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Comparison of Sleep Quality among Night-Shift and Morning-Shift Female Nurses

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Abstract **Original Research Article**

Background: Sleep is a vital process in human physiology. The prevalence of sleep problems and sleep disorders are increasing day by day. In modern-society, the shift working is also growing to provide service to people round the clock. The effects of shift work especially night shifts are sleep difficulties, poor quality of sleep, daytime sleepiness, impaired cognition, fatigue, increased risk of injuries and accident and poor quality of life. Chronic Sleep deprivation following night shifts may lead to serious health problems like hypertension, diabetes, heart attack, stroke, depression and cancers. The nurses as shift workers are overburdened in hospitals suffer from poor sleep quality and may suffer from these type of health problems. ***Objectives:*** The aim of the study was to compare sleep quality among night shift and morning shift female nurses. ***Methods:*** A cross-sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka from January 2019 to December 2019. A total 250 adult female nurses were included in this study based on inclusion and exclusion criteria with age ranging 24-50 years. Group A was selected from female nurses who work night shifts from 8.00 p. m. to 8.00 a. m. in different wards of Medicine, Surgery and Obstetrics & Gynaecology. Group B was consisted of female nurses who work in morning-shifts from 8.00 a. m. to 2.00 p.m. in Out-patient departments and different wards of Medicine, Surgery and Obstetrics & Gynaecology. A data collection form was designed and prepared including General characteristics of nurses and Pittsburg Sleep Quality Index (PSQI) Questionnaire. Informed written consent was taken from each participant. Then the subject was interviewed in details and recorded in the predesigned data collection form. Statistical analyses of the data was obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-26). ***Results:*** The statistical analysis of data were done by a computer based statistical program SPSS (Statistical package for Social Science) version 26 as applicable. The results were expressed as mean and standard deviation (mean ± SD). For all comparisons *p* value of ≤ 0.05 was considered as significant. ***Conclusion:*** Female nurses working night shifts generally experience poorer sleep quality compared to those working morning shifts, with significant implications for their health and job performance.

Keywords: Shift work, Shift work disorder, sleep quality, PSQI.

INTRODUCTION

Sleep is an important behavioral state in human physiology. The National Institute of Mental Health defined sleep and wakefulness as "Sleep and wakefulness are endogenous recurring behavioral state that reflect coordinated changes in the dynamic functional organization of the brain and that optimize physiology, behavior and health" [1].

Sleep is a cyclical process of about 90 minutes. It is consisted of two separate states: non rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep. Non rapid eye movement (NREM) sleep is again subdivided into four stages: stage1 to stage 4. Rapid eye movement sleep is also divided into phasic and tonic phases. Sleep cycles repeat 3-6 times per night and are separated by a period of wakefulness. Adult people sleep 6-8 hours per day. Night sleep time may be decreased if naps are taken during the day time [2].

Sleep is an active process. It is regulated by circadian and homeostatic mechanisms. Sleep has a

circadian rhythm of 24 hours period regulated by independent genetically determined biological clock. Central biological clock is located in suprachiasmatic nucleus (SCN) on both side of the third ventricle just above the optic chiasma. It is influenced by external factors like light, darkness, clock time, working pattern and meal time. Circadian rhythms of sleep can synchronize with these factors but can continue without them. Homeostatic mechanism maintains our need of sleep. It regulates sleep intensity. The sleep drive becomes stronger when we are awake and causes us to sleep more deeply for a long time after a period of sleep deprivation [3].

Shift work is the work schedule different from the usual work time 9 a.m-5 p.m. per day. It can be evening or night shifts, early morning shifts and rotating shifts. Most shift workers are involved in protective service, food preparation and serving, healthcare and transportation. Shift workers suffer from different sleep problems. About 10% of night and rotating shift workers have sleep disorder known as shift work disorder. The shift work disorder is a circadian rhythm sleep disorder which occurs when a person's work schedule is planned during normal sleep time. It is most common in shift workers who work at night shifts and early morning shifts. The shift work has negative impact on physical and mental health, performance and safety. The effects of shift work disorders include sleep loss, excessive sleepiness, insomnia, depression, impaired work performance, disrupted social schedules and stressed relationship [4, 5].

