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Impact of Rotating Shift on Nurses' Health Outcomes: An Analytical Cross-Sectional Study at MMC Mardan

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ABSTRACT

The rotating shift work is widely practiced in healthcare facilities in order to provide 24/7 patient care; however, it is known to disrupt circadian rhythms and adversely influence the physical, psychological, and general well-being of the nurse. **Objectives:** The study aimed to investigate the impact of the rotating shift work system on the physical, mental, and general health of MMC, Mardan, KPK nurses. **Methods:** A cross-sectional study was conducted on 142 RN who worked at least one year on rotating shifts. The convenience sampling was adopted. A validated structured questionnaire with a Cronbach's alpha of 0.70 was used to gather the data. The Kruskal-Wallis and Mann-Whitney U tests were used to determine the demographic factors and health outcomes associations; the descriptive statistics summarized demographic and health-related variables. **Results:** The majority of the participants were aged between 25 and 29 (74.6) and female (72.5). Fatigue, sleep disturbances, emotional exhaustion, and stress were also reported as common characteristics of the issues. Almost 50 percent (45.1%), but above half (54.2%), did not feel disheartened because of rotating shifts. There was no substantial correlation between the health outcomes and gender and work area ($p>0.050$). **Conclusions:** The practice of rotating shift work at MMC Mardan has a negative impact on the physical and psychological well-being of nurses and especially on their fatigue levels, sleep quality, emotional distress, and overall well-being.

INTRODUCTION

A rotating shift system refers to a work schedule in which nurses and other medical professionals switch their shifts regularly. They work various shifts, such as day, evening, and night, rather than working the same shift at all times. This system is applied by hospitals to ensure the presence of staff throughout the day and night, which makes people continue varying their sleep patterns and body clock (1, 2). The shifts can go from day to evening to night (forward rotation) or from night to evening to day (backward rotation). Nursing literature defines rotating shifts as work schedules where employees take turns working day, evening, and night shifts instead of being fixed to just one shift (3-5). Previous Studies have repeatedly shown that having irregular or poorly organized work schedules can harm nurses' health in various aspects (6, 7). These include trouble sleeping, long-lasting tiredness, stomach problems, pain in muscles and joints, and a higher chance of heart issues due to certain physiological changes (8-10). Chiang et al. reported that hospital nurses' work schedules were significantly associated with their lifestyle habits, particularly dietary practices (11). Apart from this, nurses who work different shifts have a much higher chance of getting irritable bowel syndrome and stomach problems than nurses who work regular daytime hours (12). Psychologically, rigid or stressful schedules are strongly linked to burnout, emotional exhaustion, anxiety, and decreased job satisfaction (13, 15). Also, problems with balancing work and home life can cause family arguments

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and make it harder to get along with others. Ultimately, the state of ill health in nurses is not only detrimental to them, but it also has an impact on patient safety and the quality of care as well as the effectiveness of healthcare systems (16). This is a rotating shift system in Mardan Medical Complex (MMC), Hospital Mardan, Khyber Pakhtunkhwa, and it is affecting the normal circadian rhythms of nurses and can adversely affect their physical, mental, and social health. Although the world has provided evidence to support the harmful health effects of shift work, like fatigue, sleeping disorders, and stress, very little research has been carried out in the local setting of Mardan, KPK, and Pakistan. Rotating shift work is an essential component of nursing services; however, it poses substantial risks to nurses' physical, mental, and overall health due to disruption of circadian rhythms. While international literature has extensively documented these adverse effects, evidence from local healthcare settings in Pakistan, particularly in Khyber Pakhtunkhwa, remains limited. Moreover, few studies have simultaneously examined multiple health domains among nurses working rotating shifts using standardized measures. This lack of localized, comprehensive data highlights a critical research gap that warrants systematic investigation. The study aimed to examine how the rotating shift work system affects the physical, mental, and overall health of nurses at MMC, Mardan, KPK.

METHODS

An analytical cross-sectional study was conducted from June 2025 to September 2025 among registered nurses at Mardan Medical Complex (MMC) Hospital, Mardan. Nurses who had completed at least one year of experience in rotating shift duties were included using convenience sampling. A sample of 142 nurses was calculated using the single population proportion formula $n= Z^2p\ (1 - p)/d^2$, assuming a 50% prevalence, 94% confidence level, 6% margin of error, with an estimated population of 300 nurses. Although the sample size appears modest for an analytical study, it represents nearly half of the accessible nursing population at MMC Mardan and is comparable to similar hospital-based cross-sectional studies conducted in resource-limited settings. Written informed consent was taken. Data were collected through a structured questionnaire consisting of demographic variables and a health outcomes scale adapted from [17]. For assessing the health outcomes questionnaire comprised of 8 items was used. To record the responses Likert scale (1=Never, 2=Rarely, 3=Sometimes, 4=Often, and 5= Always) was used. The physical health domain included four items with a score range of 4–20, the mental health domain included three items with a score range of 3–15, and overall health was assessed using one item with a score range of 1–5. Higher scores indicated poorer perceived health status. Composite scores were obtained from calculated the mean of item responses within each domain. Reliability was assessed using Cronbach's alpha ($\alpha = 0.70$). The collected data were analyzed by using SPSS version 27.0. Frequencies and percentages were found for Descriptive statistics. The Shapiro–Wilk test and inspection of histograms were performed to check the normality of the data, which shows a non-normal distribution. Due to the ordinal nature of Likert-scale data and non-normal distribution, non-parametric tests (Mann–Whitney U and Kruskal–Wallis) were applied, and p value less than 0.050 was considered statistically significant.

