

## Association between Shift Work and Circadian Rhythm Disruption among Healthcare Workers: A Descriptive Cross-Sectional Study in Government Hospitals in the Hail Region

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| ARTICLE INFORMATION                                                                                                                                                                 | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <b>Article history:</b><br>Published: August 2026<br><br><b>Keywords:</b><br>Shift Work<br>Circadian Rhythm Disruption<br>Sleep Disturbance<br>Work-related Fatigue<br>Saudi Arabia | Shift work is an essential component of healthcare services because healthcare workers are required to provide continuous patient care. Although day, rotating, and night shifts are necessary to ensure uninterrupted healthcare delivery, they may disrupt normal sleep patterns and the body's circadian rhythm, contributing to sleep disturbance, work-related fatigue, and reduced occupational performance. This study aimed to investigate the relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region. A descriptive cross-sectional quantitative design was adopted. Data were collected from 104 healthcare workers using a structured self-administered questionnaire and analyzed using descriptive and inferential statistical methods. The findings indicated moderate levels of sleep disturbance, work-related fatigue, and occupational performance impairment among the participants. No statistically significant association was found between current shift patterns and either sleep disturbance or work-related fatigue. However, sleep disturbance was strongly associated with work-related fatigue, and both variables were significant predictors of occupational performance, with work-related fatigue demonstrating the strongest effect. The study concludes that improving sleep quality and implementing effective fatigue management strategies may enhance occupational performance and support safer, higher-quality healthcare services. These findings provide evidence that may assist healthcare organizations in developing workplace interventions to promote employee well-being and improve healthcare outcomes. |

### 1. Introduction

Healthcare systems operate continuously to provide essential medical services and ensure patient care at all times. Consequently, healthcare workers are often required to work different shift schedules, including day, rotating, and night shifts. While these schedules are necessary to maintain uninterrupted healthcare services, they may interfere with the body's natural circadian rhythm, which regulates sleep–wake cycles, alertness, hormone secretion, and various physiological functions (Åkerstedt, 2003; Wright et al., 2013). The circadian rhythm plays a fundamental role in maintaining healthy sleep patterns and supporting overall physical and mental functioning. However, irregular work schedules and frequent night shifts may disrupt this biological rhythm, making it difficult for healthcare workers to obtain adequate sleep and maintain a consistent sleep schedule. Such disruptions may contribute to sleep disturbances, daytime sleepiness, fatigue, and difficulties adapting to changing work schedules (Costa, 2015; Wright et al., 2013). Several studies have reported that healthcare workers who perform rotating and night shifts are more likely to experience poor sleep quality, excessive fatigue, and circadian rhythm disruption compared to those working regular daytime schedules. In addition, sleep deprivation and fatigue may negatively affect concentration, decision-making, and work performance, potentially influencing both employee well-being and patient care quality (Ganesan et al., 2019; Qanash et al., 2021; Rosa et al., 2019). Although previous studies have examined the effects of shift work on sleep and health outcomes, limited research has comprehensively investigated sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region. Therefore, this study aims to explore these factors and provide evidence that may support the development of healthier work schedules and workplace interventions.

#### 1.1 Statement of the Problem

Healthcare workers are frequently required to work rotating and night shifts to ensure the continuous delivery of healthcare services. Although these schedules are essential, they may disrupt normal sleep patterns and the body's natural circadian rhythm, potentially affecting healthcare workers' well-being (Åkerstedt, 2003; Wright et al., 2013). Sleep disturbance and circadian rhythm disruption associated with shift work may contribute to work-related fatigue, reduced alertness, impaired concentration, and decreased occupational performance, which may ultimately affect the quality and safety of patient care (Booker et al., 2018; Caruso, 2014; Lockley et al., 2007).

Despite growing evidence on the effects of shift work, limited research has examined the relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region. Therefore, this study was conducted to address this research gap and provide evidence to support future workplace improvements.

## 1.2 Objectives

### 1.2.1 General Objective

To investigate the relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region.

### 1.2.2 Specific Objectives

- To identify the common shift patterns among healthcare workers.
- To determine the frequency of night shifts among healthcare workers.
- To assess sleep disturbance and circadian rhythm disruption associated with shift work.
- To evaluate the level of work-related fatigue among healthcare workers.
- To examine the effect of work-related fatigue on occupational performance.

### 1.2.3 Research Questions

- What are the common shift patterns among healthcare workers in governmental hospitals in the Hail Region?
- What is the level of sleep disturbance and circadian rhythm disruption among healthcare workers performing shift work?
- What is the level of work-related fatigue among healthcare workers performing shift work?
- To what extent does work-related fatigue affect occupational performance among healthcare workers?
- Is there a significant relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers?

## 2. Literature Review

### 2.1 Shift Work and Circadian Rhythm Disruption

Shift work has become a common practice in healthcare settings to ensure the continuous delivery of patient care. However, working during nighttime hours may conflict with the body's natural circadian rhythm.

