

## Original Research Article

# Morningness, eveningness chronotype traits and sleep quality among healthcare workers in shift work-a cross-sectional study from a tertiary care hospital in Kerala

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## ABSTRACT

**Background:** Sleep is basic physiological requirement. Sleep quality have impact on employee behaviour like alertness at work, error-making and absenteeism. The sleep disorders of nurses and other allied health workers have been reported as a risk factor for patient safety. Studies have found high prevalence of poor sleep quality among nurses. Main objective of this study was aimed to find out the morningness, eveningness chronotypes and sleep quality among allied health workers in shift work.

**Methods:** A descriptive cross-sectional study was carried out among nursing and other allied health workers working in shifts using Pittsburgh sleep quality index (PSQI) and morningness-eveningness questionnaire (MEQ). After final scores participants were categorized as having good or bad quality of sleep and different chronotypes as per the scoring guidelines given. Chi-square test, Pearson's partial correlation analyses done using SPSS software.

**Results:** Only 26.9% had good quality sleep (mean PSQI score  $8.9\pm 4.5$ ). Among chronotypes 69.9% were intermediateness and 30.1% were moderate morningness (mean MEQ score  $55.5\pm 7$ ). 87.1% participants go to sleep within one hour after dinner. 40% use mobile phones in bed. 31.2% took up to 30 mins (mean  $22.15\pm 13.8$ ) to get asleep. Strong negative correlation found between the sleep hours and total PSQI score ( $r=-0.495$ ;  $p=0.000$ ).

**Conclusions:** Higher prevalence of poor quality of sleep with intermediateness as preferred circadian chronotype, there was also a strong negative correlation found between the hours of sound sleep and the total PSQI score.

**Keywords:** Morningness, Eveningness, Sleep quality, Shift workers in healthcare

## INTRODUCTION

Sleep is basic physiological requirement, as described in Maslow's hierarchy of needs, for the human body to function normally. The suprachiasmatic nuclei of hypothalamus, circadian clock, controls and regulates sleep/awake cycle daily metabolic rhythm, sleep/wake cycle, feeding behaviour and hormonal secretions.<sup>1</sup> Sleep quality is associated with alertness and our response to environment and sleep quality have an impact on many aspects of employee behaviour within the workplace including alertness at work, error-making and absenteeism.<sup>2</sup> Economically driven studies have explored

the impact of shift work rather than individual measures of sleep dysfunction on occupational outcomes such as absenteeism.<sup>3,4</sup> The sleep disorders of nurses have been reported as a risk factor for patient safety.<sup>5-7</sup> Prevalence of poor sleep quality among nurses reported from different countries varies between 60-80%.<sup>8-11</sup> Chronotypes, individual typology (morning-type, evening-type, intermediate type), is an attribute of human beings that reflects their circadian phases of body temperature, hormone levels, and eating and sleeping patterns.<sup>12</sup> Morning-types have a relatively early circadian phase and go to sleep early and wake up early, while evening-types have a relatively late circadian phase and are active

during the night and cannot get up early.<sup>13,14</sup> Evening-type people are at risk of sleep disorders due to imbalances in their biological and social time.<sup>15</sup> A study reports about 74% of nurses had poor sleep quality and 60% were intermediateness, 24.2% were morningness, 15.8% were eveningness chronotypes.<sup>16</sup> Hence, this study aimed to find out the morningness, eveningness chronotypes and sleep quality among allied health workers in shift work.

## **METHODS**

### ***Study setting***

This descriptive cross-sectional study was carried out among nursing and other allied health workers working in shifts in Karuna medical college hospital, Vilayodi, Chittur, Kerala from December 2019 to February 2020. From the staff register and duty register we could identify there were 102 nursing and allied health care workers (32 nurses, 23 attendants, 38 cleaning staffs, 4 lab technicians, 5 drivers) working in shifts.

### ***Sample size calculation and sampling technique***

Since this study was decided to be done purposefully on allied health care workers doing shift work in the tertiary care set up, we decided to include all the 102 workers in our study and recruited them non-random convenient and purposeful sampling technique.

