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**Original Research Article**

# Fatigue, depression and anxiety among nurses working in shift in a tertiary care hospital in South India

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## ABSTRACT

**Background:** Shift work has become a social and economic necessity, as most sectors like the healthcare require round the clock operation. Extended and variable working hours leads to desynchronization of the body's circadian rhythm. Thus, shift work is commonly associated with various physical and mental disorders like insomnia, fatigue, depression, anxiety, cognitive impairment, etc. The aim of the study was to assess the prevalence of sleep deprivation and hence, the levels of fatigue, depression and anxiety among shift working nurses.
**Methods:** This cross-sectional study was conducted among shift working nurses. Sleep deprivation among 97 female and 3 male healthy nurses of age 20-50 years was assessed by Epworth Sleepiness Scale (ESS). Fatigue Severity Scale, Patient Health Questionnaire (PHQ-9) and Hamilton Anxiety Rating Scale (HAM-A) were used for assessing fatigue, depression and anxiety respectively. Level of Sleep deprivation, Depression and Anxiety were expressed in Proportion. Difference in fatigue levels during day and night shift was analyzed using Wilcoxon Signed-Ranks Test.
**Results:** Analysis of ESS, showed, 69% of shift working nurses had poorer sleep quality. The level of fatigue experienced following a night shift work was significantly higher than that following day shift work ($Z= 3.34$, $p = 0.0008$). Moderate to severe depression and anxiety was observed in 15% and 16% of the nurses working in shift.
**Conclusions:** Thus, shift work is inevitably associated with sleep deprivation. There exists an increased prevalence of fatigue, depression and anxiety among shift working nurses.

**Keywords:** Anxiety, Depression, Fatigue, Shift work, Sleep deprivation

## INTRODUCTION

Sleep plays vital role in promoting good physical, mental and emotional health. Adequate quantity and quality of sleep each night is necessary for the maintenance of homeostasis. Sleep deprivation (SD) is a condition where 'an individual is either partially or completely prevented from obtaining their usual amount of sleep in 24 hours'.[1] This serious health hazard is likely to result from inadequate quantity of sleep, poor quality of sleep, or sleep at the wrong time of the day. SD is common public health problem that affect individuals of all age groups. The need for nonstop work in certain sectors like industrial set up and health care has forced the workers into shift work.[2] Cognitive performance worsens with progressive sleep deprivation, as evidenced by its effects on general intellect, mental speed, response inhibition, reaction time, attention, working memory and other complex cognitive functions like decision making and multitasking.[3] Shift work has resulted in lifestyle modifications that affect the biological clock, i.e. the circadian rhythm. Disruption of this natural rhythm for a

long period leads to obesity, gastrointestinal disturbances, cardio-vascular diseases, intellectual impairment, menstrual irregularities and malignancies.[4] Altered circadian rhythm predisposes individuals to wide range of mood disorders, including impulsivity, mania, anxiety and depression.

Shift work has a negative impact on job performance, physical and emotional health, social and family life. It also leads to stress and dissatisfaction in job.[5] Fatigue is a principal cause of distress among night shift workers.[6] Shift work is also one of the probable cause of depression.[7,8] Long stretches of work and rotating shift hours are often associated with increased levels of anxiety.[9-11] Circadian disturbance caused by shift work increases the allostatic load i.e., 'the wear and tear' on the body as evidenced by an increased level of cytokines, insulin, cortisol and sympathetic activity. Endocrine and metabolic dysfunction brought on by prolonged stress can bring about structural remodelling of various brain regions concerned with emotion such as amygdala, hippocampus, thereby causing anxiety, aggression and depression.[12] Exposure to light, especially blue light, has been hypothesised to increase the hippocampal activity. Thus, the misalignment of the internal biological clock with the external light-dark cycle can also account for the mental health effects.[13]

Shift work and prolonged work hours among health care professionals, can result in burn out and increased incidences of errors in patient care. Nurses are the largest working group involved in shift work in health care systems. Reduced patient nurse ratio and increasing needs for nursing services has prolonged the duration of work hours for nurses. As altered circadian pattern brought on by rotational shift work has a negative impact on the work performance and mental health, increased prevalence of fatigue, depression and fatigue can be expected among shift working nurses. In our study, we aimed to find out the prevalence of sleep deprivation and its association with the levels of fatigue and to assess the depression and anxiety levels in shift working nurses.

## METHODS

This cross-sectional study conducted among 100 staff nurses of both sexes and their age group ranging from 20-50 years, on a rotating work schedule i.e., staff posted to day shift for a fortnight and the same staff posted to night shift for the next fortnight. Sample size was calculated considering prevalence of sleep deprivation among staff nurses as 51% with 20% precision.

The ethical approval was obtained from the Institution Human Ethics Committee.