According to Ganesan et al. (2019), healthcare workers who regularly worked rotating and night shifts experienced greater circadian rhythm disruption, shorter sleep duration, reduced alertness, and impaired performance compared to workers on regular daytime schedules. The study concluded that repeated night shift work may negatively affect both healthcare workers' performance and patient safety (Ganesan et al., 2019).

Similarly, Costa (2015) reported that shift work can significantly disrupt the normal sleep–wake cycle and circadian rhythm. The review explained that daytime sleep is generally shorter and less restorative than nighttime sleep, leading to chronic sleep deprivation, increased fatigue, excessive daytime sleepiness, and reduced cognitive performance among shift workers (Costa, 2015). Overall, previous studies indicate that circadian rhythm disruption is a common consequence of shift work and may contribute to various physical and psychological health problems among healthcare workers.

### 2.2 Sleep Quality Among Healthcare Workers

Sleep disturbance is one of the most commonly reported outcomes associated with shift work. Healthcare workers who perform night shifts often experience difficulty falling asleep during daytime hours and obtaining sufficient sleep.

A study conducted by Qanash et al. (2021) reported that healthcare professionals working night shifts at King Abdulaziz Medical City in Jeddah experienced significantly poorer sleep quality than those working regular daytime schedules. Participants also reported shorter sleep duration, difficulty sleeping during the day, increased fatigue, and negative physical and psychosocial effects (Qanash et al., 2021).

Similarly, Rosa et al. (2019) found that prolonged exposure to night shift work was associated with poor sleep quality, increased fatigue, work-related stress, decreased occupational performance, and a higher risk of chronic health problems among healthcare professionals. The authors recommended improving shift scheduling to reduce the negative effects of night work (Rosa et al., 2019). These findings demonstrate that shift work is strongly associated with sleep disturbances among healthcare professionals.

### 2.3 Work-Related Fatigue

Fatigue is another important consequence of shift work and sleep disruption. Inadequate sleep and irregular work schedules may reduce physical and mental energy levels, resulting in exhaustion and decreased alertness.

According to Caruso (2014), fatigue associated with shift work may impair workers' ability to remain attentive and perform tasks effectively. (Caruso, 2014)

Healthcare workers experiencing fatigue often report feeling physically exhausted during or after their shifts.

Furthermore, a study by Åkerstedt (2003) found that sleep loss and circadian misalignment significantly increase fatigue levels and daytime sleepiness among shift workers. The study emphasized that fatigue may accumulate over time when workers experience repeated sleep disruption. (Åkerstedt, 2003)

These findings highlight the importance of addressing fatigue as a major occupational health concern among healthcare workers.

### 2.4 Occupational Performance

Occupational performance refers to the ability of employees to carry out their professional responsibilities effectively and safely. Research suggests that sleep disturbances and fatigue may negatively affect concentration, attention, decision-making, and work productivity. (Lockley et al., 2007; Barger et al., 2005)

Lockley et al. (2007) reported that healthcare workers experiencing sleep deprivation demonstrated reduced cognitive performance and increased difficulty maintaining concentration during work hours. Similarly, Barger et al. (2005) found that extended work hours and insufficient sleep were associated with decreased performance and increased risk of work-related errors.

Overall, previous studies suggest that sleep disturbance and fatigue resulting from shift work may negatively influence occupational performance and healthcare service quality.

## 3. Methodology

### 3.1 Introduction

This chapter describes the methodology used to achieve the objectives of the study. It presents the research design, study setting, study population, eligibility criteria, sampling technique, study instrument, validity and reliability of the instrument, data collection procedure, ethical considerations, and the statistical methods used to analyze the data.

### 3.2 Research Design

This study employed a descriptive cross-sectional research design to investigate the relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region, Saudi Arabia.

A descriptive cross-sectional design was selected because it allows data to be collected at a single point in time and is appropriate for describing the study variables and examining the relationships among them without manipulating the study environment (Creswell & Creswell, 2018).

### 3.3 Study Setting

The study was conducted in governmental healthcare institutions in the Hail Region, Saudi Arabia. These institutions provide primary, secondary, and tertiary healthcare services and were considered appropriate settings for investigating the relationship between shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance.

### 3.4 Study Population

The target population consisted of healthcare workers employed in governmental healthcare institutions in the Hail Region, Saudi Arabia. The study included physicians, nurses, laboratory specialists, radiology specialists, pharmacists, respiratory therapists, and other healthcare professionals working fixed day, fixed night, rotating, or 12-hour shifts.

### 3.5 Inclusion Criteria

Participants were eligible for inclusion if they met the following criteria:

- Healthcare workers employed in governmental healthcare institutions in the Hail Region.
- Physicians, nurses, laboratory specialists, radiology specialists, pharmacists, respiratory therapists, and other healthcare professionals.
- Working fixed day, fixed night, rotating, or 12-hour shifts.
- Aged 20 years or older.
- Able to understand English.
- Willing to participate voluntarily.