Sleep quality is one of the important dimensions of sleep health. The good quality sleep can be determined by sleeping time more than 85% of total time in bed, falling asleep within 30 minutes, waking up less than one time and being awake for 20 minutes or less per night [6]. The sleep quality can be measured by both subjective (self-reported questionnaires and sleep diaries) and objective (polysomnography, ECG based cardiopulmonary coupling technique) methods. There are limitations in interpretation of the two methods but it is very much helpful to determine sleep quality when they are used together [7].

Nurses as shift workers play an important role in health care system. In tertiary care hospitals they must work in rotating shift duties including night shifts to provide 24-hour services to patients [8]. The schedules of night shift of nurses vary from 8-hour to 12-hour. The impacts of 12-hour shift over 8-hour shift may cause sleep disturbance, stress, tiredness, fatigue and anxiety. It also may cause emotional disturbance and desire to leave the job [9].

Bangladesh is a country with high population density. It has attained some goals in health sectors. A successfully running health system is required for improving population's health status. But there are low ratios of health care professionals, only 0.5 doctors and 0.2 nurses per 1000 people [10]. So, nurses are overburdened in their duties including night shift duties. Nurses in tertiary care hospitals have to do night shift duties from 8.00 p.m. to 8.00 a. m. (12hours).

METHODOLOGY

This cross-sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka. during January 2019 to December 2019. A total of 250 adult female nurses participated in the study. Among them 160 were night shift (Group A) and 90 were morning shift (Group B). And their aged between 24-50 years. After taking consent and matching eligibility criteria, data was collected from the female nurses on variables of interest using the predesigned structured questionnaire by interview, observation. Statistical analyses of the data was done by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-26)

RESULTS

Table I: General characteristics of the study subjects (N=250)

Parameters	Group A (n=160)	Min-Max	Group B (n=90)	Min-Max	*p* value
Age (Years)	31.86±6.69	(24-50)	31.14±6.34	(24-50)	0.406^{ns}
BMI (kg/m^2)	23.91±17.64	(18.5-24.9)	23.34±1.68	(18.5-24.9)	0.760^{ns}
Systolic pressure (mmHg)	105.63±11.10	(90-130)	106.06±10.01	(90-130)	0.761^{ns}
Diastolic pressure (mmHg)	69.94±6.68	(60-90)	70.78±6.74	(60-90)	0.342^{ns}

The age range of the study subjects was from 24-50years. The mean (± SD) age was 31.86± 6.69 years in group A and 31.14 ±6.34 in group B which was not statistically significant. The mean (± SD) BMI in group A and group B were 23.91±1.64 kg/m²and 23.34±1.68 respectively. The mean (± SD) systolic blood pressure were 105.63 ± 11.10 mmHg and 106.28 ± 10.01 mmHg in group A and group B respectively. The mean (±SD) diastolic blood pressure in group A and group B were 69.94±6.68 and 70.78±6.74 respectively. The mean (±SD) diastolic blood pressure in group B was higher than group A which was not statistically significant.

Table II: Seven components and mean global scores of Bengali Pittsburgh Sleep Quality Index (BPSQI) of the study subjects (N=250)

Parameters	Group A (n=160)	Min-Max	Group B (n=90)	Min-Max	*p* value
Components of BPSQI Subjective sleep quality	1.09±0.35	(0-2)	0.53±0.52	(0-2)	<0.001***
Sleep latency	1.95±0.84	(0-3)	0.54±0.66	(0-3)	<0.001***
Sleep duration	1.77±0.72	(0-3)	1.48±0.64	(0-3)	<0.002***
Habitual sleep efficiency	0.26±0.44	(0-1)	0.01±0.10	(0-1)	<0.001***
Sleep disturbances	1.01±0.08	(1-2)	0.90±0.34	(0-2)	<0.001***
Daytime dysfunction	1.87±0.50	(1-3)	0.40±0.59	(0-2)	<0.001***
Global BPSQI score	7.94±1.76	(6-13)	3.84±1.53	(2-10)	<0.001***

