RESEARCH ARTICLE

Assessment of the Impact of Rotating Shifts on Lifestyle Patterns and Perceived Stress among Nurses and Health Care Providers

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ABSTRACT
Although rotating shift work is known to negatively affect health, its specific impact on hospital Nurses' and healthcare providers' health remains unclear, largely due to incomplete consideration of lifestyle factors and variations in work schedules. The relationship between work schedule characteristics, lifestyle habits, and perceived stress among Nurses and healthcare providers has yet to be fully established. This cross-sectional study aimed to examine the associations between these factors in a sample of 340 Nurses and health care providers from two hospitals, with a final analysis conducted on data from 329 participants. Work schedule details, lifestyle habits (including physical activity, diet, and sleep patterns), and levels of perceived stress were analyzed using linear regression models. The findings indicated that Nurses and health care providers working fixed day shifts experienced lower perceived stress ($\beta = 0.15$, $p = 0.007$) compared to those on rotating shifts. Among rotating-shift Nurses and health care providers, those on fixed evening and fixed night shifts reported longer sleep duration ($\beta = 0.27$, $p < 0.001$; $\beta = 0.25$, $p < 0.001$) than those with non-fixed rotating schedules. Longer periods of rotating shift work were linked to healthier eating habits ($\beta = 0.15$, $p = 0.008$), better sleep quality ($\beta = -0.17$, $p = 0.003$), reduced perceived stress ($\beta = -0.24$, $p < 0.001$), and shorter sleep duration ($\beta = -0.17$, $p = 0.003$). Overall, the study suggests that hospital Nurses' and healthcare providers' work schedules significantly influence their lifestyle patterns, including diet, sleep, and stress levels. Fixed shifts were associated with better lifestyle habits and reduced stress, while extended rotating shifts appeared to enable Nurses and health care providers to adapt their lifestyle behaviors more effectively.

Keywords: health, healthcare, lifestyle, and rotating-shift Nurses
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INTRODUCTION

Rotating shift work is linked to serious health risks, including cardiometabolic diseases and cancer [1,2,3,4,5], but the exact nature of its association with these risks remains debated. This uncertainty arises from the diversity in shift work schedules and the incomplete adjustment for key factors, especially lifestyle habits.Previous research has highlighted a connection between rotating shifts and an elevated risk of cardiometabolic and gastrointestinal diseases, as well as cancer-related mortality among hospital Nurses and health care providers [2,6,7]. These health concerns appear to converge around lifestyle factors, such as physical activity, dietary habits, and perceived stress [8,9]. However, the evidence on the health outcomes of shift work is inconsistent, particularly concerning sleep patterns [10,11], which have been linked to the development of cardiovascular disease, metabolic syndrome, and cancer [12,13,14]. Substantial research supports the relationship between sleep duration and health risks [15,16], and Nurses and health care providers , especially those on night shifts, often experience poor sleep quality [11,17]. As a result, examining the impact of rotating shifts on health without accounting for lifestyle variables—such as physical activity, diet, sleep patterns, and perceived stress—could

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Table 1: Demographic and work schedule characteristics of the participants (N = 329)

Variable	Mean ± SD / n (%)	Range
Age (year)	32.8 ± 8.6	21.2–61.6
Gender		
Male	15 (4.6)	
Female	314 (95.4)	
Education		
Associate degree	72 (21.9)	
Bachelor	242 (73.6)	
Master and higher	15 (4.6)	
Marriage		
Married	70 (21.3)	
Single	259 (78.7)	
Work unit/specialty area		
General medical/surgical ward	180 (54.7)	
Emergency/critical unit	113 (34.3)	
Other	36 (10.9)	
Length of work (year)	8.4 ± 8.2	0.3–40.0
Work schedule type a		
Fixed-day shift	80 (24.3)	
Rotating shift b	249 (75.7)	
Non-fixed-rotating shift	126 (38.3)	
Fixed-evening shift (16:00–24:00)	63 (19.1)	
Fixed-night shift (00:00–08:00)	60 (18.2)	
Length of rotating shift work (year)	7.6 ± 7.5	0.2–38.1