### 3.6 Exclusion Criteria

Participants were excluded if they met any of the following criteria:

- Administrative employees who were not directly involved in patient care.
- Healthcare workers on long-term leave during the data collection period.
- Participants who submitted incomplete questionnaires.
- Individuals who declined to participate.

### 3.7 Sample Size and Sampling Technique

A convenience sampling technique was used to recruit eligible healthcare workers from governmental healthcare institutions in the Hail Region. A total of 104 healthcare workers voluntarily completed the electronic questionnaire. The sample included participants from different hospitals, departments, professions, and shift schedules.

### 3.8 Study Instrument

Data were collected using a structured self-administered questionnaire developed based on a review of previous literature related to shift work, sleep disturbance, circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers (Polit & Beck, 2021). The questionnaire was prepared in English and distributed electronically.

The questionnaire consisted of three sections:

- Part I: Demographic and occupational characteristics.
- Part II: Work-related information, including shift schedule, frequency of night shifts, sleep duration after night shifts, caffeine consumption, and the use of sleep aids.
- Part III: Study variables, including sleep disturbance and circadian rhythm disruption, work-related fatigue, and occupational performance.

### 3.9 Scoring System

The questionnaire responses were measured using a five-point Likert scale ranging from 1 (Never) to 5 (Always). Composite mean scores were calculated for each study domain and for the overall questionnaire. Higher scores indicated higher levels of the measured variables.

### 3.10 Validity of the Instrument

The questionnaire was developed after an extensive review of previous studies and published literature related to shift work, sleep disturbance, work-related fatigue, and occupational performance among healthcare workers. The wording, content, and sequence of the questionnaire items were designed to ensure that they adequately represented the study objectives and measured the intended constructs. Prior to data collection, the questionnaire was reviewed to ensure the clarity, appropriateness, and relevance of the items. Necessary modifications were made to improve the wording and comprehensibility of several statements before distributing the final version to participants. (Polit & Beck, 2021)

### 3.11 Reliability of the Instrument

The internal consistency reliability of the questionnaire was assessed using Cronbach's Alpha coefficient. Cronbach's Alpha is one of the most widely used indicators for evaluating the reliability of research instruments and determining the degree of consistency among items measuring the same construct. (Polit & Beck, 2021)

The obtained Cronbach's Alpha coefficients are presented in Table 3.11

Table 3.11 Reliability Analysis of the Study Instrument

| Study Variable                         | Number of Items | Cronbach's Alpha |
|----------------------------------------|-----------------|------------------|
| Sleep Disturbance and Circadian Rhythm | 4               | 0.860            |
| Work-related Fatigue                   | 2               | 0.747            |
| Occupational Performance               | 2               | 0.775            |
| Overall Questionnaire                  | 8               | 0.920            |

#### Interpretation

The results presented in Table 2.12 demonstrate that the questionnaire achieved satisfactory to excellent levels of internal consistency. The Sleep Disturbance and Circadian Rhythm domain obtained a Cronbach's Alpha coefficient of 0.860, indicating excellent reliability. The Work-related Fatigue domain achieved an alpha value of 0.747, while the Occupational Performance domain yielded an alpha coefficient of 0.775, both reflecting acceptable internal consistency.

Furthermore, the overall questionnaire achieved a Cronbach's Alpha coefficient of 0.920, indicating excellent overall reliability. These findings confirm that the study instrument possesses a high degree of internal consistency and is appropriate for measuring the study variables.

### 3.12 Data Collection Procedure

Data were collected from May 2026 to July 2026 using a structured electronic questionnaire created through Google Forms. The questionnaire link was distributed electronically to eligible healthcare workers in governmental hospitals across the Hail Region through appropriate communication channels. Participation was voluntary, and responses were collected until the required sample size was achieved. Completed questionnaires were reviewed for completeness, coded, and entered into the Statistical Package for the Social Sciences (SPSS) version 27 for analysis.

### 3.13 Statistical Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the participants' demographic characteristics and the study variables. Cronbach's Alpha coefficient was calculated to assess the internal consistency of the questionnaire. Pearson's Correlation Coefficient and One-Way Analysis of Variance (One-Way ANOVA) were used to examine the relationships and differences among the study variables. A p-value of less than 0.05 was considered statistically significant.

## 4. Findings

### 4.1 Sample Characteristics

Table 4.1. Demographic Characteristics of the Participants (N = 104)

| Variable    | Category | n  | %    |
|-------------|----------|----|------|
| Gender      | Male     | 23 | 22.1 |
|             | Female   | 81 | 77.9 |
| Age (years) | 20–30    | 78 | 75.0 |
|             | 31–40    | 23 | 22.1 |
|             | 41–50    | 3  | 2.9  |

Table 4.1 presents the demographic characteristics of the participants. Most participants were female (77.9%) and aged between 20 and 30 years (75.0%).