The mean (± SD) scores of subjective sleep quality (C1) were 1.09 ± 0.35 and 0.53± 0.52 in group A and group B respectively which showed significant difference statistically(p<0.001). The mean (±SD) scores of sleep latency (C2) in group A and group B were 1.95± 0.84 and 0.54± 0.66 respectively. The mean ± SD score of C2 was higher in group A was higher than group B which was statistically significant (p< 0.001). The mean± SD scores of sleep duration (C3) were 1.77± 0.72 in group A and 1.48± 0.64 in group B. There was significant difference between these two groups (p<0.002). The mean± SD scores of daytime dysfunctions (C7) were 1.87±0.50 and 0.04± 0.59 in group A and group B respectively. The mean (±SD) Global BPSQI scores of group A and group B were 7.94± 1.76 and 3.84± 1.53 respectively. The mean (±SD) global score in group A was higher than group B which was statistically significant (p value <0.001).

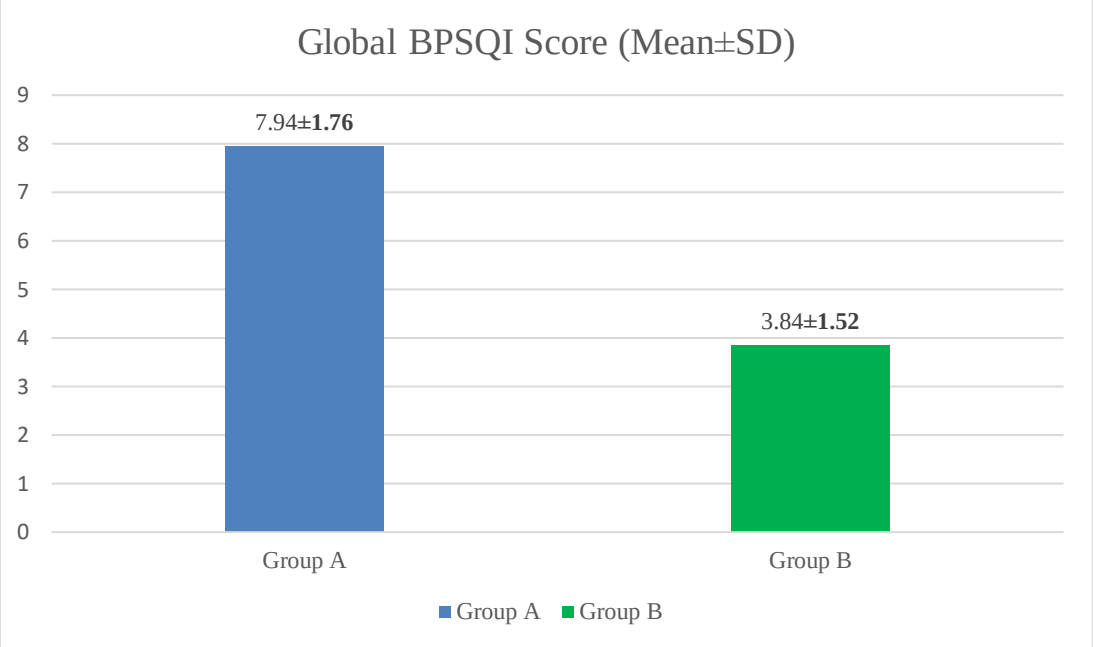

Figure I: Mean Global Bengali Pittsburgh Sleep Quality Index (BPSQI) scores of the study subjects (N=250)

Results were expressed as mean ± SD. Unpaired Students "t" test was performed to compare between the groups. Group A= night shift; Group B= morning shift. Figures in parenthesis indicate range. The Global BPSQI scores 7.94± 1.76(6-13) in group A and 3.84±1.53(2-10) in group B with p<0.001.

