Impact of Night-shift on Sleep Quality of Bangladeshi Female Nurses

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Abstract

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 study's goal was to assess the impact of night shift on sleep quality of Bangladeshi female nurses.*

Methods: *A cross-sectional study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka from January2019 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 & Gynecology. 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& Gynecology. A data collection form was designed and prepared including General characteristics of nurses' questionnaire 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. The statistical analysis of data was done by a computer based statistical program SPSS (Statistical package for Social Science) version 26.0 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.* ***Results:*** *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 score of C7 was higher in group A than group B which was statistically significant ($p<0.001$).* ***Conclusion:*** *This study revealed that night shift duties cause poor sleep quality among Bangladeshi female nurses.*

Keywords: *Night shift, sleep quality, Bangladeshi female nurses.*

I. 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]. We spend about one third of our life time in sleep. 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 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 [1]. 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 [3]. 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 hours services to patients [4]. The schedules of night shift of nurses vary from 8-hour to 12-hours. 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 [5]. They performed a study among shift work nurses in Iran and observed that high prevalence of sleep disturbances and poor sleep quality (86%) among them and higher percentage of shift work nurses had complaint of difficulty in sleep initiation [6]. 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. So, nurses are over-burdened 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) [7].

So, the present study was conducted to see the effect of night shift on sleep quality of Bangladeshi female nurses. It will help in developing awareness regarding health-related hazards of sleep deprivation and taking steps for this issue.

II. METHODOLOGY

This cross-sectional study was carried out in the Department of Physiology, Dhaka Medical college hospital, Dhaka during January, 2019 to December 2019. Study population was Bangladeshi female nurses and the sampling method was purposive sampling. A total number of 250 apparently healthy Bangladeshi nurses was included in this study. Among them 160 were night-shift nurses and 90 were morning-shift nurses. Female nurses of out-patient department and different wards of Surgery, Medicine, Obstetrics and Gynecology department of Dhaka Medical College Hospital, Dhaka. 24-50 years female Bangladeshi nurses with normal BMI were included in the study and personal or family history of sleep disorder, taking medication that affect sleep, pregnant and breast-feeding women and history of heart diseases, diabetes mellitus, bronchial asthma and bipolar diseases that may affect sleep was excluded from study. Permission was obtained from Research review committee of Department of physiology and ethical review Committee of Dhaka Medical College, Dhaka. Statistical analyses of the results were obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-26).

III. RESULTS

Table 1: General characteristics of the study subjects (N=250)

Parameters		Group A (n=160)	Group B (n=90)	p-value
Age (Years)		31.86±6.69	31.14±6.34	0.406[ns]
	Range	(24-50)	(24-50)	
BMI		23.91±17.64	23.34±1.68	0.760[ns]
	Range	(18.5-24.9)	(18.5-24.9)	
Systolic pressure (mmHg)		105.63±11.10	106.06±10.01	0.761[ns]
	Range	(90-130)	Range	
Diastolic pressure (mmHg)		69.94±6.68	70.78±6.74	0.342[ns]
	Range	(60-90)	(60-90)	

Results were expressed as mean ± SD. Unpaired Students "t" test was performed to compare between the groups. N = total number of subjects, n=number of subjects in each group. ns=not significant. Group A= night shift; Group B= morning shift. Figures in parenthesis indicate range.

Study parameters Scores of seven components of BPSQI

The results are shown in Table 1. 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 habitual sleep efficiency(C4) were 0.26±0.44 in group A and 0.01± 0.10 in group B and there was statistically significant difference ($p< 0.001$). The mean± SD scores of sleep disturbances (C5) were 1.01± 0.08 in group A and 0.90± 0.34 in group B which showed significant differences in two groups ($p<0.001$). The mean± SD score of use of

sleeping medication (C6) was 0,00± 0.00 in both groups. 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 score of C7 was higher in group A than group B which was statistically significant ($p<0.001$). The sum of each score of seven components of BPSQI is the global score. The mean (±SD) scores of seven components of group A were higher than group B except component six which was statistically significant.

Global BPSQI scores
The results are shown in Table II and Figure 1. The Global BPSQI scores range were 6-13 in group A and 2-10 in group B. 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).