Table 4.2. Occupational Characteristics of the Participants (N = 104)

| Variable                        | Category                        | n    | %    |
|---------------------------------|---------------------------------|------|------|
| Hospital                        | King Salman Specialist Hospital | 50   | 48.1 |
| Maternity and Children Hospital | 24                              | 23.1 |      |
| King Khalid Hospital            | 15                              | 14.4 |      |
| Other                           | 15                              | 14.4 |      |
| Years of experience             | <1 year                         | 46   | 44.2 |
| 1–5 years                       | 37                              | 35.6 |      |
| 6–10 years                      | 17                              | 16.3 |      |
| >10 years                       | 4                               | 3.8  |      |

Table 4.2 summarizes the occupational characteristics of the participants. Nearly half of the participants worked at King Salman Specialist Hospital (48.1%), and 44.2% had less than one year of work experience.

Figure 1: Distribution of Participants by Current Shift Pattern

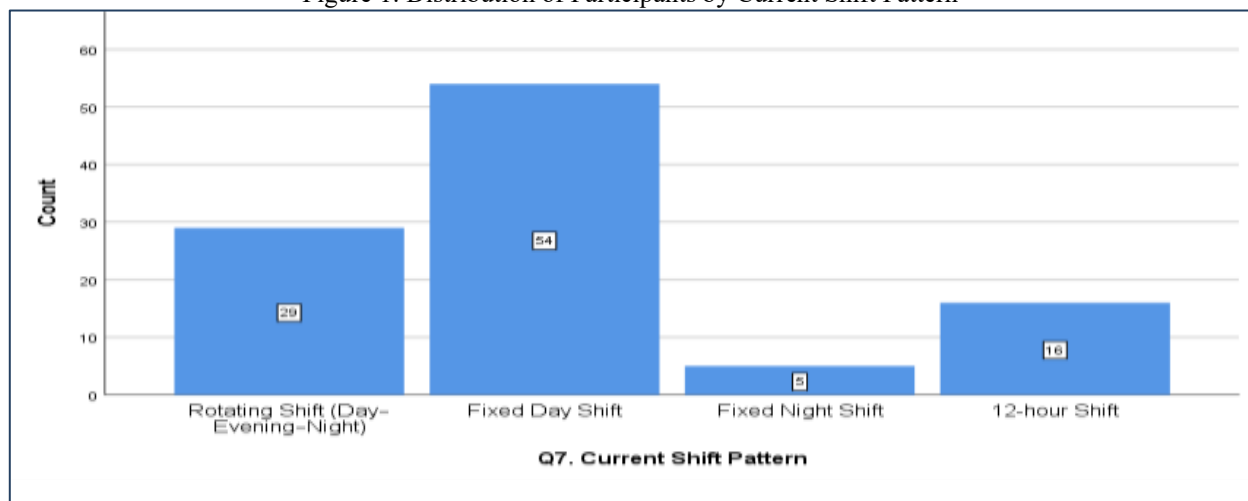


Figure 1 shows that fixed day shifts were the most common work schedule (51.9%), followed by rotating shifts (27.9%).

Figure 2: Distribution of Participants by Average Number of Night Shifts per Month

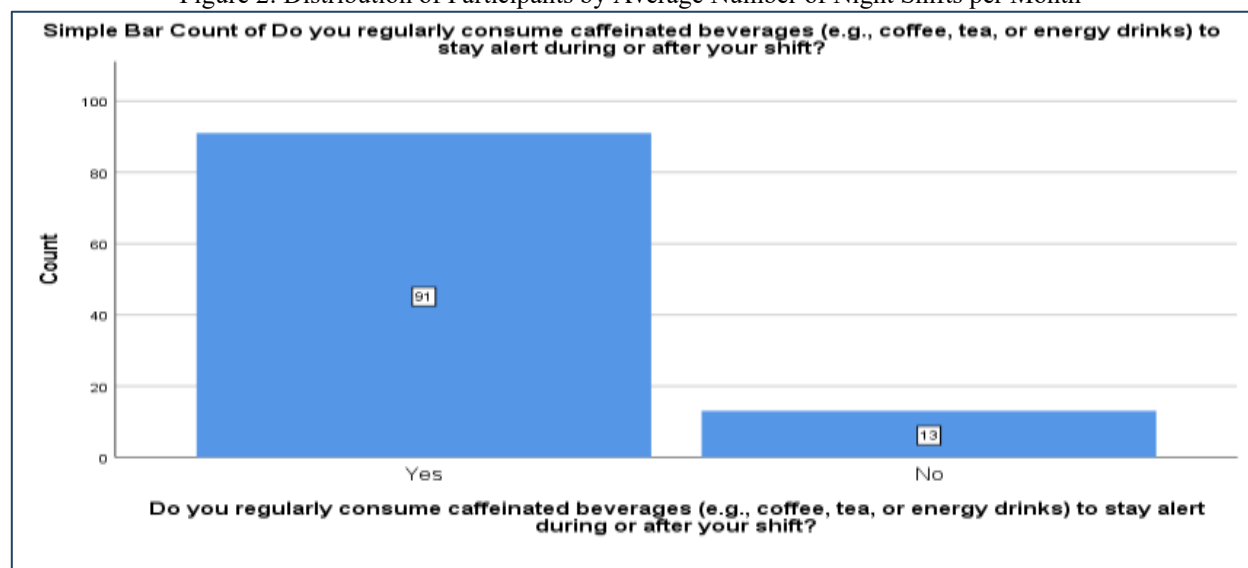


Figure 2 indicates that more than half of the participants worked fewer than five night shifts per month (54.8%).

