

## Original Research Article

# The analysis of determinants of shift nurses' sleep quality during the COVID-19 pandemic at Sanglah general hospital Denpasar

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## ABSTRACT

**Background:** Fatigue and sleepiness experienced by nurses can put them at risk of making mistakes in medication administration and clinical judgment. In addition, fatigue and sleepiness can also lead to increased emotions towards co-workers, jeopardize their own safety, especially on the way home from work, and can reduce patient care.

**Methods:** This study used an analytical research method with a cross-sectional study, involving 91 shift nurses. It was carried out by conducting interviews during the first break of the first morning cycle after holiday.

**Results:** Results of this study indicated that all sociodemographic variables did not show significant differences with sleep quality variable with a significance level of  $p > 0.05$ . There was also no relationship between physical activity and caffeine intake and sleep quality. Moreover, there was no significant difference between physical illness and sleep quality. Sleep quality (Pittsburgh sleep quality index/PSQI) and sleepiness level score (Karolinska sleepiness scale/KSS) showed no significant relationship with  $p < 0.05$ . KSS was divided into 2 including non-sleepy state (1-6) and sleepy state (7-9).4 Insignificant relationship was also shown between sleep quality score (PSQI) and fatigue level score (fatigue severity scale/FSS). Importantly, insignificant relationship was shown between sleep quality score and hospital anxiety and depression scale. In addition, there was only work unit in COVID-19 isolation room which had a significant relationship to sleep quality compared to non-isolation room with a significance level of  $p < 0.05$ .

**Conclusions:** Based on results of this study, it can be concluded that work unit in COVID-19 isolation room had a relationship with sleep quality of shift nurses who work in the unit.

**Keywords:** Sleep quality, Shift nurses, COVID-19

## INTRODUCTION

Shift system is widely adopted by workers who offer services such as police and health workers. This system often leads to "unusual" lives in which there are problems with irregular sleep patterns that affect sleep quality. Nurses are needed 24 hours in a health facility, so they adopt the shift system. Consequently, there is a very high probability that they have decreased sleep quality.

Sleep disturbance is one of the effects of the shift system caused by changes in sleep patterns, causing changes in

circadian rhythm.<sup>1</sup> The night shift dominates the high level of fatigue, physical and mental stress, deterioration of the body, and the rate of work accidents.<sup>2,3</sup>

Nurses who are tired and sleepy are at risk of making mistakes in administering medication, errors in clinical judgment, increasing emotions towards colleagues, jeopardizing their own safety, especially on the way home from work and showing a decrease in patient care and treatment. Research on the effects of nurse fatigue on the quality of care for patients is described by the level of patient outcomes and through questionnaires distributed to patients and their families.<sup>1</sup>

The explanation above shows that sleep quality and the factors affecting sleep quality in nurses need attention for the continued productivity of nurses and work units. The researchers were interested in conducting a study and analysis of determinants to identify the relationship of the factors considered affecting shift nurses' sleep quality at Sanglah general hospital Denpasar Bali. These factors included sociodemographic factors (age, sex, marital status, years of service, having children, residence status, residence location, side job), environmental factors and work-related factors (work unit, frequency of night shift in a month, sleep duration on working days, sleep duration on holidays, frequency of waking up during the night shift), psychological factors (depression, anxiety), stimulant (caffeine) intake, physical illness, physical activity, level of sleepiness, and level of fatigue. In January 2020, the world health organization (WHO) announced a novel coronavirus (COVID-19) pandemic, in which awareness of human-to-human transmission was raised, and isolation rooms were opened in many hospitals. Currently, 'new normal' has been promoted. This study took background of 7 months after COVID-19 was declared a pandemic.

## METHODS

This study utilized analytical research methods with cross-sectional studies. It was conducted from November to December 2020. The data on the questionnaire were filled in by interviews. The subjects were shift nurses in the inpatient room, intensive therapy room, emergency room (IGD), COVID-19 isolation room at Sanglah general hospital Denpasar.

The inclusion criteria in this study were shift nurses at Sanglah general hospital Denpasar for at least the last one month and had night shift at least once in the last month, while the exclusion criteria were refusing to participate in the study after receiving an explanation of the aims, objectives and complete research procedures.

In this study, independent variables included sociodemographic factors (age, sex, marital status, years of service, having children, residence status, residence location, side job), environmental factors and work-related factors (work unit, frequency of night shift in a month, sleep duration on working days, sleep duration on holidays, frequency of waking up during the night shift), psychological factors (depression, anxiety), caffeine intake, physical illness, physical activity, level of sleepiness, and level of fatigue. In addition, dependent variable was shift nurses' sleep quality.