lead to biased conclusions.To meet the demands of different work periods, the body relies on a 24-hour internal regulatory mechanism to adjust physiological processes like the sleep-wake cycle and the function of vital organs [18]. For rotating shift workers, performing tasks during what would normally be their sleep period forces their physiological systems to readjust [18]. Whether this adjustment leads to a stable new state remains uncertain [18]. Globally, a large number of hospital Nurses and health care providers engage in shift work, which disrupts their circadian rhythms and could have negative health effects due to a range of complex factors. These factors include external stimuli, such as light, physical activity, diet, sleep patterns, and social stimuli like perceived stress. In addition to the physiological impact (circadian disruption), shift work may have behavioral and psychological consequences [19]. Investigating these combined effects among Nurses and health care providers working rotating shifts could provide valuable insights into how circadian rhythms are regulated and how shift work relates to health risks.Lifestyle habits are closely tied to health risks [12,14]. A recent cohort study found that rotating shifts and unhealthy lifestyle habits were jointly associated with negative health outcomes. Interestingly, unhealthy lifestyle habits were more strongly correlated with health risks than rotating shift work in female Nurses and health care providers , suggesting that adopting healthier lifestyle habits could mitigate these risks [2]. Rotating shifts can influence an individual's ability to maintain healthy habits, such as regular physical activity and a nutritious diet [2,20]. Unfortunately, inadequate physical activity, poor dietary choices, insufficient sleep, and high stress levels can lead to worsening health [8,9]. Therefore, it is essential to explore the relationship between work schedule characteristics, lifestyle habits, and perceived stress in Nurses and health care providers working rotating shifts.Hospital Nurses and health care providers often exhibit unhealthy lifestyle patterns, particularly low physical activity levels [21]. This can be attributed to the demands of their job and, for many women, traditional family roles, particularly in Asian cultures [22]. These factors are especially pronounced among Nurses and health care providers working rotating shifts. In Taiwan, for example, women have notably low levels of physical activity [23]. Given that the majority of Nurses and health care providers are female, it is crucial to focus on the lifestyle habits of Nurses and health care providers , especially those working in rotating shifts [24]. Rotating shifts tend to reduce Nurses and health care providers ' willingness to engage in physical activity due to fatigue and sleep problems, making them more likely to choose sedentary leisure activities [20]. However, a recent six-year follow-up study found no significant differences in physical activity levels between Nurses and health care providers working different schedules, highlighting the

Table 2: Comparison of lifestyle patterns between the different work schedule types

Variables	All Participants (N = 329)	Fixed-Day Shift (n = 80)	Rotating-Shift (n = 249)	t	d	p
Physical activity (MET-min/week)	1408.5 (1341.3)	1377.1 (1330.8)	1418.6 (1347.2)	−0.24	−0.03	0.81
Dietary behavior	66.0 (7.2)	65.8 (7.0)	66.1 (7.3)	−0.33	−0.04	0.74
General dietary behavior	62.0 (10.4)	61.4 (10.4)	62.1 (10.4)	−0.52	−0.07	0.60
Nutrient consumption behavior	63.5 (7.4)	63.5 (6.9)	63.5 (7.6)	0.01	0.001	0.99
Salt consumption behavior	66.2 (15.8)	67.0 (17.4)	66.0 (15.3)	0.50	0.06	0.62
High fat-density consumption behavior	63.3 (9.4)	63.9 (9.0)	63.1 (9.6)	0.61	0.08	0.54
Sugar consumption behavior	62.5 (13.0)	63.3 (13.6)	62.3 (12.9)	0.57	0.07	0.57
High fiber consumption behavior	61.3 (20.4)	54.5 (20.1)	63.5 (20.1)	−3.50	−0.45	0.001
Sleep duration (hour)	7.7 (1.7)	7.2 (1.1)	7.9 (1.8)	−4.27	−0.55	<0.001
Sleep quality	7.2 (3.1)	7.0 (2.9)	7.2 (3.2)	−0.61	−0.08	0.54
Perceived Stress	18.4 (4.2)	17.3 (3.7)	18.8 (4.3)	−2.73	−0.12	0.007