Figure 3: Distribution of Participants by Average Sleep Duration After a Night Shift

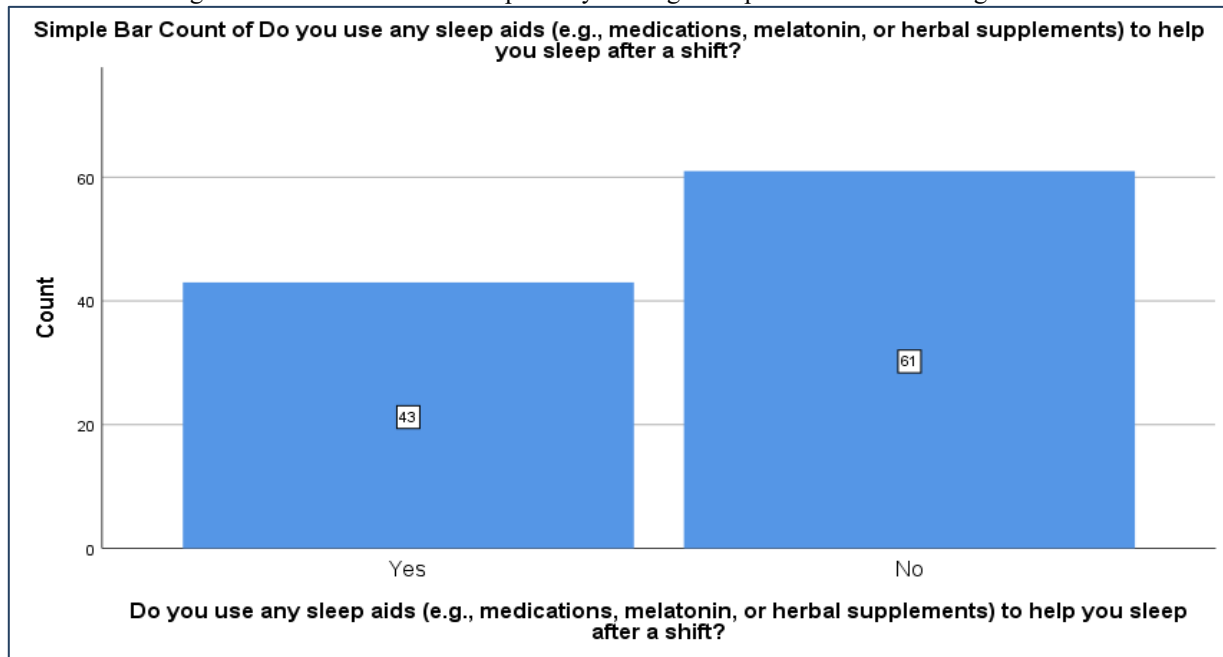


Figure 3 shows that the majority of participants reported sleeping 5–7 hours after completing a night shift (53.8%).

#### 4.2 Descriptive Statistics of the Study Variables

Table 4.2 Descriptive Statistics of the Study Variables

| Study Variable                         | N   | Minimum | Maximum | Mean | Std. Deviation |
|----------------------------------------|-----|---------|---------|------|----------------|
| Sleep Disturbance and Circadian Rhythm | 104 | 1.00    | 5.00    | 2.80 | 0.968          |
| Work-related Fatigue                   | 104 | 1.00    | 5.00    | 2.86 | 0.991          |
| Occupational Performance               | 104 | 1.00    | 5.00    | 2.72 | 0.957          |

Table 4.1 presents the descriptive statistics of the study variables. The results showed that healthcare workers reported moderate levels of sleep disturbance and circadian rhythm, work-related fatigue, and occupational performance impairment according to the adopted scoring system. Work-related fatigue recorded the highest mean score ( $M = 2.86$ ,  $SD = 0.99$ ), followed by sleep disturbance and circadian rhythm ( $M = 2.80$ ,  $SD = 0.97$ ), whereas occupational performance impairment recorded the lowest mean score ( $M = 2.72$ ,  $SD = 0.96$ ).