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

Results were expressed as mean ± SD. Unpaired Students "t" test was performed to compare between the groups. N = total number of subjects, n=number of subjects in each group. Group A= night shift; Group B= morning shift. Figures in parenthesis indicate range.
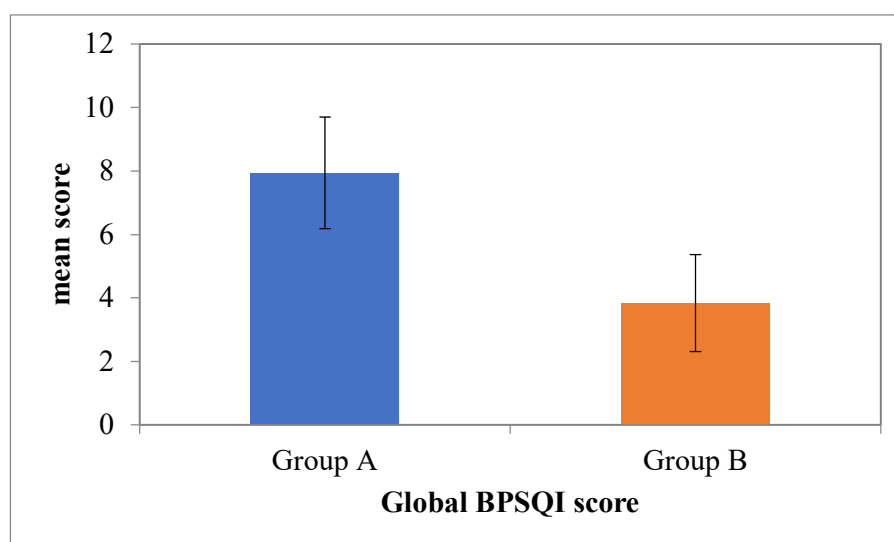

Figure1: Mean Global Bengali Pittsburgh Sleep Quality Index (BPSQI) scores of the study subjects (N=250)
Results were expressed as mean ± SD. Unpaired Students "t" test was performed to compare between the groups. N = total number of subjects, n=number of subjects in each group. Group A= night shift; 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%)	
1	139 (86.9%)	46 (51.1%)	<0.001***
2	18 (11.3%)	1 (1.1%)	

Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. ***= significant, N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.

Distribution of study population according to C1(subjective sleep quality) of BPSQI: The results are shown in Table III, 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. There was statistically significant difference between two groups (*p*<0.001)

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

Points	Group A	Group B	P Value
0	3 (1.9%)	48(53.3%)	
1	52 (32.5%)	36(40.0%)	
2	55 (34.4%)	5(5.6%)	<0.001***
3	50 (31.3%)	1(1.1%)	

Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. ***= significant,N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.

Distribution of study population according to scores of C2 (sleep latency) scores of BPSQI: The results are shown in Table IV. 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. There was statistically significant difference between two groups *p*<0,001).

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

Scores	Group A (n=160)	Group B (n=90)	*p* value
0	7(4.4%)	4(4.4%)	
1	43(26.9%)	42(46.7%)	
2	90(56.3%)	41(45.6%)	<0.004***
3	20(12.5%)	3(3.3%)	

Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. ***= significant,N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.