Staff nurses from the departments like Medicine, Surgery, OBG, and Pediatrics who had a previous work experience of at least 1 year in rotating shift work were included for the study after obtaining their written informed consent. Staff nurses with a history of neurological, psychiatric and sleep disorders and those habituated to smoking, alcohol and any other drug consumption were excluded from the study.

There were 114 nurses enrolled for the study of whom 14 were excluded after taking history, as 4 were alcoholic, 2 were smokers, 2 were on anti-epileptic drugs and 6 were on anti-hypertensive medications.

The study was carried out over a duration of 6 months from May 2016 to October 2016.

Smokers experience sleep disturbance because of the stimulant effect of nicotine, nocturnal withdrawal and even due to its medical consequences such as chronic obstructive pulmonary disease.[14] Alcohol in low to moderate doses initially promotes sleep, but chronic use results in tolerance to its sedative effect and increases daytime sleepiness. The incidence of obstructive sleep apnoea is also higher among those who consume alcohol.[15] Drugs that cross the blood-brain barrier affect the quality and quantity of sleep. Anti-epileptics, analgesics, steroids, anti-hypertensive drugs are some of the common drugs altering sleep pattern.

### *Sleep deprivation*

The participants were informed about the test procedure and asked to fill the Epworth Sleepiness Scale (ESS).[16] The ESS is a scale used to measure daytime sleepiness and was hence used to assess sleep deprivation. This simple questionnaire asked the participant to rate his or her probability of falling asleep on a scale of increasing probability from 0 to 3 for eight different situations that most people engage in. (Ex. Likelihood of falling asleep while sitting and reading.). The scores for the eight questions were added together to obtain the total score.

### *Fatigue*

The level of fatigue following both night and day shift found using the Fatigue Severity Scale (FSS). The FSS questionnaire contains nine statements that an individual has to rate based on the severity of one's symptoms during the past week. The FSS is one of the most commonly used and reliable self-report questionnaires to assess and quantify fatigue.[17] The level of fatigue was assessed at the end of their day shift work and 3 to 4 days after beginning of their night shift work.[18] This ensured enough duration for the circadian rhythm to reset according to the altered working hours.

### *Depression*

Patient Health Questionnaire (PHQ-9) is a self-report questionnaire used as a screening and diagnostic tool for depression, administered at the end of night shift.[19] This simple and brief tool sites nine problems, which the

individual might have faced in the last 2 weeks, before undertaking the test.

### *Anxiety*

Hamilton Anxiety Rating Scale (HAM-A) is used to assess the severity of anxiety also administered at the end of night shift. The scale consists of 14 items, each defined by a series of symptoms and measures both psychic and somatic anxiety.[20]

### *Statistical Analysis*

Data was analysed using SPSS Version 19. Level of Sleep deprivation, Depression and Anxiety were expressed in percentage. Difference in fatigue levels during day and night shift was analysed using Wilcoxon Signed-Ranks Test. The Conventional level of $p< 0.05$, considered statistically significant.

## RESULTS

Of the 100 participants, 97 of them were females and the rest were male staff nurses. The mean age of the participants was 25.06 years. From the scores obtained from ESS, (69) 69% had disturbed sleep patterns due to shift work. Based on the ESS scores, those with scores ≥8 were considered to have disturbed sleep pattern. Table.1 The average ESS score obtained was 9.37 (±4.225). Majority of the nurses (42) 42% had mild SD (ESS scores of 8 to 12) Figure 1.

**Table 1: Prevalence of sleep deprivation among shift workers.**

| Epworth sleepiness score | Interpretation |
|---|---|
| Less than 8 | Normal sleep |
| 8-11 | Mild sleep deprivation |
| 12-15 | Moderate sleep deprivation |
| 16-24 | Severe sleep deprivation |

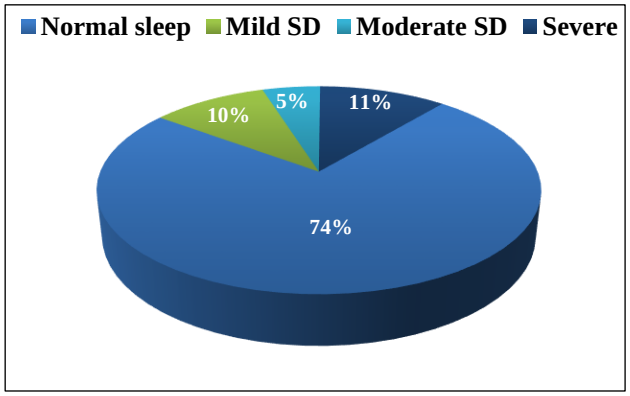


**Figure 1: Sleep deprivation among shift workers.**

The maximum score obtained in FSS during night shift and day shift hours was 61 and 57 respectively and the minimum score was 10 during the night and 9 during the day. It was observed that the level of fatigue experienced following a night shift was more than that of day shift in 65% of the staff nurses.