Figure 4: Mean Scores of the Study Variables

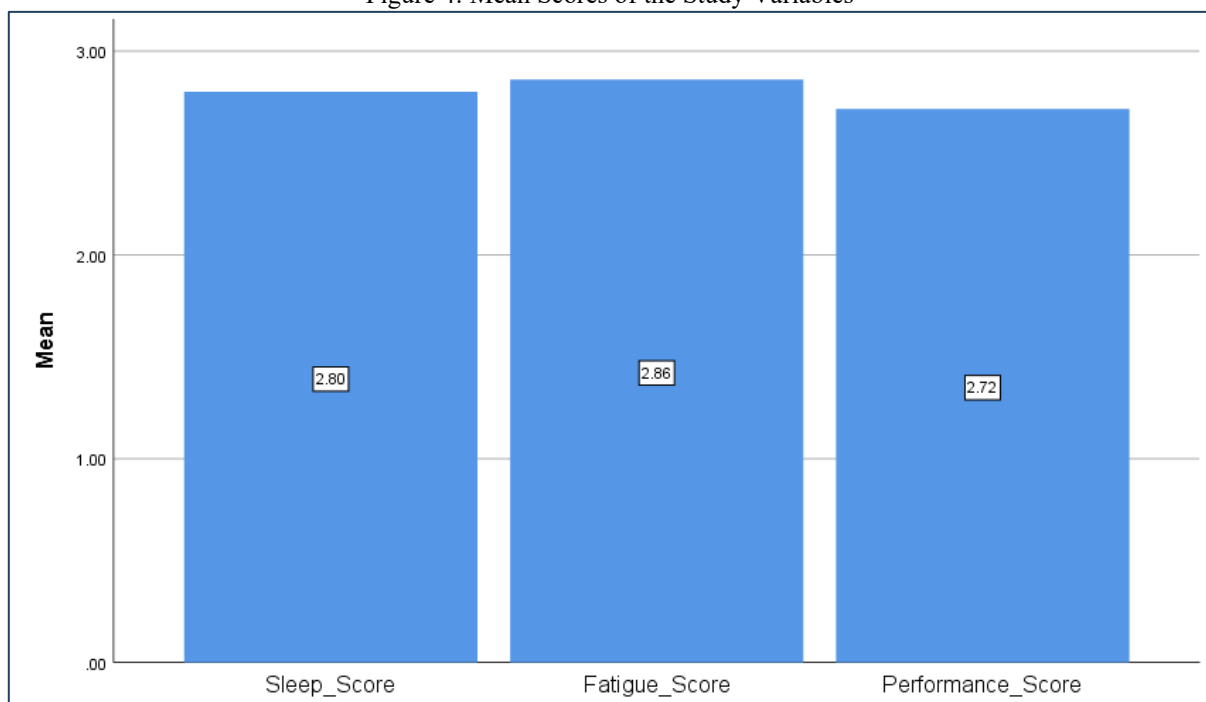


Figure 4 illustrates the mean scores of the study variables. Overall, healthcare workers reported moderate levels across all study variables, with work-related fatigue recording the highest mean score.



### 4.3 Hypothesis Testing

4.3.1 H1: *There is a significant effect of current shift pattern on sleep disturbance and circadian rhythm among healthcare workers.* Before conducting the One-Way ANOVA, Levene's Test was performed to examine the assumption of homogeneity of variances.

Table 4.1 Levene's Test of Homogeneity of Variances

| Levene Statistic | df1 | df2 | Sig.  |
|------------------|-----|-----|-------|
| 1.017            | 3   | 100 | 0.389 |

Levene's Test was not statistically significant, indicating that the assumption of homogeneity of variances was satisfied. Therefore, One-Way ANOVA was considered appropriate.

Table 4.3 2 One-Way ANOVA for the Effect of Current Shift Pattern on Sleep Disturbance

| Source         | Sum of Squares | df  | Mean Square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 5.415          | 3   | 1.805       | 1.983 | 0.121 |
| Within Groups  | 91.007         | 100 | 0.910       |       |       |
| Total          | 96.422         | 103 |             |       |       |

The One-Way ANOVA revealed no statistically significant differences in sleep disturbance and circadian rhythm according to the participants' current shift pattern ( $F = 1.983$ ,  $p = 0.121$ ). Therefore, the first research hypothesis was not supported.

Hypothesis Two (H2)

4.3.2 H2: *There is a significant relationship between sleep disturbance and work-related fatigue among healthcare workers.*

Table 4.3 Pearson Correlation Between Sleep Disturbance and Work-related Fatigue

| Variables                              | Sleep Disturbance | Work-related Fatigue |
|----------------------------------------|-------------------|----------------------|
| Sleep Disturbance and Circadian Rhythm | 1.000             | 0.735                |
| Work-related Fatigue                   | 0.735             | 1.000                |
| Sig. (2-tailed)                        | —                 | <0.001               |
| N                                      | 104               | 104                  |

Pearson's Correlation analysis revealed a strong positive relationship between sleep disturbance and work-related fatigue ( $r = 0.735$ ,  $p < 0.001$ ). Therefore, the second research hypothesis was supported.

Hypothesis Three (H3)

4.3.3 H3: *There is a significant effect of current shift pattern on work-related fatigue among healthcare workers.*

Before conducting the One-Way ANOVA, Levene's Test was performed to examine the assumption of homogeneity of variances.

Table 4.4 Levene's Test of Homogeneity of Variances for Work-related Fatigue

| Levene Statistic | df1 | df2 | Sig.   |
|------------------|-----|-----|--------|
| 0.854*           | 3   | 100 | >0.05* |

Levene's Test indicated that the assumption of homogeneity of variances was satisfied.