RESULTS

A total of 142 nurses from MMC Mardan participated in the study. Most respondents were between 25 and 29 years of age (74.6%), with smaller proportions in the age groups 30-34 years (18.3%), 35-39 years (4.9%), and above 40 years (2.1%). Females made up the majority of the sample (72.5%), while 27.5% were male. Half of the nurses were single (50.7%), and 46.5% were married. Nearly half were working in general wards (48.6%), followed by 36.6% in critical areas and 14.8% in emergency departments. All respondents were staff nurses, and more than half had one to three years of experience (57.0%), while only 3.5% had more than ten years of experience. Every participant was working under a rotating shift schedule, as required in MMC Mardan (Table 1).

Table 1: Demographic Characteristics of Participants

Sr. No.	Variables	n (%)
Age in Years		
1	25-29	106 (74.6%)
	30-34	26 (18.3%)
	35-39	7 (4.9%)
	Above 40	3 (2.1%)
Gender		
2	Male	39 (27.5%)
	Female	103 (72.5%)
Marital Status		
3	Single	72 (50.7%)
	Married	66 (46.5%)
	Divorced	3 (2.1%)
	Separated	1 (0.7%)
Working Area		
4	General Ward	69 (48.6%)
	Critical	52 (36.6%)
	Emergency	21 (14.8%)
Current Role		
5	In charge Nurse	0 (0%)
	Nursing supervisor	0 (0%)
	Others	0 (0%)

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Working Experience (Years)		
6	1 To 3 Years	81 (57.0%)
	4 To 6 Years	46 (32.4%)
	7 To 9 Years	10 (7.0%)
	More than 10 Years	5 (3.5%)

Fatigue was commonly reported, with 42.3% sometimes and 21.8% often feeling fatigued after their shifts. Although most nurses did not regularly rely on medication, 22.5% reported sometimes using medicine to manage health issues, and 12.7% reported frequent or constant use. Gastrointestinal discomfort was also reported, with 21.8% sometimes experiencing indigestion or nausea after shifts, although 46.5% denied such symptoms. Sleep disturbances were significant, as 23.9% sometimes, and 23.2% often, and 28.2% always woke up frequently during sleep or earlier than intended. Emotional exhaustion due to rosters was reported by 31.7% sometimes and 20.5% often or always. Stress was also evident, with 28.2% sometimes and 28.9% often or always feeling stressed while working rotating shifts. Despite these issues, more than half of the nurses (54.2%) reported never feeling demotivated. Regarding overall health, 21.1% sometimes and 24% often or always felt that their health had deteriorated since working rotating shifts (Table 2).

Table 2: Impact of Rotating Shift on Nurses' Health Outcomes

Sr. No.	Variables	Never	Rarely	Sometimes	Often	Always
1	I feel physically fatigued after completing my shift.	18 (12.7%)	14 (9.9%)	60 (42.3%)	31 (21.8%)	19 (13.4%)
2	I regularly consume medicine to manage my health issues.	57 (40.1%)	35 (24.6%)	32 (22.5%)	12 (8.5%)	6 (4.2%)
3	I experience stomach problems (indigestion, nausea after my shift.)	66 (46.5 %)	24 (16.9%)	31 (21.8%)	11 (7.7%)	10 (7.0%)
4	I wake up frequently during sleep or too early in the morning.	14 (9.9%)	21 (14.8%)	34 (23.9%)	33 (23.2%)	40 (28.2%)
5	I feel emotionally exhausted because of my duty roster.	47 (33.1%)	21 (14.8%)	45 (31.7%)	12 (8.5%)	17 (12.0%)
6	I feel stressed while working under a rotating shift.	39 (27.5%)	22 (15.5%)	40 (28.2%)	24 (16.9%)	17 (12.0%)
7	I feel demotivated due to my work schedule.	77 (54.2%)	13 (9.2%)	33 (23.2%)	13(9.2%)	6 (4.2%)
8	Overall, my health has worsened since the rotating shift system.	42 (29.6%)	36 (25.4%)	30 (21.1%)	22 (15.5%)	12 (8.5%)

The below non-parametric test has been applied, which showed no statistically significant differences in physical health, mental health, or overall health across working areas (Kruskal-Wallis, $p>0.050$) or between male and female nurses (Mann-Whitney U, $p>0.050$). These results indicate that although nurses report fatigue, stress, sleep disturbances, and worsening health, these effects do not vary by gender or department (Table 3).

