Sleep quality and sleep related breathing disorders among nursing staff working in a tertiary care teaching hospital

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Abstract

Background: Sleep is a critical biological function helping to optimize the functioning of an individual and in emotional regulation. Sleep is important for maintaining an individual's ability to think, to be vigilant and alert and also to sustain attention. Sleep disorders are found to be more prevalent among nurses owing to their erratic work schedules. This study aims to assess the sleep pattern and excessive daytime sleepiness among nursing staff using Pittsburgh sleep quality index (PSQI) and Epworth Sleepiness Scale (ESS) among nursing staff working in a tertiary care teaching hospital. **Materials and Methods:** The study is a hospital-based descriptive cross-sectional study, conducted in a tertiary care teaching hospital. The study participants included nursing staff age aged between 30 to 60 years. The Pittsburgh Sleep Quality Index was used to determine poor sleepers; while the Epworth Sleepiness Scale (ESS) was adopted to determine the presence of tendency of daytime sleepiness. Stop Bang questionnaire was used to screen for sleep related breathing disorders. **Result:** The study included 200 eligible subjects. Among the study 123 (61.5%) were poor sleepers and only 77 (39.5%) were good sleepers. About 76.5% of participants were found to suffer from some sleep problems. Among the study population 42 (21%) had high risk of OSA and 68.5% had intermediate risk of OSA. **Conclusion**: High proportion of nursing staff had poor sleep quality and an increased tendency to day time sleepiness. High and intermediate risk of OSA was also very high among them.
Keywords: Sleep quality, Sleep apnea, Pittsburgh Sleep Quality Index (PSQI), STOP Bang Questionnaire (SBQ)

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INTRODUCTION

Nursing is an important service in healthcare system required to obtain optimal outcomes in patients. Nurses have many responsibilities in a health care system which include patient engagement, improving the care of patients by coordinating, promoting and leading health care teams. Health care system which has to provide round the clock services usually has 45% of its workers working in shift system. Nurses also work in shifts and may sometimes work more shifts because of understaffing which leads to busy, difficult and uncertain work schedules. This kind of work schedule which includes long work hours and additional burden of family responsibilities has negative impact on sleeping patterns of female nursing staff. [1] Sleep

and breathing are closely related and hence female nurses suffer sleep related breathing disorders including obstructive sleep apnea and central sleep apnea. Sleep related breathing disorders result in excessive daytime sleepiness, cognitive impairment, mood disturbance, functional decline which negatively affects not only quality of life of nurses but their work performance which results in a higher risk of medical errors which may jeopardize patient's safety. [2] Obstructive sleep apnea causes repeated episodes of partial or complete obstruction of upper airways causing oxygen desaturations and arousals during sleep. It causes several comorbidities like cardiovascular disorders, hypertension, metabolic disorders, type 2 diabetes mellitus and stroke. Poor sleep affects overall health interacting bi-directionally with numerous physiological, psychological and behavioural factors. [3] Considering this central role of sleep in health and importance of functional alertness in nursing profession appropriate sleep problem assessment is important for female nurses. Self-rating questionnaires such as the Pittsburgh Sleep Quality Index (PSQI) and Stop bang Questionnaire have an important role in sleep health assessment in both clinical and research settings. These questionnaires have the advantages of cost effectiveness, high patient compliance, and ease of administration.[3]

OBJECTIVES:
1. To assess the sleep pattern and excessive daytime sleepiness among nursing staff using Pittsburgh sleep quality index (PSQI) and Epworth Sleepiness Scale (ESS) (PSQI) among nursing staff working in tertiary care teaching hospital
2. To assess the prevalence of sleep disordered breathing using Stop bang Questionnaire among the study population and correlation with sleep quality