need for more clarity on this issue [25].Dietary behavior is another key factor influencing health risks, but whether it is affected by work schedule remains uncertain. Nurses and health care providers working rotating shifts often have poorer dietary habits [21], as their food preparation, selection, and purchasing decisions differ from those of day-shift workers [26]. However, research on the dietary habits of rotating-shift Nurses and health care providers is limited and lacks sufficient consideration of cultural differences [27]. We propose that the physiological effects of circadian rhythm disruption, combined with the behavioral impact of dietary habits, create a model that explains health risks in this population.Perceived stress is another critical factor for hospital Nurses and health care providers , contributing to their high turnover rates. Studies show that hospital Nurses and health care providers experience higher levels of perceived stress compared to the general population and employees in the private sector [28]. Rotating shifts are closely linked to higher stress levels [29], which play a key role in the development of major non-communicable diseases [30]. Furthermore, as sleep quality declines and sleep duration shortens, perceived stress and burnout increase significantly [28]. Despite this, there has been limited research on the relationship between work schedule characteristics and perceived stress in hospital Nurses and health care providers .This study aims to assess the associations between work schedule characteristics, lifestyle habits (physical activity, dietary behavior, and sleep patterns), and perceived stress among hospital Nurses and health care providers .

MATERIALS AND METHODS

Study Design

This study utilized a cross-sectional research design to examine the relationships between work schedule characteristics (type of schedule, type of rotating shifts, and shift duration), lifestyle habits (physical activity, dietary behavior, and sleep patterns), and perceived stress among Nurses and health care providers in hospitals.

Participants and Settings

The study participants were registered Nurses and health care providers aged 20 to 65 years, working in a medical center and a regional hospital . Initially, 1700 Nurses and health care providers with at least three months of work experience were identified through employee records. A stratified random sampling method, selecting 20% of Nurses and health care providers from 42 work units/specialty areas, was employed, generating a sample using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA). The process, overseen by the principal investigator, resulted in a final sample of 340 Nurses and health care providers who consented to participate. Research assistants (RA) explained the study and distributed paper questionnaires, ensuring participants understood the purpose to reduce response bias. Completed questionnaires were returned to the head Nurses and health care providers of each work unit within two weeks and then collected by the RA. To boost the response rate, participants were compensated $7 upon completing the survey.

Inclusion criteria:

- Nurses and health care providers aged 20–65
- A minimum of three months of work experience
- Full-time employment, with a maximum of 46 overtime hours per month
- Ability to speak and understand Mandarin
- Provided informed consent

Exclusion criteria:

- Less than three months of work experience
- Part-time employees
- Refusal to participate or inability to provide informed consent
- History of mental illness or cancer, due to its impact on lifestyle
- Experienced a major life event (e.g., death of a close family member) within the past six months, as this could affect stress levels.

Table 3: Comparison of lifestyle patterns between the different types of rotating shifts (n = 249)

Variables	Non-Fixed-Rotating-Shift (A) (n = 126)	Fixed-Evening Shift (B) (n = 63)	Fixed-Night Shift (C) (n = 60)	F	p	Post-Hoc
Physical activity (MET-min/week)	1333.0 (1187.0)	1577.1 (1298.1)	1431.9 (1682.4)	0.69	0.502	
Dietary behavior	65.4 (6.9)	66.6 (7.9)	66.9 (7.6)	1.11	0.331	
General dietary behavior	60.3 (9.1)	62.8 (11.2)	65.3 (11.2)	4.95	0.008	C > A
Nutrient consumption behavior	63.7 (7.2)	63.9 (8.2)	62.6 (7.6)	0.58	0.560	
Salt consumption behavior	66.8 (15.5)	68.4 (13.3)	61.7 (16.0)	3.46	0.033	B > C
High fat-density consumption	63.8 (9.4)	63.3 (9.5)	61.6 (9.9)	1.10	0.333	
Sugar consumption behavior	61.0 (10.7)	63.2 (15.2)	64.2 (14.2)	1.48	0.231	
High fiber consumption behavior	62.7 (19.3)	60.6 (20.3)	68.3 (20.9)	2.51	0.084	
Sleep duration (hour)	7.4 (1.3)	8.4 (1.8)	8.4 (2.3)	10.98	<0.001	A < B, A < C
Sleep quality	7.5 (2.9)	6.7 (3.3)	7.1 (3.5)	1.30	0.274	
Perceived Stress	19.2 (3.8)	18.5 (5.3)	18.2 (4.1)	1.27	0.283	