The basic characteristics of research subjects were obtained through descriptive analysis of the independent variables. Data analysis in this study was carried out using SPSS 21.0 for windows software. Descriptive analysis was used to determine the description of the characteristics of the research sample. Chi square test was utilized to determine the relationship between sleep quality and all determinants. Logistic regression analysis was used to find

the determinants or risk factors affecting shift nurses' sleep quality at most. This study has received ethical clearance from research ethics commission of the faculty of medicine, Udayana university/Sanglah hospital with letter number 2404/UN14.2.2.VII.14/LT/2020.

## RESULTS

This study involved 91 shift nurses with interviews conducted during the first break of the first morning shift after a holiday. The response rate of this study was 100%. The characteristics of research subjects can be seen in Table 1. There were 47.7% of shift nurses aged over 30 years, with the maximum age limit of nurses who were still working with the shift system by 51 years (Table 1). The proportion of female respondents (73.8%) was more than male respondents (Table 1). There were 63 respondents (75%) who were married, and 64.3% of respondents who had children. Most of the respondents chose to live with their family (82.4%). There were 53.6% of respondents living outside Denpasar and chose to commute to work. Moreover, most of the respondents did not have side job (91.7%), and 51.2% of respondents had worked for >10 years. Additionally, there were 56% of respondents with vigorous activity, which was an accumulation of light activities carried out every day. There were 94% of respondents not consuming caffeine up to 3-4 times a day, and 94% of respondents also did not suffer from physical illness. For sleep duration on holidays, 66.7% of respondents slept 8 hours during the night, which was reduced to only the sleeping for 2 hours during night shift.

Table 3 shows the Indonesian version of Karolinska sleepiness scale, in which the most voted sleepy, but no effort to keep alert'. These data were taken in the first morning cycle after 2 days off. In addition, the table also shows fatigue severity scale, in which the majority of respondents had normal fatigue level score (67.9%).

Table 4 shows sleep quality of respondents. There were 86.9% of respondents who had good/normal sleep quality. Each component was described and tested for normality. If data distribution was not normal, reporting was made in the form of median value. It can be seen that respondents' subjective sleep quality was in a fairly good range. There was mild sleep disturbance (once a week) and no sleeping pills. Additionally, the majority of daytime dysfunction was still within normal limits.

It was found that all sociodemographic variables did not show significant differences with the sleep quality variable with a significance level of  $p > 0.05$ . Physical activity and caffeine intake also showed no relationship with sleep quality. There was no significant difference between physical illness and sleep quality. Sleep quality (PSQI) and level of sleepiness score (KSS) showed no significant relationship with  $p < 0.05$ . The KSS scale is divided into 2: the condition of not sleepy (1-6) and the condition of sleepy (7-9).<sup>4</sup> Moreover, no significant relationship was shown between sleep quality score (PSQI) and level of

fatigue score (FSS). No significant relationship was also shown between sleep quality score and the hospital anxiety and depression scale. Table 5 shows that only the work unit

in the COVID-19 isolation room had a significant relationship with sleep quality compared to the non-isolation room with a significance level of  $p < 0.05$ .

**Table 1: Characteristics of research subjects.**

Variables	Total (%)
Sex	Male
	22 (26.2)
	Female
	62 (73.8)
Age (year)	33 (23-53)
	≤ 33
	44 (52.3)
	> 33
	40 (47.7)
Marital status	Single
	21 (25)
	Married
	63 (75)
Having children	Yes
	54 (64.3)
	No
	30 (35.7)
Residence status	Living alone
	16 (17.6)
	Living with family
	75 (82.4)
Residence location	In Denpasar
	39 (46.4)
	Outside Denpasar
	45 (53.6)
Years of service	≤ 10
	41 (48.8)
	> 10
	43 (51.2)
Side job	Yes
	4 (8.3)
	No
	77 (91.7)
Physical activity	Vigorous
	47 (56)
Caffeine intake 3-4 times a day	Light-moderate
	37 (44)
Physical illness	No
	79 (94.)
Work unit	Yes
	5 (6)
frequency of night shift in a month	No
	79 (94)
Sleep duration during the night shift	Yes
	5 (6)
	Emergency room (IGD)
	28 (33.3)
	Inpatient room
	15 (17.9)
	COVID-19 isolation room
	26 (31.0)
	Intensive therapy room
	15 (17.9)
Frequency of waking up during the night shift	8 (1-16) times
	41 (48.8)
	less than 8 or more
	43 (51.2)
	2 (0-6) hours
	4 (4.8)
	sufficient
	80 (95.2)
	insufficient
	8 (3-10) hours
	56 (66.7)
	sufficient
	28 (33.3)
	insufficient
	3 (1-8) times
	47 (56)
	Rarely (1-3x/night)
	29 (44)