### ***Inclusion criteria***

We included only those workers belonging to nursing and other allied health services engaging in shift work for more than 12 months and those willing to participate in the study.

### ***Exclusion criteria***

Excluded not willing subjects and critically ill workers who cannot communicate normally.

### ***Study tool***

A pre-designed, semi-structured, pre-tested questionnaire constituted 3 parts. Part A constituted items for exploring select socio-demographic characters and work profile details, part B was PSQI questionnaire and part C was MEQ.<sup>17,18</sup>

### ***Data collection method***

After clearance from institute ethical committee and obtaining informed consent each participant was interviewed separately, with informed written consent, to obtain select socio-demographic characters and work profile details. Then the investigators explained to all the participants the nature of the English version of the self-administered PSQI and MEQ parts of the questionnaire. To those participants knowing English were asked to fill

the responses themselves and to return filled questionnaire within speculated time on the spot. Those participants not speaking English or those having difficulty in understanding were helped by the investigator to fill the responses and to return it on the spot.

### ***Interpretation of scores***

Thus, obtained data were compiled and scores were calculated. Those participants having scored less than or equal to 5 in total PSQI questionnaire were classified as having “good” quality of sleep and those who scored more than 5 were classified as having ‘bad’ quality of sleep. From MEQ all the Likert scale values against the opted answers are added for a total score for each participant. If the total score is 41 and below it is ‘eveningness’(ET) chronotype, if it is within 42 to 58 it is ‘intermediate’(IT) chronotype and if it’s 59 and more it is ‘morningness’(MT) chronotype. Within eveningness if the score is up to 30 it is ‘definite eveningness’ type and if it is 31 to 41 it is ‘moderate eveningness’ type. Similarly, in the morningness trait if the total score falls between 59 and 69 it is ‘moderate morningness’ and if it is more than 69 it is ‘definite morningness’.

### ***Statistical analysis***

The collected data were entered in the excel worksheet and analysed using SPSS vs 23 (IBM, Illinois) software. Frequency distributions and mean scores were calculated. Chi square test with Fischer’s exact was used to test the presence of association between basic and work profile characteristics of the study participants and circadian chronotypes as well as sleep quality categories. Pearson’s partial correlation test was used to identify the correlation between the sleep hours and sleep quality and chronobiologic types.

## **RESULTS**

Out of 102 participants enrolled 93 (30 nurses, 21 Attendants, 35 cleaning staffs, 3 lab technicians, 4 drivers) completed the study (9% non-response rate). Among the 93 participants there were 54 males (58.1%) and 39 females (41.9%). More participants were in the 31-45 years age group (65.6%) with mean age 43.4±9.3 (range 19-65 years). Many participants had secondary school level education (44.1%). More participants were in the group formed by unmarried and separated individuals (59.1%). Percentage living in nuclear family was high (69.9%). Seventy participants (75.3%) had their monthly income more than 10,000 INR (Table 1).

Sixty-four percentage (60 out of 93) participants admitted of having physically active work nature and their working hour is ≤8 hours (63.4%). Almost equal number of participants were there in both the once in a week shift change and shift change once after a fortnight (49.5 and 50.5% respectively). Majority participants were mixed

diet consumers (80.6%), non-smokers (88.2%) and non-alcoholics (86%). But majority stated of having tea, coffee drinking habits (87.1%). Similar majority of participants admitted that they go to bed within 1 hour of dinner intake (87.1%). Around 40% participants had habit of using mobile phones in the bed (Table 2). Similar percentage (39.8%) participants admitted of suffering from one or other acute illnesses (Figure 1). In the circadian chronotypes the intermediateness (69.9%) was the more perceived by the participants compared to moderately morningness type (30.1%) and there was no participant fell in the eveningness types (0%) (mean MEQ score  $55.5 \pm 7.1$ ). Only 25 (26.9%) had good quality sleep (mean PSQI score  $8.9 \pm 4.5$ ) (Table 3 and Figure 2) highlights the frequency of other sleep related variables and their mean values.