Sample size was calculated based on a linear multiple regression model with 30 predictors, a 0.05 alpha, and 80% power, resulting in a required sample of 282 participants. Considering an estimated 85% response rate, 332 participants were required.

Measures

Work Schedule Characteristics

Work schedules were categorized into two types: fixed-day shifts and rotating shifts. A fixed-day shift involved working only from 08:00–16:00 for the entire month. Rotating shifts included at least two different shifts in a month, and were classified into three types:

- **Non-fixed rotating shift**: working three shifts (day, evening, night) with no consistent rotation pattern, either clockwise or counter-clockwise, and with no quick returns (less than 11 hours between shifts).
- **Fixed-evening shift** or **fixed-night shift**: working a
- consistent evening or night shift for at least 16 days per month.

The duration of rotating shifts (in years) was also recorded.

Lifestyle Patterns

- **Physical Activity**: The Taiwanese version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF) was used, consisting of seven items evaluating various types of activity (household, transportation, leisure) over the past week. Physical activity was measured in MET-minutes/week (walking = 3.3 METs, moderate = 4.0 METs, vigorous = 8.0 METs) and categorized as low, moderate, or high based on CDC and ACSM guidelines.
- **Dietary Behavior**: The 21-item Modified Dietary Behavior Scale assessed general dietary habits, including intake of high-sodium, fat, cholesterol, and fiber foods. Each item was scored from 1–5, with higher total scores (range: 21–105) indicating healthier dietary behaviors.
- **Sleep Pattern**: The Taiwanese version of the Pittsburgh Sleep Quality Index (PSQI) was employed, a 19-item scale assessing sleep quality, duration, latency, efficiency, disturbances, and daytime dysfunction. Higher scores (range: 0–21) indicated poorer sleep quality.

Perceived Stress

The 10-item Chinese version of the Perceived Stress Scale, scored on a 5-point Likert scale (0–4), was used to assess the subjective perception of stress. Total scores ranged from 0–40, with higher scores representing greater perceived stress.

Data Analysis

Data were analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were expressed as mean (standard deviation) for continuous variables and frequency (percentage) for categorical variables. Inferential statistics were conducted using chi-square tests, t-tests, ANOVA, Pearson correlation, and multiple linear regression to examine associations between variables. Sociodemographic factors, correlated with lifestyle and

Table 4: Correlations among the length of rotating shift work and lifestyle patterns

Variables	Length of Rotating Shift Work	
	r	**p**
Physical activity (MET-min/week)	0.015	0.792
Dietary behavior	0.149	0.008
Sleep pattern		
Sleep duration (hour)	-0.169	0.003
Sleep quality	0.033	0.562
Perceived Stress	-0.238	<0.001

stress, were adjusted for in the regression models. Categorical variables were converted to dummy variables for regression analysis. Statistical significance was set at $p < 0.05$ for all tests.