Table 4.5 One-Way ANOVA for the Effect of Current Shift Pattern on Work-related Fatigue

| Source         | Sum of Squares | df  | Mean Square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 5.043          | 3   | 1.681       | 1.748 | 0.162 |
| Within Groups  | 96.185         | 100 | 0.962       |       |       |
| Total          | 101.228        | 103 |             |       |       |

The One-Way ANOVA showed no statistically significant differences in work-related fatigue according to the participants' current shift pattern ( $F = 1.748$ ,  $p = 0.162$ ). Therefore, the third research hypothesis was not supported.

Hypothesis Four (H4)

4.3.4 H4: *Sleep disturbance and work-related fatigue significantly predict occupational performance among healthcare workers.*

Multiple Linear Regression Analysis was conducted to determine whether sleep disturbance and work-related fatigue significantly predicted occupational performance.

Table 4.6 Model Summary

| Model | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | Std. Error | Durbin-Watson |
|-------|-------|----------------|-------------------------|------------|---------------|
| 1     | 0.838 | 0.703          | 0.697                   | 0.527      | 2.029         |

The regression model demonstrated a strong relationship between the independent variables and occupational performance ( $R = 0.838$ ) and explained 70.3% of the variance in occupational performance ( $R^2 = 0.703$ ).

Table 4.7 ANOVA for the Regression Model

| Source     | Sum of Squares | df  | Mean Square | F       | Sig.   |
|------------|----------------|-----|-------------|---------|--------|
| Regression | 66.319         | 2   | 33.160      | 119.342 | <0.001 |
| Residual   | 28.063         | 101 | 0.278       |         |        |
| Total      | 94.382         | 103 |             |         |        |

The regression model was statistically significant ( $F = 119.342$ ,  $p < 0.001$ ), indicating that the independent variables significantly predicted occupational performance.

Table 4.8 Regression Coefficients

| Predictor                              | B     | Beta  | t     | Sig.   |
|----------------------------------------|-------|-------|-------|--------|
| Constant                               | 0.233 | —     | 1.375 | 0.172  |
| Sleep Disturbance and Circadian Rhythm | 0.368 | 0.372 | 4.649 | <0.001 |
| Work-related Fatigue                   | 0.508 | 0.526 | 6.575 | <0.001 |

The regression coefficients indicated that both independent variables significantly predicted occupational performance. Sleep disturbance and circadian rhythm significantly predicted occupational performance ( $\beta = 0.372$ ,  $t = 4.649$ ,  $p < 0.001$ ). Likewise, work-related fatigue was a statistically significant predictor ( $\beta = 0.526$ ,  $t = 6.575$ ,  $p < 0.001$ ). Among the two predictors, work-related fatigue demonstrated the strongest standardized effect. Therefore, the fourth research hypothesis was supported.

#### 4.4 Summary of Hypothesis Testing

Table 4.1 Summary of Hypothesis Testing

| Hypothesis                                                                                                                     | Statistical Test           | Result                                                    |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------|
| H1: There is a significant effect of current shift pattern on sleep disturbance and circadian rhythm among healthcare workers. | One-Way ANOVA              | Not Supported ( $F = 1.983$ , $p = 0.121$ )               |
| H2: There is a significant relationship between sleep disturbance and work-related fatigue among healthcare workers.           | Pearson Correlation        | Supported ( $r = 0.735$ , $p < 0.001$ )                   |
| H3: There is a significant effect of current shift pattern on work-related fatigue among healthcare workers.                   | One-Way ANOVA              | Not Supported ( $F = 1.748$ , $p = 0.162$ )               |
| H4: Sleep disturbance and work-related fatigue significantly predict occupational performance among healthcare workers.        | Multiple Linear Regression | Supported ( $F = 119.342$ , $p < 0.001$ ; $R^2 = 0.703$ ) |

Table 4.1 summarizes the findings of the four research hypotheses. Two hypotheses (H2 and H4) were supported, whereas the remaining two hypotheses (H1 and H3) were not supported. The findings demonstrated that current shift patterns were not significantly associated with differences in sleep disturbance and circadian rhythm or work-related fatigue. However, a strong positive relationship was observed between sleep disturbance and work-related fatigue. Furthermore, both sleep disturbance and work-related fatigue were significant predictors of occupational performance among healthcare workers.

#### 4.5 Chapter Summary

This chapter presented the statistical analyses and findings of the study. Descriptive statistics showed that healthcare workers reported moderate levels of sleep disturbance and circadian rhythm, work-related fatigue, and occupational performance impairment. Prior to hypothesis testing, the assumptions required for parametric statistical analyses were examined. The assumptions of One-Way ANOVA and Multiple Linear Regression were adequately satisfied, indicating that the selected statistical procedures were appropriate for the study data.