**Table 2: Level of sleepiness and level of fatigue.**

Characteristics	Proportion (%)
<b>The value of the Indonesian version of KSS</b>	
Extremely alert	10 (11.9)
Very alert	8 (9.5)
Alert	18 (21.4)
Fairly alert	8 (9.5)
Neither alert nor sleepy	6 (7.1)
Some signs of sleepiness	2(2.4)
Sleepy, but no effort to keep awake	28 (33.3)
Sleepy, but some effort to keep awake	4 (4.8)
Very sleepy, great effort to keep awake, fighting sleep	-

**Table 3: Scores of fatigue severity scale.**

Scale	Scores (%)
Normal	57 (67.9)
Abnormal	27 (32.1)

**Table 4: Sleep quality based on the Pittsburgh sleep quality index.**

Characteristics	Total (%)
<b>Skor global Pittsburgh sleep quality index</b>	
Good/ normal	73 (86.9)
Bad/abnormal	11 (13.1)

**Table 5: The relationship between variables and sleep quality.**

Variables	P value
Sex	0.155
Age	0.877
Marital status	0.555
Having children	0.604
Residence status	0.584
Residence location	0.350
Years of service at Sanglah hospital	0.811
Having side job other than being a nurse at Sanglah general hospital	0.360
<b>IPAQ score categorization</b>	
Physical activity level	0.415
Routinely consume at least 3 cups of caffeine per day	0.487
Having physical illness	0.126
<b>Work unit</b>	
Emergency room- (Inpatient room + COVID-19 isolation room + intensive therapy room)	0.062
Inpatient room-(emergency room + COVID-19 isolation room + intensive therapy room)	0.098
COVID-19 isolation room-(inpatient room + emergency room + intensive therapy room)	0.018
Intensive therapy room-(inpatient room + COVID-19 isolation room + emergency room)	0.307
<b>Frequency of night shift in a month</b>	0.083
<b>Sleeping duration on working days</b>	0.436
<b>Frequency of waking up during the night shift</b>	0.579
<b>Sleeping duration on holidays</b>	0.06
<b>Score of Karolinska sleepiness scale-level of sleepiness</b>	0.129
<b>Score of Fatigue severity scale-level of fatigue</b>	0.243
<b>Score categorization hospital anxiety scale-level of anxiety</b>	0.419
<b>Score categorization of hospital depression scale-level of depression</b>	0.869

## DISCUSSION

Sociodemographic variables did not show significant differences in the sleep quality scores of respondents. Having children is closely related to parental stress. Physical and mental fatigue in caring for children often takes up their sleep hours which results in a decrease in their sleep quality.<sup>5</sup> This study shows the exact opposite results. The results showed no significant difference, while the majority of respondents who had children actually had a good sleep quality. It can be explained by the culture and work environment that shows discrimination against those who do not have children. Legitimacy was given to provide additional workload for those who did not have children.<sup>6</sup>

More importantly, bivariate analysis showed that there was no difference in sleep quality in physical factors such as sex and age. It is not in line with a study showing that male

shows tolerance for shift work than female. The physical endurance of male exceeds that of female, so that it is easier for female nurses to experience fatigue.<sup>7</sup> Age has an inverse relationship with sleep quality scores. Increasing age is associated with the appearance of pathological conditions that interfere with sleep and health. The results of this analysis can be explained from the sociodemographic character which showed that 86.8% of nurses were over 30 years old, with the maximum age limit of nurses who were still working with the shift system by 51 years. This is in accordance with the nurses' health study (NHS) II in 2015 which showed that nurses over the age of 46 were placed on morning shifts (80%), reducing the negative effects of night shifts on health. The decree of minister of health in May 2020 number HK.01.07/MENKES/328/2020 on guidelines for COVID-19 prevention and control at workplaces and industries in supporting business sustainability amid the pandemic suggests workers aged 50 years and over to reduce the

night shift.<sup>8</sup> In addition, in terms of sex, the results of this study are in accordance with the preliminary on nurses in child care room at Sanglah general hospital Denpasar which also showed that the majority were female nurses (99%).<sup>9</sup>

Social factors in the form of marital status and status of living with family are closely related to sleep quality. Although the results of this study did not show a significant relationship, several studies suggested otherwise. It can be explained by studies showing that a good interpersonal relationship with a partner brought benefits in the form of protection from stressful conditions (physical and psychological) which affected health conditions and sleep quality. The relationship occurs in two directions (reciprocal) between the quality of the relationship with the partner and sleep quality.<sup>10</sup>