RESULTS

The study initially recruited 340 participants, with 330 completing it (97.1% response rate); however, only 329 were analyzed due to missing information from one participant. Table 1 outlines the participants' sociodemographic and work schedule details, while Table 2 highlights their lifestyle patterns. When comparing fixed-day and rotating-shift Nurses and health care providers , there were no significant differences in physical activity, dietary habits, or sleep quality. However, fixed-day-shift Nurses and health care providers exhibited less healthy dietary behaviors, such as lower fiber intake (54.5 vs. 63.5, $t = -3.5$, $p = 0.001$), shorter sleep duration (7.2 vs. 7.9, $t = -4.27$, $p < 0.001$), and lower stress levels (17.3 vs. 18.8, $t = -2.73$, $p = 0.007$) than rotating-shift Nurses and health care providers . Table 3 shows that non-fixed rotating-shift Nurses and health care providers were generally less physically active compared to fixed-evening or fixed-night-shift Nurses and health care providers . They also reported less healthy dietary behaviors, reduced sleep quality, shorter sleep duration, and higher stress. Notably, only general dietary behavior ($F = 4.95$, $p = 0.008$), salt consumption behavior ($F = 3.46$, $p = 0.033$), and sleep duration ($F = 10.98$, $p < 0.001$) showed significant differences between rotating-shift types. Post-hoc Scheffe's tests indicated that non-fixed rotating-shift Nurses and health care providers had poorer general dietary habits compared to fixed-night Nurses and health care providers . Fixed-night Nurses and health care providers had worse salt consumption behaviors compared to fixed-evening-shift Nurses and health care providers , and non-fixed rotating-shift Nurses and health care providers experienced shorter sleep duration compared to both fixed-evening and fixed-night-shift Nurses and health care providers .Table 4 highlights the relationship between the duration of rotating shift work and lifestyle factors. A longer duration of rotating shifts was linked with healthier dietary habits ($r = 0.149$, $p = 0.008$), reduced sleep duration ($r = -0.169$, $p < 0.001$), and lower stress ($r = -0.238$, $p < 0.001$).In the multiple linear regression analysis adjusting for sociodemographic variables, work schedule type was correlated with sleep duration ($\beta = 0.18$, $p = 0.001$) and stress levels ($\beta = 0.15$, $p = 0.007$). Rotating-shift Nurses and health care providers had longer sleep durations ($\beta = 0.18$, $p = 0.001$) and higher stress ($\beta = 0.15$, $p = 0.007$) compared to fixed-day-shift Nurses and health care providers . Regarding shift type, fixed-evening and fixed-night-shift Nurses and health care providers had longer sleep durations ($\beta = 0.27$, $p < 0.001$; $\beta = 0.25$, $p < 0.001$) than non-fixed rotating-shift Nurses and health care providers . Additionally, the length of rotating shift work was associated with better dietary behaviors ($\beta = 0.15$, $p = 0.008$), shorter sleep duration ($\beta = -0.17$, $p = 0.003$), lower sleep quality ($\beta = -0.17$, $p = 0.003$), and decreased stress ($\beta = -0.24$, $p < 0.001$). Longer durations of rotating shifts were thus linked to healthier diets, shorter sleep, and lower stress among the participants.