Education ( $\chi^2$  value-10.48; p value-0.003), shift nature ( $\chi^2$  value-7.733; p value-0.005) and alcoholism ( $\chi^2$  value-4.130; p value-0.035) were showing statistically significant association between the circadian chronotypes (Table 4). Marital status ( $\chi^2$  value-5.183; p value-0.021), monthly income level ( $\chi^2$  value-4.282; p value-0.039), tea coffee intake habit ( $\chi^2$  value-5.065; p value-0.017), time gap between dinner and bed time ( $\chi^2$  value-16.230; p value-0.000) and the circadian chronotypes ( $\chi^2$  value-7.788; p value-0.006) showed statistically significant association between quality of sleep among the study participants (Table 5). There was strong negative correlation found between the hours of sound sleep (sleep hours) ( $r=-0.495$ ;  $df=90$ ;  $p=0.000$ ) and the total PSQI score during partial correlation analysis.

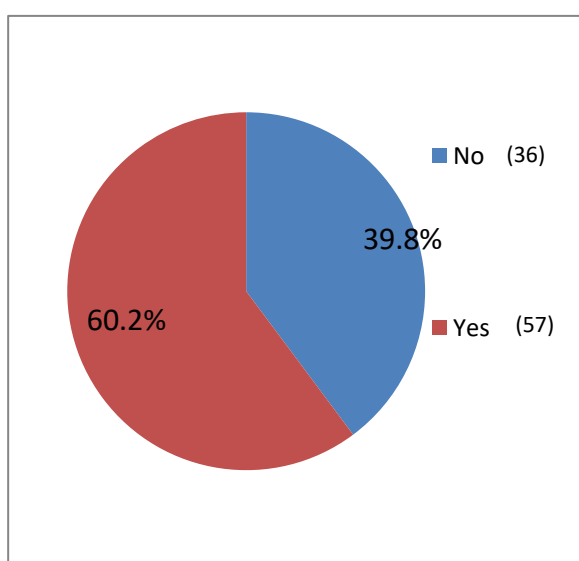


Figure 1: Frequency of participants according to presence of acute illness with them (n=93).

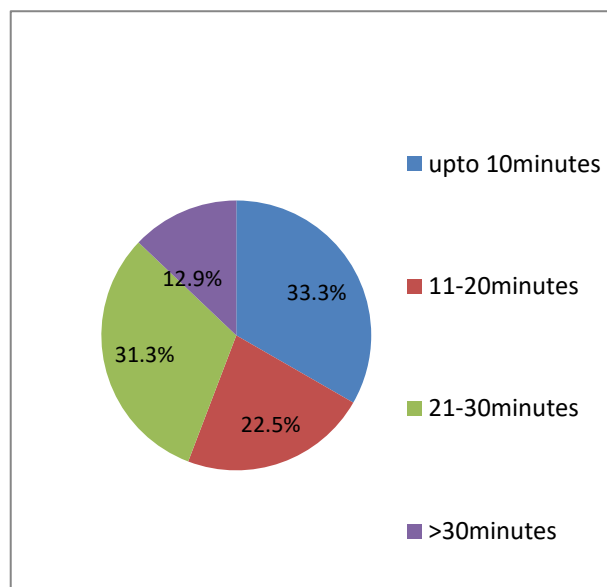


Figure 2: Frequency according to time taken to fall asleep (n=93).

Table 1: Frequency distribution of study participants according to their select socio-demographic characteristics (n=93).

Character	Sub-category	Number	%	Total (%)
Age (year)	≤30	3	3.2	93 (100)
	31-45	61	65.6	
	46-6	27	29.0	
	>60	2	2.2	
Sex	Male	54	58.1	93 (100)
	Female	39	41.9	
Education	Primary school	24	25.8	93 (100)
	Secondary school	41	44.1	
	HSC/diploma	27	29.0	
	Degree/profession	1	1.1	
Marital status	Unmarried/separated	55	59.1	93 (100)
	Married	38	40.9	
Family type	Nuclear	65	69.9	93 (100)
	Joint	28	30.1	
Monthly income (INR)	≤10000	23	24.7	93 (100)
	>10000	70	75.3	