The insignificant relationship was also shown by the factors of residence location and side job. The residence location is associated with commute time. It is supported by a study conducted in 2019 that the commute time was found to have a significant relationship with sleep quality if the respondent took >60 minutes of commute time, which means that the respondent took 2 hours of commuting to and from work in a day. A study by Murad et al in 2019 found that there was an adaptation mechanism; more senior nurses had the privilege of being able to leave the workplace earlier.<sup>11</sup> Besides, no significant difference was found in years of service of nurses at the hospital. Years of service more than 10 years, referring to a study by Murad et al, are related to better sleep quality since senior nurses tended to be considered "unhealthier" so that they got privileges such as leaving work on time. The factor of side job also had no significant difference on sleep quality. It can be explained from a review conducted by Giuliano Russo in 2018 that having a job side was related to fatigue due to an extended working time duration. The characteristics of nurses at Sanglah general hospital also showed that 91.7% of nurses did not have side job.<sup>12</sup>

Additionally, this study showed that physical activity had no relationship with sleep quality. This is consistent with a study on 185,000 workers in Korea showing that sleep quality improvement was found in the group with 600-9000 METs-min/week of physical activity. The results of this study were divided specifically for male shift workers (between 1800-3000), while for female workers, there was no significant difference that physical activity affected sleep quality. There are basically many factors beyond physical activity that can affect sleep quality.<sup>13,14</sup>

The characteristics of respondents showed that 94% of respondents did not consume caffeine up to 3-4 cups a day and did not have physical disease. The bivariate analysis also found no relationship between the two.

The Karolinska Sleepiness Scale questionnaire in this study was first translated into Indonesian by a translator

from the Indonesian translator association (HPI). The Indonesian version of this questionnaire has been discussed by the sleep disorders Division of the neurology department, faculty of medicine, Udayana university and approved. The interview and data collection by the researcher were also a test of language understanding to make sure that the translated questionnaire was well understood by the respondents and make sure that there were no obstacles in collecting data. Research by Jeanne Geiger Brown in 2013 on nurses using the KSS instrument revealed that lower results (lower levels of sleepiness) were obtained for morning shift nurses, while high results were obtained for night shift nurses. The data were taken during the morning shift. The results of this study were found to be greater in the alert condition although not much different, and no significant relationship was obtained.<sup>4</sup>

Furthermore, the level of fatigue had no relationship with sleep quality. It can be said that individuals with "good" sleep quality or "good sleepers" may be depictions of high level of fatigue. In this case, the proposed rationalization is that exhausted individuals with abnormal sleep quality can adapt, for example by consuming caffeine to improve performance so that they look more 'less tired'.<sup>15</sup>

The relationship between sleep quality and psychological factors (depression and anxiety) was found to be insignificant. Multi-factors play a role in psychological factors such as support from family, age, sex, years of service and personality traits that affect tolerance to the shift system.<sup>16</sup>

This study showed that the COVID-19 isolation room work unit had a relationship with the sleep quality of shift nurses working in that unit. These results are consistent with a study in China conducted in April 2020 on the experiences of nurses in the COVID-19 isolation room. Isolation room nurses had to deal with the discomfort of wearing hazmat every day, felt afraid of being infected due to long-term interaction with people with COVID-19 even though they had used hazmat, witnessed many deaths due to COVID-19, while at the same time they faced the risk of being infected and getting bored because they were not free to leave the isolation room.<sup>17</sup>

A limitation of this study is the potential for bias. The historical identification of independent variables in the last month is varied and subjective. Asking respondents to recall their experiences in the last month has the potential to lead to recalled bias. The implementation of PSQI to measure sleep quality has limitations since the data are fully sourced from the subjectivity of the respondents' answers.

## CONCLUSION

Based on the results of this study, it can be concluded that sociodemographic factors (age, sex, marital status, years of service, having children, residence status, residence

location, side job); environmental factors and workload (emergency room work unit, intensive therapy room, inpatient room, frequency of night shift in a month, sleep duration on working days, sleep duration on holidays, frequency of waking up during the night shift), psychological factors (depression, anxiety), stimulant (caffeine) intake, physical illness, physical activity, levels of sleepiness, and level of fatigue do not have an effect on the shift nurses' sleep quality at Sanglah general hospital Denpasar during the COVID-19 pandemic. The COVID-19 isolation room work unit has a relationship with the sleep quality of shift nurses who work in the unit.

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