Wilcoxon Signed-Ranks Test was used to analyses these non-parametrical values. A p-value of less than 0.001 was statistically significant. Thus, the level of fatigue experienced following a night shift work was significantly higher than that following day shift work ($Z=3.34$, $p=0.0008$), Table 2.

**Table 2: Fatigue among shift workers using fatigue severity scale.**

| Domain | Day shift | | Night shift | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Fatigue | 23.5 | 9.192 | 29 | 15.55 | 0.0008 |
| % of nurse with fatigue | 32% | | 39% | | |

From the PHQ-9, 68% suffered from mild to moderate depression, 15% suffered from moderate to severe depression and 2% had no depression. The maximum score obtained was 26 and the minimum was 0. Mean and SD values were 5.5 and 2.121 respectively (Figure 2).

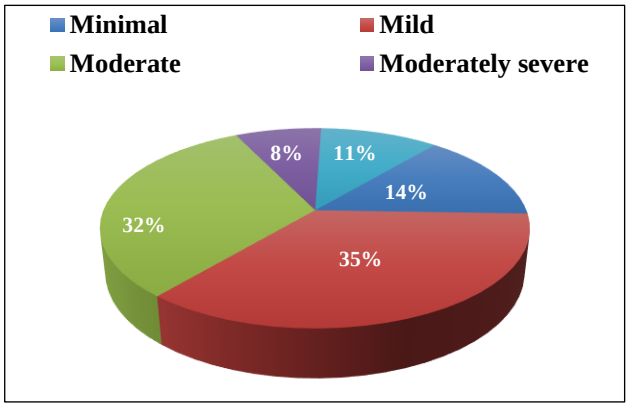


**Figure 2: Fatigue among shift workers using Fatigue Severity Scale.**

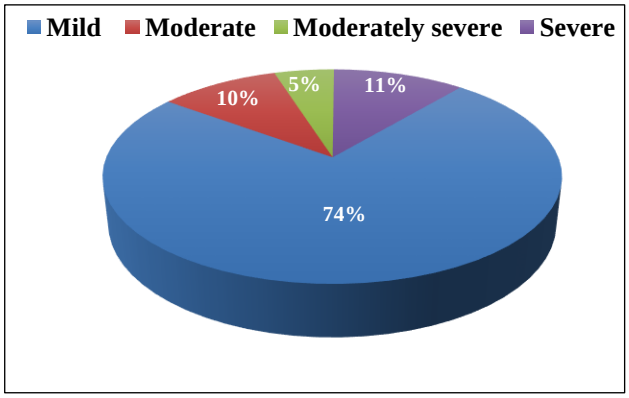


**Figure 3: Level of anxiety among shift workers.**

The scores obtained from the HAM-A showed that, 82% had mild to moderate anxiety, 16% had moderate to severe anxiety and 2% had no anxiety. The maximum score obtained was 50 and the minimum was 0. Mean and SD values were 9.5 and 9.192 respectively (Figure 3).

## DISCUSSION

Shift work is the important risk factor for most of the physical, mental and behavioral disorders like fatigue, depression and anxiety. In our present study, there exists a positive association between sleep deprivation and fatigue. Authors also find an increased prevalence of mild to moderate degree of depression among rotational shift workers (as a baseline). Higher level of fatigue reported in night shift than in day shift this may be due to reduced work force during night shift. Suzuki et al, had reported in his study that increased occurrence of error in workplace. This may be due to fatigue among shift working nurses as they were exposed to excessive workload and sleep deprivation.[21] Increase in frequency of night shift was also associated with fatigue among the subjects.[22] Reduced quality and quantity of sleep experienced by shift workers reduces their threshold for fatigue.

Sleep deprivation has a negative impact on mood, cognitive performance and motor function due to an increase in sleep propensity and destabilization of the wake state. In our study conducted among shift working nurses, majority of them found to have mild to moderate degree of depression following night shift. In a study conducted in Iran also showed high prevalence of anxiety and depression in shift working nurses.[23] Attention, judgement and decision-making capacity are affected as shift working nurses are subjected to long and variable work schedules. In a survey conducted in UK both men and women working in shift presented with symptoms depression.[24]

In this study, prevalence of anxiety levels was much higher among shifter working nurses. Attarchi et al, in his study found that prevalence of depressive symptoms and anxiety are 8.8% and 53.9% among nurses respectively.[25] In contrary there are some studies revealing no association exists between shift work and mental disorders.10 Altered work schedules leads to anxiety and depression, due to exhaustion as their rest and recovery time is very less.

This study brings forth the negative impacts of sleep deprivation on physical and mental wellbeing of shift working nurses. Appropriate work force education, napping before night shifts, anchor sleep (sleep occurring through at least half of the time normally reserved for sleep) diet and lifestyle modifications (Regular exercise, avoiding excess alcohol and caffeine intake) bright light treatment can be recommended to avoid the consequences of sleep deprivation among shift working nurses.

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