



# Correlation Between Sleep Patterns and Blood Pressure in Students of Universitas Prima Indonesia

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## ABSTRACT

**Introduction:** Hypertension is a chronic condition which blood pressure increases above normal limits. It can cause a variety of other health issues such as heart, eyes, and kidney problems. Hypertension can occur due to various risk factors such as sleep disturbance. Sleep disturbance often occurs in students that could be affected by demands from college such as attending school community, school tasks, or exams.

**Objective:** Correlation between sleep patterns and blood pressure in students of the Faculty of Medicine, Universitas Prima Indonesia in 2023.

**Method:** Cross sectional, the samples in this study are students of the Faculty of Medicine, Universitas Prima Indonesia, Class 2020-2022 who had met the selection and exclusion criteria based on the quota sampling technique. The data was then analyzed with the Chi Square test.

**Result:** The calculation results shows that out of 85 respondents, 49 people (57,6%) had poor sleep patterns and 36 people (42,9%) had good sleep pattern. And out of 85 respondents, 11 people (12,9%) had normal blood pressure, 35 people (41,2%) had pre-hypertension blood pressure, 33 people (38,8%) had stage 1 hypertension blood pressure, and 6 people (7,1%) had stage 2 hypertension blood pressure. The Chi Square test results showed no meaningful relationship between sleep patterns and blood pressure ( $p$  value=0,929).

**Conclusion:** There is no meaningful relationship between sleep patterns and blood pressure of Universitas Prima Indonesia students in 2023.

**Keywords:** Blood pressure; hypertension; sleep patterns



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## 1. Introduction

Sleep is one of the physiological human needs that affects the quality and balance of a person's life. Sleep is a recurring condition in every person and is an active state. Sleep is done every day and becomes a basic need to be met. Depending on the age, each person's need for sleep is different, the amount of sleep a person needs will decrease as they get older [1].

Various factors can affect sleep quality, such as physical activity, lifestyle, stress, and caffeine consumptions. There are two aspects of sleep quality: the quantitative (sleep hours) and the qualitative (the depth of sleep), such as how long it takes to fall asleep, how much time it takes for sleep, how many times a person wakes up, and subjective factors such as the duration of sleep. If a person does not experience signs of

lack of sleep or has a sleep disorder, then the quality of sleep is considered good [2].

Poor sleep quality can affect a variety of health problems. Such as heart problem or hypertension. Hypertension is an increase in blood pressure in the arteries. Blood pressure has two digits, namely a higher number (systolic) obtained when the heart contracts and a lower number (diastolic) at the time of the heart relaxation. In general, hypertension shows no symptoms, but can increase the risk of heart failure, stroke, and chronic kidney disease [3].

In Indonesia the prevalence of hypertension based on Riskedas (2018) population age 18-24 years old (13,2%), age 25-34 (20,1%), age 35-44 (31,6%), age 45-54 (45,3%) and age 55-64 (55.2%). High prevalence of hypertension in other Asian countries such as, in China 23.2% (2018), India 24% (2015), Japan 50% (2018.), Malaysia 30.3% (2015). Pakistan 46.2% (2017) [4,5]

Blood pressure can be influenced by many factors such as caffeine intake, smoking, sodium, genetics, age, and lifestyle [6]. From a study conducted in 2019 in Guntung Payung, Indonesia in hypertensive patients, the obtained results in patients with poor sleep quality, the majority had moderate blood pressure increases and patients with good sleep quality had a slight increase in blood pressure [7].

Poor sleep patterns and shift work that cause shortening of sleep time can increase the risk of hypertension by interfering with circadian rhythms resulting in irregular circadian rhythms. The suprachiasmatic nucleus that regulates endogenous circadian rhythms become flat and arrhythmias due to insufficient sleep and chronic reverse cycles of behavior leading to inconsistencies with the 24-hour light/dark cycle. This poor sleep behavior interfering circadian rhythms, diurnal pattern of 24-hour blood pressure, and higher risk of hypertension [8].

High blood pressure or hypertension is a risk factor for a variety of health problems that can affect quality of life and an increase in a person's mortality rate. So understanding and preventing risk factors, in this case sleep pattern is very important. Therefore, the authors feel that it is very necessary to study the correlation between sleep and blood pressure.