Distribution of study population according to (C3) sleep duration scores of BPSQI: The results are shown in Table V in this study, 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 2: **Distribution of study subjects according to sleep efficiencyC4) scores of BPSQI (N=250)**
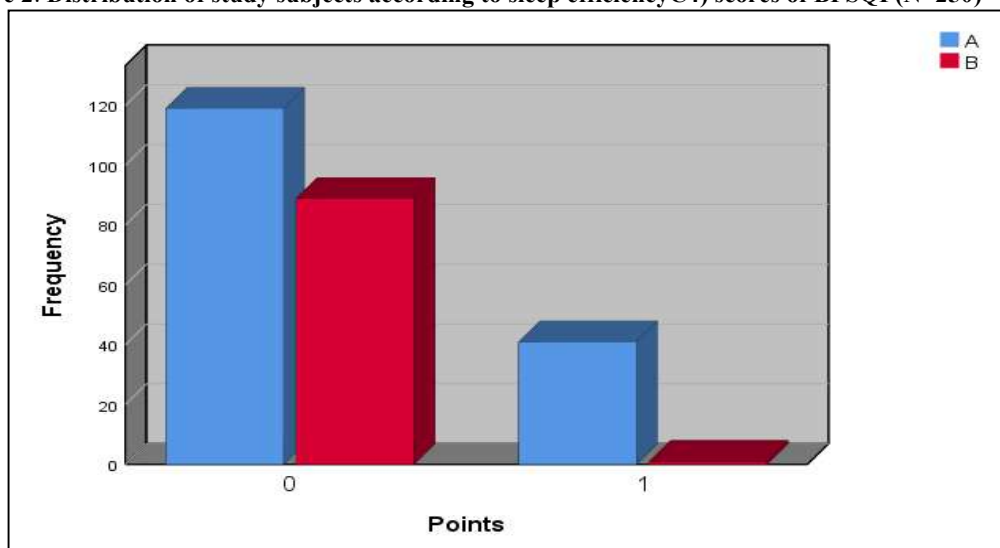
Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups N = total number of subjects, n=number of subjects in each group, Group A= night shift (n=160; Group B= morning shift(n=90). Figures in parenthesis were calculated as percentage from frequency in each group.

Distribution of study population according to C4 (sleep efficiency) scores of BPSQI: The results are shown in Figure 2. In this study, 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.

| Scores	Group A	Group B
'0'	119(74.4%)	89(98.1%).
'1'	41(25.6%)	1(1.1%)

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%)	
1	159(99.4%)	79(87.8%)	0.616^{ns}
2	1(0.6%)	1(1.1%)	

Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. ns= not significant,N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.

Distribution of study population according to C5 ((sleep disturbance) scores of BPSQI: The results are expressed in Table VI. 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 3: Distribution of study subjects according to daytime sleep dysfunction scores of BPSQI (N=250)
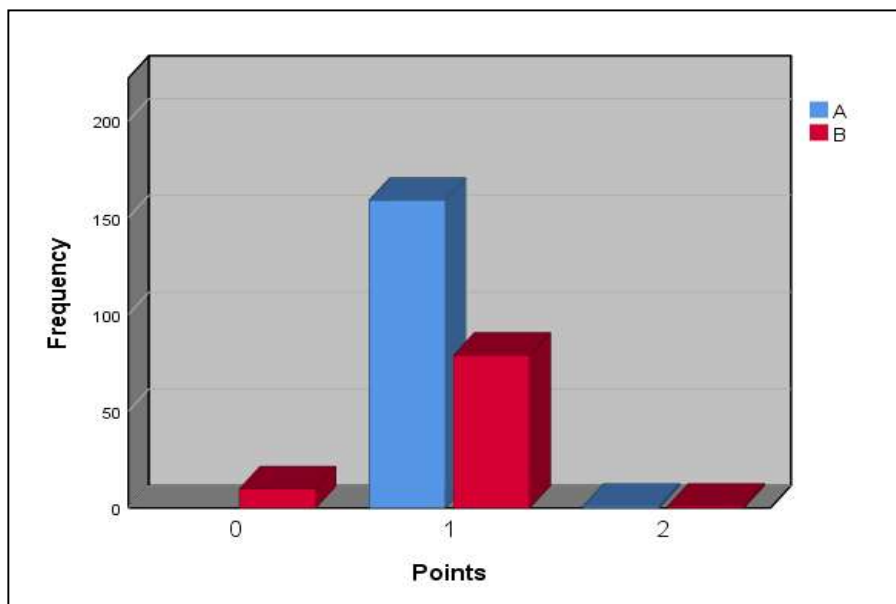
Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.). Figures in parenthesis were calculated as percentage from frequency in each group.

Distribution of study population according to daytime sleep dysfunction scores of BPSQI: The results are showed in figure 3. 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 ($p<0.001$).

Scores	Group A	Group B
'0'	0(0.0%)	10(11.1%)
'1'	159(99.4%)	79(87.7%)
'2'	1(0.6%)	1(1.1%)

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

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

Results were expressed as frequency and percentage. Chi-Square test was performed to compare between the groups. ***= significant, N = total number of subjects, n=number of subjects in each group, Group A= night shift; Group B= morning shift.