**Table 2: Frequency distribution of study participants according to their select habits and work profiles (n=93).**

Character	Sub-category	Number	(%)	Total (%)
Work nature	Sedentary	33	35.5	93 (100)
	Physically active	60	64.5	
Working hours (hours)	≤8	59	63.4	93 (100)
	>8	34	36.6	
Shift nature	Once a week	46	49.5	93 (100)
	Once in >fortnight	47	50.5	
Diet	Vegetarian	18	19.4	93 (100)
	Mixed diet	75	80.6	
Smoking habit	No	82	88.2	93 (100)
	Yes	11	11.8	
Alcohol intake	No	80	86.0	93 (100)
	Yes	13	14.0	
Other forms of caffeine intake (Tea, Coffee drinking)	No	12	12.9	93 (100)
	Yes	81	87.1	
Gap between dinner and bed time (hour)	≤1	81	87.1	93 (100)
	>1	12	12.9	
Mobile use in the bed	No	56	60.2	93 (100)
	Yes	37	39.8	

**Table 3: Distribution of sleep related variables with their mean score values.**

Variable	Range		Median/ Mean±SD	Interpretation	
	Minimum/ as early by	Maximum/ as late by			
PSQI component scores	C1	0	4	1.09	
	C2	0	6	1.81	
	C3	0	3	1.10	
	C4	0	3	1.48	
	C5	0	8	1.60	
	C6	0	4	0.66	
	C7	0	3	1.29	
PSQI final score	1	21	8.9±4.5	26.9% good QoS; 73.1% bad QoS	
Bed time	7 PM	12 MN	10 PM	90.3% between 9 PM to 10.30 PM	
Time to asleep (min)	5	60	22.15±13.8	Majority (31.2%) took up to 30 mins	
Wake time	4 AM	10 AM	6 AM	77.4% between 5 AM to 7AM	
Hours in bed (hours)	5	11	7.9±1.3	12.9% ≤8 hrs and 58.06% >8 hrs	
Sleep hours (hours)	4	11	7.2±1.4	33.33% 6 hrs, 27.9% 7 hrs, 38.7% ≥8 hrs	
MEQ final score	32	74	55.5±7.1	No subject come under eveningness type	

PQSI-Pittsburgh quality of sleep (QoS) index; MEQ-Morningness-eveningness questionnaire.

**Table 4: Characteristics and statistical association with morningness and intermediate types.**

Characteristics	Sub-category	Type of the trait (%) <sup>#</sup>		χ <sup>2</sup> value	P value*
		Morningness	Intermediateness		
Age group (Year)	≤45	19 (29.7)	45 (70.3)	0.017	0.540
	>45	9 (31.0)	20 (69.0)		
Gender	Male	14 (25.9)	40 (74.1)	1.070	0.210
	Female	14 (35.9)	25 (64.1)		
Education level	Up to secondary	13 (20.0)	52 (80.0)	10.481	0.003
	HSC and above	15 (53.6)	13 (46.4)		
Marital status	Unmarried/separate	15 (27.3)	40 (72.7)	0.514	0.312
	Married	13 (34.2)	25 (65.8)		
Family type	Nuclear	17 (26.2)	48 (73.8)	1.604	0.154
	Joint	11 (39.3)	17 (60.7)		

Continued.

Characteristics	Sub-category	Type of the trait (%) <sup>#</sup>		$\chi^2$ value	P* value
		Morningness	Intermediateness		
Monthly income (INR)	≤10,000	7 (30.4)	16 (69.6)	0.002	0.581
	>10,000	21 (30.0)	49 (70.0)		
Work nature	Sedentary	12 (36.4)	21 (63.6)	0.951	0.229
	Physically active	16 (26.7)	44 (73.3)		
Shift nature	Weekly day and night	20 (43.5)	26 (56.5)	7.733	0.005
	>Fortnightly change	8 (17.0)	39 (83.0)		
Working hours (hrs/day)	≤8	20 (33.9)	39 (66.1)	1.102	0.209
	>8	8 (23.5)	26 (76.5)		
Diet nature	Vegetarian	5 (27.8)	13 (72.2)	0.058	0.528
	Mixed diet	23 (30.3)	52 (69.7)		
Smoking	No	25 (30.5)	57 (69.5)	0.048	0.566
	Yes	3 (27.3)	8 (72.2)		
Alcoholism	No	27 (34.2)	52 (65.8)	4.130	0.035
	Yes	1 (7.1)	13 (92.9)		
Tea/coffee Intake	No	1 (8.3)	11 (91.7)	3.104	0.070
	Yes	27 (33.3)	54 (66.7)		