## **2. Method**

This research is an observational analytical research with a cross-sectional design used. This research was conducted to analyze the relationship between sleep patterns and blood pressure in medical faculty students at Universitas Prima Indonesia using the Chi Square statistical test. In this study the independent variable is sleep patterns, and the dependent variable is blood pressure.

The population in this study were students from the faculty of medicine at Universitas Prima Indonesia 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> semester who were still active in their studies. The sampling technique is a quota sampling technique and is in accordance with the inclusion criteria, which were students who are still active and willing to become respondents by filling out a consent form for research. And the exclusion criteria were students who filled out the questionnaire incompletely, students with a history of heart or kidney disease, diabetes mellitus, consuming coffee and alcohol every day, taking antihypertensive drugs, smoking, and having psychological disorders.

The instrument used in this study was the PSQI (Pittsburgh Sleep Quality Index) questionnaire which had been translated into Indonesian and had been tested for validity by previous researchers to assess sleep patterns, while blood pressure was measured using a digital blood pressure monitor.

## **3. Results**

This research was conducted at the medical faculty of Universitas Prima Indonesia in July 2023 with 85 respondents who met the inclusion and exclusion criteria. The characteristics of respondents in table 1 were the respondents habits in the last 1 month.

**Table 1.** Characteristics of Respondents

Characteristics	Frekuensi (n = 85)	Percentage (%)
Gender		
Male	46	54,1
Female	39	45,9
Student level		
3 <sup>rd</sup> semester	30	35,3
5 <sup>th</sup> semester	30	35,3
7 <sup>th</sup> semester	25	29,4
Sick in the last 1 month		
Never	38	44,7
Ever	47	55,3
Sleep environment (light)		
Bright	17	20
Dim	24	28,2
Dark	44	51,8
Sleep environment (sound)		
Noisy	3	3,5
Calm	82	96,5
Types of food frequently consumed		
Fast food/Junk food	27	31,8
Healthy food	58	68,2
Food that are rarely consumed		
Vegetables	29	34,1
Fruit	38	44,7
Meat	18	21,2
Exercise frequency		
Never	19	22,4
1-2 times	36	42,4
3-4 times	15	17,6
>4 times	15	17,6
Preferred activity place		
Outdoor	34	40
Indoor	51	60
Worship according own beliefs		
Never	3	3,5
Rarely	30	35,3
Often	52	61,2
Clubbing		
Never	81	95,3
Rarely	4	4,7
Often	0	0
Blood pressure		
Normal	11	12,9
Pre-hypertension	35	41,2
Grade 1 hypertension	33	38,8
Grade 2 hypertension	6	7,1
Sleep pattern		

Good	36	42,4
Bad	49	57,6

In table 1, the characteristics of respondents can be seen such as male gender 49 respondents (54.1%) and female gender 39 respondents (45.9%). In terms of student level, in 3<sup>rd</sup> semester there were 30 respondents (35.3%), 5<sup>th</sup> semester there were 30 respondents (35.3%) and 7<sup>th</sup> semester there were 25 respondents (29.4%).

Then, it was also seen whether the respondent had or had never been sick in the last 1 month. Most of the respondents had been sick as many as 47 respondents (55.3%) and had never been sick as many as 38 respondents (44.7%).

There is a descriptions of the respondents sleeping environment in the last 1 month. Most of them were in dark environment as many as 44 respondents (51.8%), 24 respondents (28.2%) in dim light and 17 respondents (20%) in bright light. And the most frequent sound environment was calm with 82 respondents (96.5%) and noisy with 3 respondents (3.5%).

There is also a description of the respondents eating behavior in the last 1 month. Regarding the types of food frequently consumed, it was found that 27 respondents (31.8%) often consumed junk food and 58 respondents (68.2%) consumed healthy food. Then there is the type of foods that respondents rarely consumed in the last month, such as vegetables by 29 respondents (34.1%), fruit by 38 respondents (44.7%) and meat by 18 respondents (21.2%).

There is an illustration of the respondents exercise frequency in the last 1 month. There were 19 respondents (22.4%) who never exercised, 1-2 times there were 36 respondents (42.2%), 3-4 times there were 15 respondents (17.6%), and >4 times there were 15 respondents (17.6%). Then there is a description of where respondents prefer to do activities, which indoor there were 51 respondents (60%) and outdoor 34 respondents (40%).