Distribution of study population according to Global BPSQI scores
The results are expressed in Table VII. 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 between5-6; 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. These results showed significant difference between two groups ($p<0.001$).

IV.   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 nights 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 height and body-weight were measured to calculate BMI in study groups. Blood pressure was measured to assess the normal cardiovascular condition of the subjects. The health status of the study subjects was assessed by taking detailed history and clinical examinations. Bengali version of Pittsburg Sleep Quality Index questionnaire was used to assess sleep quality of study subjects. 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 [13] 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 [8]. Age is an independent factor of sleep quality. Tarhan reported that advanced age group had poor sleep quality than young age group. This may be due to decreased psycho-physical adaptation of circadian desynchronization in shift work with advanced age [9]. In this study, female was included as study subjects. Chien in Taiwan also included female as study subjects [3]. On the contrary, Sepehrmanesh conducted a study on both male and female nurses in Iran [10].

Female are more prone to anxiety and depression than male which may reflect the difference of poor sleep quality than male. Also, there are variations in physiological and psychological aspects between male and female. Female has also more family pressure than male to take care of her family. Dong observed that female nurses had poor sleep quality than female [11]. In the present study the scores seven components of BPSQI were used as study parameters to assess the sleep quality of Bangladeshi female nurses. The mean scores of seven components (except component six) showed statistically significant difference between two groups. In the present study, the mean score for subjective sleep quality was high which was similar to findings by Aliyu [12]. On the other hand, the score was lower than the results observed by Vijaykumar [13]. The prevalence of subjective sleep quality of study subjects 86.9% had score '1' similar to findings by Akbari [6]. This may be due to personal, cultural and life style differences among the subjects. The present study showed that mean sleep latency score was higher than the findings observed by Tarhan [9]. The prevalence of sleep latency of the subjects was between 1-2 score in night shift nurses comparable to study findings by Akbari [6]. On the contrary, the mean score was lower in the study conducted by Aliyu [12]. 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. The mean score of sleep duration was similar to result of the study conducted in India [13]. On the other hand, this score was higher than the findings of another study [15].

The prevalence rate of sleep duration score was comparable to score of other study [6]. According to Akersted, sleep duration is reduced to 2-4 hours after a working night, light and REM sleep are mostly affected. Work load, individual sleep habit may have effect on sleep duration. The mean score of habitual sleep efficiency and prevalence rate were comparable to findings reported by [9]. On the other, Lajoie found that mean score of sleep efficiency was higher than the finding of present study. This may be due to desynchronization of circadian rhythm, sleep pattern of study subjects and work load of the institute [14]. The mean score of sleep disturbances was comparable to score observed by Tarhan [9] but lower than the score reported by Lajoie [14]. The prevalence rate of sleep disturbance was similar to the findings observed by Akbari [6]. These differences may be due to work pressure. Frequent shift rotation and alteration of circadian rhythm in night shift nurses. In this study mean score of daytime dysfunctions was higher than other studies Aliyu and Tarhan [9, 12]. The prevalence rate of day time dysfunction was lower than Boughattus [8]. This may be due to change of sleep pattern in night shift nurses following change of circadian rhythm. In this study the Mean global score of BPSQI in night shift nurses were comparable to findings observed by other researchers Dai [15]; Akbari [6], Paulhares [16]. On the contrary, Aliyu [12] observed global PSQI score 5.7± 2.7 in night shift nurses. 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 [10]. On the other hand, Attia found 65% of poor sleep quality among shift nurses in Egypt; Aliyu [12]. observed 61% of poor sleep quality among night shift nurses.

In this study night shift causes more poor sleep quality in night nurses than morning shift nurses. On the contrary, according to observation by Chien poor sleep quality was frequently found in hospital staff nurses but it did not have any relation with shift work [3]. 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 [16].

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.

V. LIMITATION

The samples were collected purposively and were collected from single institute which may not represent the whole country. The objective methods of sleep quality determinations were not done. Only female nurses were included in this study.

VI. RECOMMENDATIONS

The research could be done in nurses working at different hospitals of Bangladesh to make the sample more representative. The objective methods of sleep quality determinations could be done for obtaining more conclusive results. Both male and female nurses could be included as study subjects.

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