Table-III: Distribution of study population according to subjective sleep quality (C1) scores of BPSQI (N=250)

Scores	Group A (n=160)	Group B (n=90)	*p* value
0	3 (1.9%)	43 (47.8%)	**<0.001*** **
1	139 (86.9%)	46 (51.1%)	
2	18 (11.3%)	1 (1.1%)	

The range of subjective sleep quality score was 0-2 in study population. In group A 139(86.9%) subjects had '1' score, 18(11.3%) had score '2' and 39(2%) had '0'score. In group B 46 (51.1%) had '1' score 43(47.8%) had '0'score and only 1 subject (1.1%) had '2'score.

Table IV: Distribution of study population according to sleep latency (C2) scores of BPSQI (N=250)

Scores	Group A (n=160)	Group B (n=90)	*p* value
0	3 (1.9%)	48(53.3%)	**<0.001*** **
1	52 (32.5%)	36(40.0%)	
2	55 (34.4%)	5(5.6%)	
3	50 (31.3%)	1(1.1%)	

The range of sleep latency score of BPSQI was 0-3. Most of the subjects of group A had scores between1-3(98.2%) but in group B most of them had 0-1(93.3%) score.

Table-V: Distribution of study population according to sleep duration (C3) scores of BPSQI (N=250)

Scores	7(4.4%)	4(4.4%)	*p* value
0	7(4.4%)	4(4.4%)	**<0.004*** **
1	43(26.9%)	42(46.7%)	
2	90(56.3%)	41(45.6%)	
3	20(12.5%)	3(3.3%)	

The range of sleep duration scores was 0-3. In group A 90(56.3%) subjects had '2' score, 43(20.9%) had '1' score and 20(12.5%) subjects with '3'score. In group B majority of subjects had score '1' and '2'. It showed significant difference between two groups.

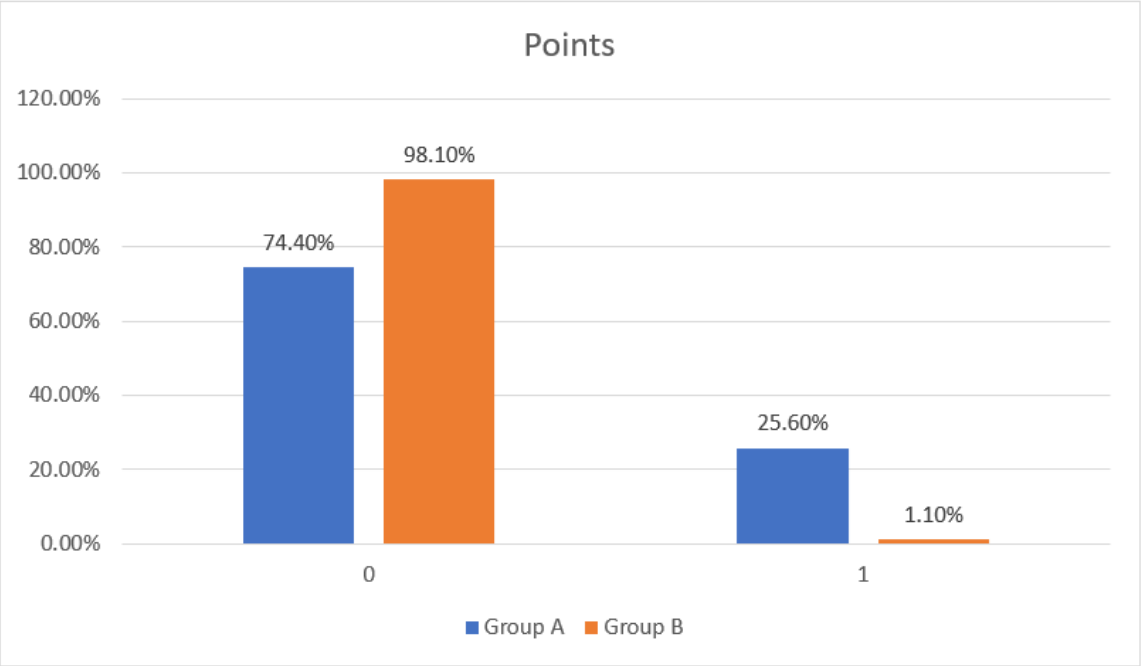

Figure II: Distribution of study subjects according to sleep efficiencyC4) scores of BPSQI (N=250)