MATERIALS AND METHODS
The study was hospital based descriptive cross-sectional study, conducted in a tertiary care
teaching hospital located in Andhra Pradesh, India.
Study population included nursing staff working in a tertiary care teaching hospital.
The trainee nurses were excluded from the study. Total number of participants included in the study were 200. Pittsburgh sleep quality index is the most widely used sleep questionnaire. The PSQI consists of 24 questions or items to be rated (0–3 for 20 items while 4 items are open-ended), 19 of these questions are self-reported and 5 require secondary feedback from a room or bed partner. Only the self-reported items (15 rated as 0–3 while 4 open-ended)

are used for quantitative evaluation of sleep quality as perceived by the patient. The open-ended items are also finally scored as structured categorical values (rated at 0–3) as per the range of values reported for them by the patient. These 19 self-reported items are used to generate categorical scores representing the PSQI's 7 components. The individual component scores each assess a specific feature of sleep. Finally, the scores for each component are summed to get a total score, also termed the global score (range: 0 to 21). This score provides an efficient summary of the respondent's sleep experience and quality for the past month. [4] The STOP-Bang questionnaire is a simple, feasible and efficient questionnaire for OSA screening. STOP-Bang questionnaire is a more accurate tool for detecting mild, moderate, and severe OSA. [5] The STOP-Bang questionnaire developed in 2008 is a simple, easy to remember, and self-reportable screening tool, which includes four subjective (STOP: **S**noring, **T**iredness, **O**bserved apnea and high blood **P**ressure) and four demographics items (Bang: **B**MI, **a**ge, **n**eck circumference, **g**ender).[6] The STOP-Bang questionnaire was originally validated to screen for OSA in the surgical population. The sensitivity for the STOP-Bang score ≥3 as the cut-off to predict any OSA (apnea hypopnea index (AHI) >5), moderate-to-severe OSA (AHI >15) and severe OSA (AHI >30) was 83.9%, 92.9% and 100% respectively. [7]

Epworth Sleepiness Scale (ESS):
Sample size was calculated assuming the proportion of Day time sleepiness as 51.8% as per the study by Gómez-García T *et al.*.[8] The other parameters considered for sample size calculation were 7% absolute precision and 95% confidence level. The following formula was used for sample size as per the study by Daniel WW *et al.*.[9]

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where n = Sample size
Z= Z statistic for a level of confidence level= 1.960
P = Expected prevalence/proportion of outcome= 0.518
d = Precision= 0.07
The required sample size as per the above-mentioned calculation was 196. To account for a non-participation rate of a about 5%, another 10, subjects will be added to the sample size. Hence the final required sample size would be 206.

Statistical methods:
Day time sleepiness was considered as primary outcome of interest. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables.

RESULTS

A total of 200 participants were included in the study.

Table 1:

Parameter Baseline characteristics of the study population (N=200)	Frequency	Percentage
Age group		
<30	43	21.5%
31 to 40	49	24.5%
41 to 50	57	28.5%
51 to 60	51	25.5%
Gender		
Male	59	29.5%
Female	141	70.5%
Years of experience		
< 5 years	52	26.0%
5 to 10 years	63	31.5%
11 years or more	85	42.5%
Shift system		
Regular day shift	45	22.5%
Regular Night shift	36	18.0%
Alternate shifts	119	59.5%

Majority of 28.5% participants were aged between 41 to 50 years, followed by 51 to 60 years, 31 to 40 years and less than or equal to 30 years was 25.5%, 24.5% and 21.5% respectively. Among the study population, 59 (29.5%) were participants male and remaining 141 (70.5%) participants were female. Majority of 85 (42.5%) participants having more than 10 years' experience, followed by 63 (31.5%) participants having 5 to 10 years' experience and 52 (26%) participants having <5 years' experience. (Table 1)

Table 2: Component wise daytime sleepiness using Epworth Sleepiness Scale (ESS)