<sup>#</sup>row percentage; \* P value≤0.05 is statistical significance value

**Table 5: Characteristics and statistical association with quality of sleep.**

Characteristics	Sub-category	Quality of sleep (%) <sup>#</sup>		$\chi^2$ value	P value*
		Good	Bad		
Age group (year)	≤45	14 (21.9)	50 (78.1)	2.618	0.088
	>45	11 (37.9)	18 (62.1)		
Gender	Male	14 (25.9)	40 (74.1)	0.060	0.495
	Female	11 (28.2)	28 (71.8)		
Education level	HSC and above	15 (23.1)	50 (76.9)	1.590	0.157
	Up to secondary	10 (35.7)	18 (64.3)		
Marital status	Married	10 (18.2)	45 (81.8)	5.183	0.021
	Unmarried/separate	15 (39.5)	23 (60.5)		
Family type	Joint	21 (32.3)	44 (67.7)	3.234	0.050
	Nuclear	4 (14.3)	24 (85.7)		
Monthly income (INR)	>10,000	15 (21.4)	55 (78.6)	4.282	0.039
	≤10,000	10 (43.5)	13 (56.5)		
Work nature	Physically active	15 (25.0)	45 (75.0)	0.305	0.376
	Sedentary	10 (30.3)	23 (69.7)		
Shift nature	>Fortnightly change	11 (23.4)	36 (76.6)	0.585	0.298
	Weekly day and night	14 (30.4)	32 (69.6)		
Working hours (hours/day)	≤8	16 (27.1)	43 (72.9)	0.005	0.573
	>8	9 (26.5)	25 (73.5)		
Diet nature	Vegetarian	5 (27.8)	13 (72.2)	0.009	0.568
	Mixed diet	20 (26.7)	55 (73.3)		
Smoking	No	22 (26.8)	60 (73.2)	0.001	0.613
	Yes	3 (27.3)	8 (72.7)		
Alcoholism	No	24 (30.4)	55 (69.6)	3.267	0.610
	Yes	1 (7.1)	13 (92.9)		
Tea/coffee Intake	No	0 (0.0)	12 (100.0)	5.065	0.017
	Yes	25 (30.9)	56 (69.1)		
Acute illness	No	10 (27.0)	27 (73.0)	0.001	0.581
	Yes	15 (26.8)	41 (73.2)		
Dinner-bed time gap (hour)	≥1	9 (75.0)	3 (25.0)	16.230	0.000
	<1	16 (19.8)	65 (80.2)		
In-bed mobile use	No	15 (26.8)	41 (73.2)	0.001	0.581
	Yes	10 (27.0)	27 (73.0)		
Chronotype by MEQ score	Morningness	13 (46.4)	15 (53.6)	7.788	0.006
	Intermediateness	12 (18.5)	53 (81.5)		

<sup>#</sup>row percentage; \* P value≤0.05 is statistical significance value

## DISCUSSION

Out of 102 participants enrolled 93 completed the study (9% non-response rate-2 each from nursing and Attendants, 3 cleaning staffs, 1 lab technician, 1 driver). Only 26.9% had good quality sleep in our study with a mean PSQI score of  $8.9 \pm 4.5$ . This is comparable to the reports by study finding by Hajaghazadeh et al where about 74% of nurses self-reported poor sleep quality with global PSQI value of 6.88.<sup>16</sup> Similarly in few other studies have reported range of 62, 78, 70 and 79.8% poor sleep quality among nurses.<sup>6-8,19</sup> The 69.9% intermediateness, 30.1% moderately morningness and no participants in eveningness circadian chronotypes found in our study is supported by the finding by Achari et al where they have reported that the prevalence of IT was the highest (62.7%) in the studied population, irrespective of gender and age and that the percentage of evening trait was extremely low (1.93%) and that of morning trait (35.34%) was considerably higher.<sup>20</sup>