Figure II shows, the range of sleep efficiency was 0-1. Majority of the study subjects had score '0' in both groups. In group A 119(74.4%) subjects had '0' and 41(25.6%) had '1'score. But 89(98.8%) had '0' score and 1(1.1%) had '1'score.

Table-VI: Distribution of study population according to sleep disturbances (C5) scores of BPSQI (N=250)

Scores	Group A (n=160)	Group B (n=90)	*p* value
0	0 (0%)	10 (11.1%)	**<0.001*** **
1	159(99.4%)	79(87.8%)	
2	1(0.6%)	1(1.1%)	

The range of sleep disturbance scores 1-2 in group A and 0-1 in group B. The majority of subjects (99.4% in group A) and (87.8% in group B) had score '1'.

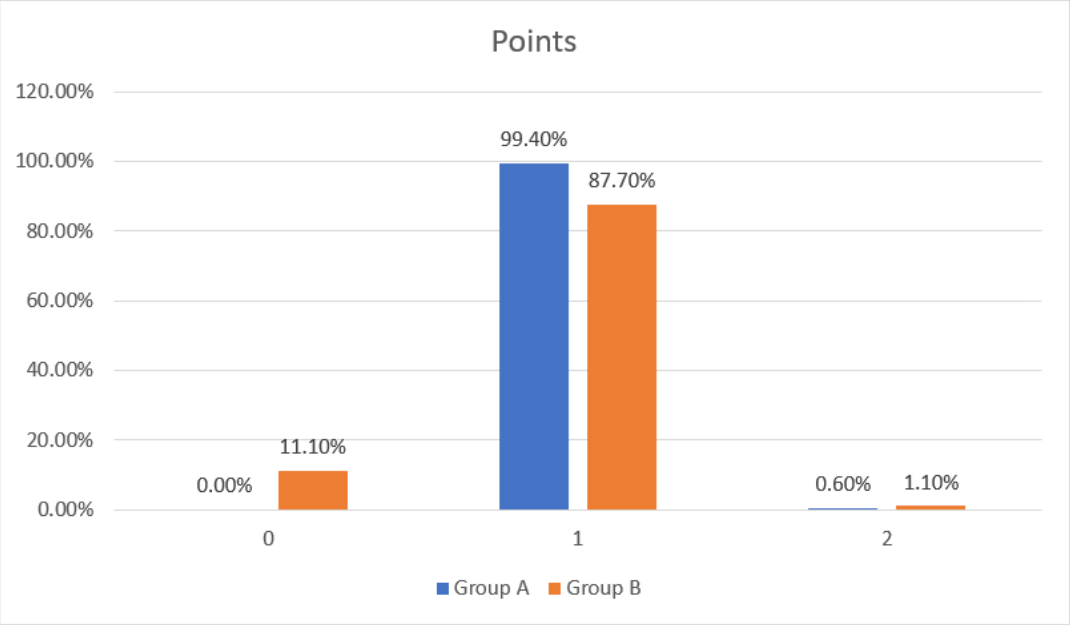

Figure III: Distribution of study subjects according to daytime sleep dysfunction scores of BPSQI (N=250)

The range of daytime dysfunction scores was 1-3 in group A and 0-2 in group B. The majority of subjects (73.1%) had score '2' in group A and '0' score in group B. There was statistically significant difference between these two groups (p<0.001).