|	I never feel sleepy	I rarely feel sleepy	I often feel sleepy	I always feel sleepy
While reading newspaper - n (%)	71 (35.5%)	96 (48%)	29 (14.5%)	4 (2%)
While watching TV- n (%)	57 (28.5%)	99 (49.5%)	36 (18%)	8 (4%)
While sitting- n (%)	130 (65%)	50 (25%)	15 (7.5%)	5 (2.5%)
While traveling- n (%)	68 (34%)	77 (38.5%)	40 (20%)	15 (7.5%)
In the afternoon- n (%)	61 (30.5%)	89 (44.5%)	37 (18.5%)	13 (6.5%)
While speaking- n (%)	181 (90.5%)	18 (9%)	1 (0.5%)	0 (0%)
After meals- n (%)	115 (57.5%)	62 (31%)	22 (11%)	1 (0.5%)
While waiting in traffic- n (%)	193 (96.5%)	4 (2%)	1 (0.5%)	2 (1%)
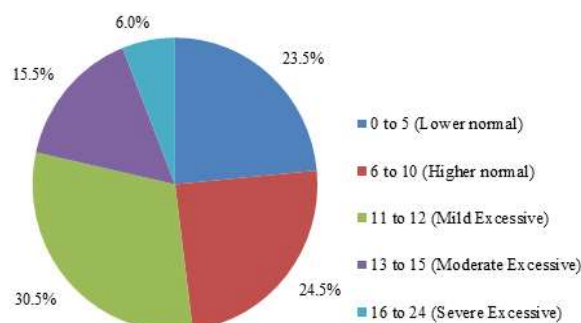
Figure 1: Bar chart of overall daytime Sleepiness in the study population

Table 3: Prevalence of poor-quality sleep and excessive day time sleepiness among the study population

PSQI component	Total	PSQI grading		P Value
		Good sleeper (N=77)	Poor sleeper (N=123)	
Sleep quality	1.28 ± 0.61	0.99 ± 0.53	1.43 ± 0.62	0.001
Latency	1.24 ± 0.64	1.10 ± 0.59	1.37 ± 0.71	0.005
Sleep duration	0.85 ± 0.78	0.65 ± 0.23	0.94 ± 0.86	0.042
Sleep efficiency	0.79 ± 0.45	0.65 ± 0.23	0.86 ± 0.66	0.007
Sleep disturbance	0.81 ± 0.59	0.94 ± 0.44	1.28 ± 0.47	0.001
Sleep medication	0.45 ± 0.27	0.45 ± 0.23	0.47 ± 0.34	0.649
Daytime sleep	1.23 ± 0.42	0.77 ± 0.57	1.07 ± 0.74	0.002

Among the study 123 (61.5%) were poor sleepers and only 77 (39.5%) were good sleepers. There was statistically significant difference between two groups in PSQI component parameters sleep quality, latency, sleep duration, sleep efficiency, sleep disturbance and daytime sleep (P value <0.05). There was no statistically significant difference between two groups in Sleep medication (P value >0.05). (Table 3)

Table 4: Descriptive analysis of STOP-BANG questionnaire

STOP-Bang items	Frequency	Percentage
Snoring (loud)	134	67.0%
NC (>40cm)	103	51.5%
Tiredness	115	57.5%
Age (>50)	103	51.5%
Observed apnea	40	20.0%
Pressure (hypertension	72	36.0%
BMI (>35)	69	34.5%
Gender (Male)	59	29.5%

NC=Neck circumference, BMI= Body Mass Index

Among the stop bang items, majority of 134 (67%) participants were reported snoring, followed by 103 (51.5%) particpants were reported NC (>40 cm), 115 (57.5%) partcipants were reported tiredness and 40 (20%) participants were reportred in observed apnea. (Table 4)
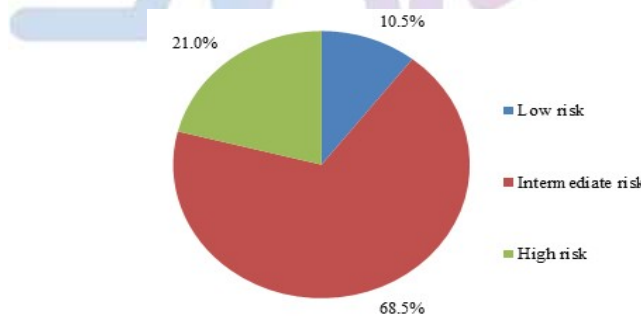

Figure 2: Pie chart of risk of OSA as assessed by STOP-BANG questionnaire

Among the study population 42 (21%) had high risk of OSA and 68.5% had intermediate risk of OSA. (Figure 2)