In addition to this Roenneberg et al also report that emerging evidence from studies in adolescents as well as in general population suggested that increased adiposity, although some found this relationship in overweight individuals, associated with evening preference (or late bedtime) and social jetlag.<sup>21</sup>

In our study the education level had a statistically significant association with chronotypes. This may be due to higher the education beyond secondary school level (59.1%) higher the shift from protective morningness to circadian dis-alignment rhythm of intermediate and then to eveningness. Even though majority participants (75.3%) had their monthly income more than 10,000 INR there was no association between the chronotypes in our study. The expected is more the economic growth more the facilities delaying the time to engage in bed and getting up late in the morning. Sixty-four percentage (60 out of 93) participants admitted of having physically active work nature and their working hour is  $\leq 8$  hours (63.4%). This is in line with work culture in most part of the Kerala state where most of the people will strictly follow work time and they don't crave for overtime wages. Similarly, at work also they do not like sitting idle for many hours and they will like to interact with co-workers. For which they start moving around. The finding of higher proportion of (87.1%) tea, coffee drinking habits found in our study participants may also be another reason for adapting to the shift work mental stress. Similar majority of participants admitted that they go to bed within 1hr of dinner intake (87.1%).

Around 40% participants had habit of using mobile phones in the bed. This may be due to the finding in our study that percentage living in nuclear family was also high (69.9%). And, there were 39 out of 68 (57.3%) participants belonging to nuclear family type using mobile phones in the bed and 55 out of 65 (84.6%) of participants belonging to nuclear family type going to bed

early (<1 hour) or immediately after dinner. This can be indirectly explained that in the joint family system interaction with people to each other may control, directly or indirectly, going early to bed as well as frequency of the mobile phone use in the bed. In our study 31.2% had reported that they take up to 30 mins to fall asleep after engaging in the bed with an average of  $22 \pm 13.8$  minutes. Similar findings had been reported by Al Shareef that of employed respondents, 35.4% reported taking over 30 minutes to fall asleep.<sup>22</sup> The average sleep duration was 6.49 hours ( $SD \pm 2.03$ ).

The statistically significant association of education (p value-0.003), shift nature (p value 0.005) and alcoholism (p value-0.035) with circadian chronotypes in our study is supported by a study finding by Hajaghazadeh et al where they have reported that the sleepiness of nurses had a significant relation with shift works and marital status (p value <0.05).<sup>16</sup> Marital status (p value-0.021), monthly income level (p value-0.039), tea coffee intake habit (p value 0.017), time gap between dinner and bed time (p value 0.000) and the circadian chronotypes (p value-0.006) showed statistically significant association between quality of sleep among the study participants in our study. In support of our findings Hajaghazadeh et al also report that a significant relation was found only between shift work and quality of sleep.<sup>16</sup> There was strong negative correlation found between the hours of sound sleep (sleep hours) ( $r = -0.495$ ;  $df = 90$ ;  $p = 0.000$ ) and the total PSQI score in our study.

### Limitations

This is only a cross-sectional study with a small purposeful sample. We could only reveal the magnitude and suspected associations of the sleep quality among these health workers. Identification of occupational health risk levels and analysis of correlation between other biological variables related to sleep quality were not feasible in this design of study. Our findings cannot be generalized to any other setting as such.

### CONCLUSION

Higher prevalence of poor quality of sleep with intermediateness as preferred circadian chronotype, influenced by shift nature, time gap between dinner and bed time and use of mobile electronic gadgets in bed. There was also a strong negative correlation found between the hours of sound sleep and the total PSQI score.

### Recommendations

From our study findings we strongly recommend nature and duration of shifts can be reviewed periodically. We also recommend future studies with longitudinal analytical design enrolling more participants from other different strata. It is high time to encourage better life quality through improved sleep quality aspects of these

health care workers working in various shifts for continuum of care they provide at the tertiary care level.