Hypothesis testing demonstrated that current shift pattern did not significantly affect sleep disturbance and circadian rhythm or work-related fatigue. In contrast, a strong positive relationship was found between sleep disturbance and work-related fatigue. Moreover, Multiple Linear Regression Analysis showed that both sleep disturbance and work-related fatigue significantly predicted occupational performance, with the regression model explaining 70.3% of the variance in occupational performance.

#### 4.6 Discussion

The present study aimed to investigate the relationship between current shift patterns, sleep disturbance and circadian rhythm disruption, work-related fatigue, and occupational performance among healthcare workers in governmental hospitals in the Hail Region.

The descriptive findings showed that healthcare workers reported moderate levels of sleep disturbance, work-related fatigue, and occupational performance impairment. These findings suggest that although the participants experienced noticeable sleep-related problems and fatigue, the overall severity remained at a moderate level rather than a high level. This may reflect the ability of healthcare workers to adapt to the demands of their work while still experiencing challenges related to sleep quality and fatigue.

The first hypothesis examined whether current shift patterns were associated with sleep disturbance and circadian rhythm disruption. The results showed no statistically significant differences among healthcare workers with different shift schedules. Although previous studies have frequently reported poorer sleep quality among employees working rotating or night shifts, the findings of the present study did not demonstrate a significant association between the current shift pattern and sleep disturbance. One possible explanation is that more than half of the participants worked fixed day shifts, while only a small proportion worked permanent night shifts. In addition, most participants reported working fewer than five night shifts per month, which may have reduced the variation between the different shift groups. Therefore, healthcare workers in this sample appeared to experience similar levels of sleep disturbance regardless of their current work schedule.

Similarly, the third hypothesis showed that current shift patterns were not significantly associated with work-related fatigue. Participants reported comparable levels of fatigue across the different shift schedules. This finding may indicate that work-related fatigue is influenced by multiple occupational and personal factors beyond shift pattern alone. Factors such as workload, staffing levels, psychological stress, recovery time, individual health status, and personal sleep habits may contribute to fatigue regardless of whether employees work day, rotating, or night shifts.

A major finding of the present study was the strong positive relationship between sleep disturbance and work-related fatigue. Healthcare workers who reported greater sleep disturbance also reported higher levels of work-related fatigue. This finding is consistent with previous literature suggesting that inadequate sleep, disrupted sleep-wake cycles, and circadian rhythm disturbances are closely associated with increased physical and mental fatigue among healthcare workers. Sleep is essential for physical recovery,



cognitive functioning, and emotional well-being. Therefore, insufficient or poor-quality sleep may reduce energy levels, impair alertness, and increase feelings of exhaustion during work.

The regression analysis further demonstrated that both sleep disturbance and work-related fatigue were significant predictors of occupational performance. Among the two variables, work-related fatigue showed the strongest contribution to occupational performance, indicating that fatigue may have a greater influence on employees' perceived ability to perform their professional responsibilities effectively. In addition, the regression model explained approximately 70.3% of the variation in occupational performance, suggesting that sleep disturbance and work-related fatigue together represent important factors associated with healthcare workers' job performance.

These findings are consistent with previous studies reporting that poor sleep quality and fatigue are associated with reduced concentration, decreased attention, impaired decision-making, and lower work efficiency among healthcare professionals. Healthcare workers frequently perform tasks that require sustained attention, rapid decision-making, and accurate clinical judgment. Consequently, difficulties related to sleep and fatigue may negatively influence their ability to maintain optimal occupational performance during demanding work situations.

Overall, the findings of this study emphasize that while current shift patterns were not significantly associated with sleep disturbance or work-related fatigue within the study sample, sleep disturbance and work-related fatigue themselves were strongly associated with each other and were significantly related to occupational performance. These findings highlight the importance of promoting healthy sleep habits, supporting fatigue management strategies, and implementing workplace interventions that improve employee well-being. Such measures may contribute to maintaining better occupational performance and improving the quality of healthcare services provided to patients.

## 5. Conclusion and Recommendations

### 5.1 Study Limitations

- Data were collected using self-reported questionnaires, which may be affected by response bias.
- Other factors (e.g., workload, job stress, working hours, organizational support, job roles, and environmental factors) were not examined.

### 5.2 Study Recommendations

Based on the empirical evidence linking sleep issues and fatigue to decreased occupational performance, the following measures are recommended:

#### 5.2.1 Practical Recommendations for Healthcare Facilities:

- Healthcare facilities should regularly assess sleep disturbance and work-related fatigue among healthcare workers to identify individuals who may need additional support.
- Healthcare organizations should promote awareness of healthy sleep practices and the potential impact of sleep disturbance and work-related fatigue on occupational performance.
- Healthcare administrators should consider employees' sleep health and work-related fatigue when developing workplace health and well-being initiatives.

#### 5.3.1 Recommendations for Future Research:

- Investigate additional factors affecting sleep disturbance, work-related fatigue, and occupational performance (e.g., workload, job stress, working hours, and organizational support).
- Explore these relationships among different groups of healthcare workers.
- Conduct longitudinal or experimental studies to further investigate these relationships.

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