interventions such as ensuring the availability of balanced meals and healthy

snacks during all shifts, improving the nutritional quality and accessibility of hospital cafeteria offerings, and incorporating dietary education and counselling into employee wellness programs. Age- and gender-responsive strategies should also be considered to better address the distinct needs of different worker populations. Promoting healthy eating in hospital environments is not only a matter of staff well-being but also of operational efficiency and patient safety, as poor nutrition can impact energy, cognitive function, and long-term health. Ultimately, this research highlights the need for a systemic approach to nutrition in healthcare settings—one that acknowledges the intersection of organizational structure, occupational stress, and individual health behaviour—and calls for ongoing research and policy development to support sustainable dietary improvements among shift-based hospital staff.

Declarations

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Data analysis and interpretation: MB, VK
Manuscript writing: MB
Critical review of the content: VK, DR
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