DISCUSSION

To the best of our knowledge, this study is the first to examine the relationship between work schedule characteristics and various lifestyle patterns (physical activity, sleep patterns, and dietary behavior), as well as perceived stress among Nurses and health care providers . By distinguishing between different types of work schedules, we aimed to identify which schedule type could potentially promote a healthier lifestyle for Nurses and health care providers . The findings revealed that rotating shifts were linked to higher levels of perceived stress compared to fixed-day shifts. Furthermore, Nurses and health care providers working fixed evening or night shifts reported longer sleep durations than those on non-fixed rotating shifts. Nurses and health care providers with longer durations of rotating shift work tended to report shorter sleep durations but also exhibited healthier dietary habits, better sleep quality, and lower perceived stress.Physical activity has been highlighted as a mediator between rotating shifts and negative health outcomes [19]. Using the IPAQ-SF, a validated tool, this study assessed weekly physical activity across different work schedules. The results showed no significant differences in physical activity levels, aligning with a prior study that used accelerometers to track physical activity in rotating shift workers versus fixed-day shift workers [41]. Some studies reported that shift workers engaged in more occupational physical activity than day workers [42,43], while others found that shift workers were less likely to engage in physical or leisure-time activities [21]. Discrepancies in findings may arise due to varying definitions of physical activity (e.g., leisure-time versus occupational activity), different measurement methods, or cultural factors [19,25]. Future research should address these inconsistencies using standardized tools to clarify whether certain types of physical activity contribute to the health risks associated with rotating shift work in Nurses and health care providers .While there is no conclusive evidence linking rotating shift work with reduced physical activity among Nurses and health care providers , potential barriers to maintaining regular physical activity have been identified [20,22]. Nurses and health care providers on rotating shifts often face challenges in staying active due to fatigue, difficulty participating in social physical activities, and perceived exertion during exercise [20], along with other complex barriers [22].Dietary habits are a critical lifestyle factor affecting the risk of non-communicable diseases [9]. Our study showed that Nurses and health care providers on non-fixed rotating shifts had less healthy dietary behaviors than those on fixed evening or night shifts. Although this difference did not remain statistically significant after adjusting for sociodemographic factors, it is consistent with previous findings indicating that shift workers often consume less healthy foods due to limited availability during night shifts [27]. Irregular eating patterns associated with non-fixed rotating shifts may disrupt circadian rhythms, potentially leading to adverse metabolic

outcomes and increasing the risk of chronic diseases [19,21]. Conversely, the less healthy dietary behaviors, particularly regarding fiber intake, among fixed-day shift Nurses and health care providers could be attributed to their tightly scheduled routines, which may encourage fast food consumption or preference for snacks over full meals, likely influenced by cultural factors. Nurses and health care providers on fixed shifts may gradually adopt healthier dietary behaviors as they become accustomed to their work routine. Our results also suggest that a longer history of rotating shift work is associated with healthier dietary patterns.Rotating shift work's impact on health risks, especially through reduced sleep duration, has received growing attention. This study found that Nurses and health care providers on fixed evening or night shifts reported longer sleep durations than those on non-fixed rotating shifts. Surprisingly, Nurses and health care providers working rotating shifts had longer sleep durations compared to those on fixed-day shifts. This might be due to longer work hours during the day for fixed-day Nurses and health care providers or the higher usage of sleeping aids among rotating shift workers [44]. While no significant differences in sleep quality were found between shift types, Nurses and health care providers on fixed evening shifts had relatively better sleep quality than those on non-fixed rotating shifts, suggesting that fixed shifts may be more conducive to maintaining sufficient sleep. Moreover, short sleep durations have been linked to increased cardiometabolic disease risk [1,3]. In this study, Nurses and health care providers with longer durations of rotating shift work reported shorter sleep durations, but no association was found with sleep quality. Further research is needed to explore this phenomenon. Nurses and health care providers working in hospitals often face high levels of stress due to their work environment, and shift work exacerbates this stress [29,42]. Our study found that Nurses and health care providers working fixed-day shifts experienced lower perceived stress than those on rotating shifts. Among rotating shift workers, those on fixed evening or night shifts reported lower stress levels than those on non-fixed rotating shifts. This suggests that fixed shift schedules may help reduce perceived stress, thereby mitigating health risks associated with stress. Additionally, Nurses and health care providers with longer experience working rotating shifts reported lower stress levels, possibly due to greater familiarity with their work routines and improved clinical skills in handling emergencies, which helps them better manage shift-related stress over time.Given these findings, hospital administrators should be mindful of the negative lifestyle and psychological impacts of shift work on Nurses and health care providers . Efforts should be made to implement health screening programs for shift workers and offer resources and activities that promote healthy lifestyles among hospital staff.

CONCLUSION

Work schedule characteristics among hospital Nurses and health care providers were found to influence lifestyle factors, including dietary behavior, sleep patterns, and perceived stress. Early screening and lifestyle modifications should be integrated into health promotion strategies for rotating shift Nurses and health care providers to mitigate the adverse effects of shift work. Importantly, fixed or ergonomically designed shift schedules may promote healthier lifestyles and reduce stress, ultimately improving Nurses and health care providers ' overall well-being.

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