Table 3: Comparison of Health Domain Scores by Gender using the Mann-Whitney U Test

Health Domain	U-value	p-value
Physical Health	1864.0	0.500
Mental Health	1891.0	0.606
Overall, Health	1946.5	0.775

*Note: A p-value < 0.050 was considered statistically significant. *

DISCUSSION

This study examined the impact of rotating shift work on the physical, mental, and overall health of nurses working at Mardan Medical Complex (MMC), Mardan. Consistent with research, nurses in this study reported various health problems such as fatigue, sleep disturbances, emotional exhaustion, stress, and gastrointestinal issues, similar to the evidence presented in earlier studies (18). Santana et al. reported that the prevalent symptom is physical fatigue, reported by participants, aligns with a previous study that the major issue with shift work was fatigue; many individual participants commonly discussed feelings of tiredness and the effect this had on their ability to function and focus at work. It turned out that exhaustion was evident in all aspects of their life (19). Also, Circadian rhythm disruption and insufficient time of rest between shifts are considered to be the common causes of Fatigue in rotating shifts. On the same note, the gastrointestinal symptoms as noted by certain nurses are in line with previous reports, and it is possible that rotating shifts disrupts the normal digestive activity and predisposes an individual to develop indigestion and nausea (11). Along with fatigue, the topic of Sleep disturbances was also very high, as almost 3/4 of the nurses reported frequent or constant disruptions in sleep or early waking. Mao *et al.* reported that nurses working rotational shifts are more likely to experience circadian rhythm disruptions, which may lead to chronic sleep disorders and impaired cognitive function. (14). Moreover, Ko *et al.* underlined that the shift employees are subject to sleep-wake disturbances and consequent fatigue and sleep disruption because daytime sleep is not as restorative as nighttime sleep (17). Likewise, other psychological factors like emotional exhaustion and stress were also raised by a significant number of the participants. These results correspond with the results that report that the shift work was linked with the increased levels of work-family conflict and the risk of burnout, anxiety, and lower job satisfaction among nurses who work in the condition of the high-demand rotating schedule (4). It is important to note that over 50 percent of the nurses also reported never being demotivated, even with fatigue and stress. This was a sign of high professional

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commitment, job security, or a culture that ensured resilience among nurses in Pakistan. It may also imply a coping or adaptation to rotating shift systems that are popular in government hospitals. Moreover, in this study, the initial four questions focused on physical health, three questions focused on mental health, and the last question addressed overall health. We examined the association of these factors with gender and working area, but Statistical analysis revealed no significant differences in health outcomes by gender or working area. This study showed that rotating shift has similar health issues across different demographic groups and working areas at MMC, Mardan. The consistency in the shift system across the hospital may lead to these findings, as all nurses experience similar rotation patterns regardless of unit assignment. Overall, the results showed that rotating shifts hurts nurses' well-being, particularly in terms of sleep quality, fatigue, and psychological strain. These findings emphasize the global literature indicating that shift work is a significant occupational health concern in nursing, need specific interventions such as improved scheduling practices; sleep hygiene education, adequate rest intervals, and supportive workplace policies as stated in (20), that Institute of Medicine (IOM), the Joint Commission and many professional nursing organizations have emphasized the importance of reducing work-related fatigue among nurses as a priority issue. Furthermore, this association may be improved through appropriate shift work scheduling. At least 2 days off, avoidance of a schedule containing 7 consecutive work days, and increased participation in arranging work shifts might be able to reduce work stress.

This study is limited by its cross-sectional design and convenience sampling, which restrict causal inference and generalizability beyond the study setting. Data were collected from a single tertiary care hospital and relied on self-reported measures, potentially introducing response bias. Future research should employ multicenter, longitudinal, or interventional designs to better assess long-term health outcomes associated with rotating shifts. Additionally, evaluating the effectiveness of optimized scheduling, rest intervals, and workplace wellness interventions could guide evidence-based policy development.

CONCLUSIONS

This analytical cross-sectional study demonstrated a significant association between rotating shift work and adverse health outcomes among nurses at MMC Mardan. The primary reported issues were frequent fatigue, sleep disturbances, emotional exhaustion, and stress, with nearly half of the participants perceiving a decline in their overall health. However, no statistically significant differences in these outcomes were found based on gender or clinical working area. These findings underscore that rotating shifts are a pervasive occupational health concern in this setting, uniformly affecting nurses across demographics. To mitigate these risks, institutional interventions—such as optimized scheduling, sleep hygiene support, and workplace wellness programs are recommended to safeguard nurse well-being and, in turn, promote sustained quality of patient care.

Authors' Contribution

Conceptualization: AR
Methodology: SK, ZS, MG, MA
Formal analysis: AU
Writing and Drafting: SK
Review and Editing: AR, SK, ZS, MG, MA, AU

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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