DISCUSSION

Sleep is essential for maintenance of good physical and mental health of an individual. Although in general older population are at risk of developing sleep problems owing to age sleep problems are also developed because occupational problems. Nurses are more prone to development of sleep problems and disorders due to their long and irregular working hours. Health of nurses is of utmost importance for effective delivery of service to patients. Nurses affected with sleep related disorders will not be able to provide quality care to patients with increased risk of occupational mistakes and accidents due to their reduced mental health and cognitive ability. This sometimes may lead to serious consequences in patient care. This study was conducted to assess the sleep pattern and excessive daytime sleepiness among nursing staff using Pittsburgh sleep quality index (PSQI) and Epworth Sleepiness Scale (ESS) among female nursing staff working in tertiary care teaching hospital and to assess the prevalence of sleep disordered breathing using Stop bang Questionnaire. Majority of participants amounting to 28.5% were aged between 41 to 50 years, followed by 51

to 60 years, 31 to 40 years and less than or equal to 30 years were 25.5%, 24.5% and 21.5% respectively. This Percentage of age distribution with majority of nurses being in the age group of 40 to 50 years is similar to that found in a study Rocha, M. C. P. d. et al.. [10] in which 41.9% were between 40 and 49 years old but different from findings in two studies one by Bianchi, E. R. F., et al.. [11] and another by Guerrer, F., et al.. [12] both of which reported majority of study participants in the age group of 31 to 40 years. Prevalence of female gender of about 60.5% in study participants is similar to that reported in similar studies by Rocha, M. C. P. d. et al.. [10], Bianchi, E. R. F., et al.. [11] and Guerrer, F., et al.. [12] The rate of prevalence of day time sleepiness in present study was found to be 76.5% which varied from higher normal to severe excessive in the following percentages 24.5% reported higher normal, 30.5% reported mild excessive, 15.5% reported moderate excessive, and 6% reported severe excessive day time sleepiness. Day time sleepiness is mainly due to sleep problems and 76.5% of participants suffering from sleep problems reported in this study is lower than that reported in similar studies, a study by Sepehrmanesh, Z., et al.. [13] in which 95.5% suffered from sleep problems, in a study by Akbari, V., et al.. [14] in which 85.7% of the nurses had poor sleep quality and in another study by Zamanian, Z., et al.[15] in which 85% of the study participants had sleep problems. The percentage reported in this study is comparable to that reported in a study by Aliyu, I. et al.. [16] in which 61% of participants reported poor sleep and in another study by Hasson, D., et al.. [17] But in the study by Aliyu, I. et al.. [17] poor sleep did not cause day time sleepiness as reported in the present study the reason for which was described as job description which included 7 days' off duty after a 7-day night duty and 3 days' off duty after a 7-day afternoon duty (2 pm–7 pm) schedules which might have allowed for correction of any possibly incurred sleep debt. Among the study participants 61.5% were poor sleepers and only 39.5% were good sleepers. This finding is lesser when compared to similar studies like in a study by Akbari, V., et al.. [14] in which 85.7% were bad sleepers. The mean sleep latency noticed among nurses who reported poor sleep in this study was lower than that reported in studies by Aliyu, I.,et al.. [16], Chien, P.-L., et al.. [1] and Lajoie, P., et al.. [18] whereas sleep duration noticed was similar to these studies. The mean sleep quality and latency were observed to be lower in good sleeper group which is similar to that found in study by Aliyu, I., et al.. [16] Among the stop bang items, 67% participants reported snoring, 64.5% particpants reported NC (>40 cm), 57.5% partcipants reported tiredness and 46.5% participants reportred observed apnea. Among the study population 21% had high risk of OSA and 68.5% had intermediate risk of OSA.

CONCLUSION

The study concludes that majority of study participants suffer from poor sleep quality. Majority of participants show one or more symptoms related to sleep apnea which needs further evaluation with sleep study. Majority of participants also show increased tendency to day time sleepiness which affects their performance and service delivery to patients. Considering all these consequences the study recommends certain interventions to improve sleep quality and further evaluation of suspected cases of obstructive sleep apnea to reduce sleep disorders in nurses of the tertiary care teaching hospital.

Recommendations: Adequate staffing, reducing work hours and using rotating shifts for nurses to improve their sleep quality.

Limitations: The main limitation of the study is since it is based on small sample size from a single hospital generalization of results require evidence from studies covering large sample size from different hospitals. Another limitation since the results are obtained from self-answered questionnaires from study participants there might be bias in the reported results.

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