Table-VII: Distribution of study population according to Global BPSQI scores (N=250)

Scores	Group A (n=160)	Group B (n=90)	*p* value
<5	0(%)	61(67.8%)	**<0.001*****
5-6	35(21.9%)	26(28.9%)	
7-8	44(27.5%)	2(2.2%)	
>8	81(50.6%)	1(1.1%)	

On the basis of original PSQI (English) the score less than '5' indicate good sleep quality and score '5' or above indicate poor sleep quality. In this study 35(21.9%) subjects had score between 5-6; 44(27.5%) subjects with score between 7-8 and 81(50.6%) subjects had the score '>8' in group A. In group B 61(67.8%) subject had score '<5', 26(28.9%) subjects had scores between 5-6.

DISCUSSION

The present study was undertaken to determine the impact of night shift on sleep quality of Bangladeshi female nurses. For this study, a total number of 250 female nurses were included with age ranging 24-50years on the basis of inclusion and exclusion criteria. The subjects were grouped into two groups according to their duty schedule (Group A; night –shift nurses doing at least 5-night duties per month in addition to their morning and evening duties and Group B; morning shift nurses doing only fixed morning duties only). There were 160 subjects in Group A and 90 subjects in Group B.

The age range was 24-50 years; BMI range 18.5-24.9 Kg/m^2; the range of systolic blood pressure 130-80mm of Hg and diastolic blood pressure range was 60-90 mm of Hg in this study. The mean age of the study population in the present study were 31.86±6.69 in group A and 31.14±6.34 years in group B respectively. Similar type of findings was observed by Vijaykumar in India on the contrary, Boughattas conducted a study in Tunisia with mean age 41.6±7.8 and 40.2±8.0 in night shift and day shift nurses [11, 12].

In this study, female was included as study subjects. Chien in Taiwan also included female as study subjects [7]. On the contrary, Sepehrmanesh conducted a study on both male and female nurses in Iran [13]. In the present study, the mean score for subjective sleep quality was high which was similar to findings by Aliyu [14]. On the other hand, the score was lower than the results observed by Vijoykumar. [11] The prevalence of subjective sleep quality of study subjects 86.9% had score '1' similar to findings by Akbari. This may be due to personal, cultural and life style differences among the subjects [15].

The present study showed that mean sleep latency score was higher than the findings observed by Tarhan [16]. The prevalence of sleep latency of the subjects was between 1-2 score in night shift nurses

comparable to study findings by Akbari [15]. On the contrary, the mean score was lower in the study conducted by Aliyu. This may be due to altered circadian rhythm change the sleep pattern of night shift nurses, longer duration of shift work and regional framework of shift duty.

In this study the Mean global score of BPSQI in night shift nurses were comparable to findings observed by other researchers [15, 17, 18]. On the contrary, Aliyu observed global PSQI score 5.7± 2.7 in night shift nurses [14]. The prevalence of poor sleep quality was significantly high (100%) in this study. Sepehrmanesh observed 95.5% of poor sleep quality in shift work nurses [13].

In this study night shift cause more poor sleep quality in night nurses than morning shift nurses. On the contrary, according to observation by Chin poor sleep quality was frequently found in hospital staff nurses but it did not have any relation with shift work [7]. This suggests that nurses who are deprived of sleep suffer from sleep deprivation and poor sleep quality. Sleep duration among night shift worker is reduced, which is due to obligation to sleep during morning hours. Environmental factors light, temperature, noise are also unfavorable condition for sleep [19].

In the present study the night shift nurses suffer more from poor sleep quality than morning shift nurses could not be explained exactly. But that may be related to heavy workload, long time duration of night shift, individual daily life style, and working environment at hospital in different departments of hospital.

Limitations of the study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

CONCLUSION

The results of this study showed that mean scores of subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, daytime sleep dysfunction and Global BPSQI were significantly higher in night shift nurses than morning shift nurses. So, this study reveals that night shift duties cause poor sleep quality among Bangladeshi female nurses.

RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

ACKNOWLEDGEMENTS

The wide range of disciplines involved in comparison of sleep quality among night shift and morning female nurses research means that editors need much assistance from references in the evaluation of papers submitted for publication. I would also like to be grateful to my colleagues and family who supported me and offered deep insight into the study.

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