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## REFERENCES

1. Huang W, Ramsey KM, Marcheiva B, Bass J. Circadian rhythms, sleep, and metabolism. *J Clin Invest*. 2011;121:2133-41.
2. Pilcher JJ, Morris DM. Sleep and organizational behavior: implications for workplace productivity and safety. *Front Psychol*. 2020;11:45.
3. Kucharczyk ER, Morgan K, Hall AP. The occupational impact of sleep quality and insomnia symptoms. *Sleep Med Rev*. 2012;16(6):547-59.
4. Yazdi Z, Sadeghniiat-Haghighi K, Loukzadeh Z, Elmizadeh K, Abbasi M. Prevalence of sleep disorders and their impacts on occupational performance: a comparison between shift workers and non-shift workers. *Sleep Disord*. 2014;2014:870320.
5. Muecke S. Effects of rotating night shifts: Literature review. *J Adv Nurs*. 2005;50(4):433-9.
6. Park E, Lee HY, Park CSY. Association between sleep quality and nurse productivity among Korean clinical nurses. *J Nurs Manag*. 2018;26(8):1051-8.
7. Chanchlani N. Health consequences of shift work and insufficient sleep. *BMJ*. 2017;356:i6599.
8. Tarhan M, Aydin A, Ersoy E, Dalar L. The sleep quality of nurses and its influencing factors. *Eurasian J Pulmonol*. 2018;20(2):78.
9. McDowall K, Murphy E, Anderson K. The impact of shift work on sleep quality among nurses. *Occup Med*. 2017;67(8):621-5.
10. Bjorvatn B, Dale S, Hogstad-Erikstein R, Fiske E, Pallesen S, Waage S. Self-reported sleep and health among Norwegian hospital nurses in intensive care units. *Nurs Crit Care*. 2012;17(4):180-8.
11. Zhu L, Zee PC. Circadian rhythm sleep disorders. *Neurol Clin* 2012; 30(4): 1167-91.
12. Levandovski R, Sasso E, Hidalgo MP. Chronotype: A review of the advances, limits and applicability of the main instruments used in the literature to assess human phenotype. *Trends Psychiatry Psychother*. 2013;35(1):3-11.
13. Yazdi Z, Sadeghniiat-Haghighi K, Javadi ARHS, Rikhtegar G. Sleep quality and insomnia in nurses with different circadian chronotypes: morningness and eveningness orientation. *Work*. 2014;47(4):561-7.
14. Demir Zencirci A, Arslan S. Morning-evening type and burnout level as factor influencing sleep quality of shift nurses: A questionnaire study. *Croat Med J*. 2011;52(4):527-37.
15. Bavarsad MB, Azimi N, Moradbeigi K, Latifi M. Associations between morningness eveningness and sleep quality among female dormitory residents. *Thrita*. 2015;4(1) e59661.
16. Hajaghazadeh M, Zamanzadeh V, Ghofrani M, Orujlu S. Morningness-Eveningness Chronotypes, Sleep Quality, and Sleepiness Among Nurses. *Public Health J*. 2019;12:414-9.
17. Buysse DJ, Reynolds CF 3<sup>rd</sup>, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193-213.
18. Horne JA, Östberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *Int J Chronobiol*. 1976;4(2):97-110.
19. Zhang L, Sun DM, Li CB, Tao MF. Influencing factors for sleep quality among shift-working nurses: A cross-sectional study in China using 3-factor Pittsburgh sleep quality index. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2016;10(4):277-82.
20. Achari VK, Pati AK. Morningness – eveningness preference in Indian school students as function of gender, age and habitat. *Biological Rhythm Res*. 2007;38(1):1-8.
21. Roenneberg T, Allebrandt KV, Meroow M, Vetter C. Social jetlag and obesity. *Curr Biol*. 2012;22:939-43.
22. Al Shareef SM. Occupational Outcomes Associated with Sleep Quality and Excessive Daytime Sleepiness: Results from a National Survey. *Nat Sci Sleep*. 2020;12:875-82.

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