There is an illustration of the respondents frequency of worship according their own beliefs and clubbing lifestyle in the last 1 month. The highest frequency of respondents often worshiped was 52 respondents (61.2%), rarely 30 respondents (35.2%) and never 3 respondents (3.5%). There is a frequency of respondents clubbing lifestyle in the last 1 month, which never clubbing as many as 81 respondents (95.3%) and rarely as many as 4 respondents (4.7%).

There is an illustration of the distribution of respondents blood pressure. The highest frequency was pre-hypertension as many as 35 respondents (41.2%), normal as many as 11 respondents (12.9%), grade 1 hypertension as many as 33 respondents (38.8%) and grade 2 hypertension as many as 6 respondents (7.1 %). And there is a distribution of sleep patterns and the bad sleep pattern results were 49 respondents (57.6%) and good sleep pattern results were 36 respondents (42.4%).

The table 2 shows correlation between sleep pattern and blood pressure. The table shows respondents with good sleep patterns with normal blood pressure were 5 respondents, pre-hypertension 14 respondents, and hypertension 17 respondents. Then data on poor sleep patterns with normal blood pressure were 6 respondents, pre-hypertension 21 respondents and hypertension 22 respondents. So it can be concluded from the table that the blood pressure value for the poor sleep pattern group is higher than the blood pressure value for the good sleep pattern group. In the chi-square test results table, the p value is 0.929, so it can be concluded that there is no significant relationship between sleep patterns and blood pressure because the p value is >0.05.

In table 3 shows correlation between sleep patterns and light in the sleep environment of the respondents in the last 1 month, the table shows good sleep patterns with bright lighting there were 3 respondents, dim lighting 8 respondents and dark 25 respondents. Then 14 respondents had poor sleep patterns with bright lighting, 16 respondents with dim lighting and 19 respondents with dark. From the results of the chi-square data analysis, the p value is 0.012, so there was a significant relationship between sleep patterns

and lighting during sleep because the p value is  $<0,05$ .

**Table 2.** Correlation Between Sleep Pattern and Blood Pressure

		Blood Pressure			Total	P Value
		Normal	Pre-hypertension	Hypertension		
Sleep pattern	Good	5	14	17	36	0,929
	Bad	6	21	22	49	
Total		11	35	39	85	

**Table 3.** Correlation Between Sleep Pattern and Light in the Sleep Environment

		Light			Total	P Value
		Bright	Dim	Dark		
Sleep pattern	Good	3	8	25	36	0,012
	Bad	14	16	19	49	
Total		17	24	44	85	

#### 4. Discussion

In table 2 shows that there was no relationship between sleep patterns and blood pressure. This is in accordance with research by Rahman (2020) that there is no relationship between sleep patterns and blood pressure. However, this is contrary to research by Luthfi B, Azmi and Erkadius (2017) which states that there is a relationship between sleep patterns and blood pressure. This may occur in terms of the number of respondents being less, namely 85 respondents compared to research by Luthfi B, Azmi and Erkadius (2017) which as many as 153 respondents [9,10].

This research contradicts the theory that continuous sleep disturbances can cause changes in the body's physiology where the balance between the regulation of the sympathetic and parasympathetic nervous systems is disturbed, people who experience sleep disturbances will experience an increase in blood pressure because the activity of the sympathetic system increases. On the other hand, parasympathetic system activity decreases [11]. Inconsistent results may be caused by several factors such as age, physical activity, genetics, stress, and sodium consumption. And in this study there were shortcomings, such as the authors did not ensure respondents rest approximately 10 minutes before taking blood pressure measurements, which could result in less accurate measurement results due to physical activity such as walking or climbing stairs which the respondent may have just done.

In table 3, it was found that there was a significant relationship between sleep patterns and light in the sleep environment. These results are in accordance with research by Rochmani et al (2022) where the respondents were predominantly 17 years old, that there was a relationship between sleep patterns and lighting during sleep (p value = 0.001). This is in line with the theory that in lack of light condition, it signals the retinal ganglion cells to inhibit the suprachiasmatic nucleus, it activates the paraventricular nucleus which then sends axons through the intermediolateral nucleus (IML) to the superior cervical ganglion which stimulates the sympathetic nervous system which causes drowsiness. And the pineal gland is mobilized to release melatonin into the circulation which improves sleep [12,13].

The authors have analyzed the relationship between sleep patterns with the characteristics of respondents listed in table 1 and blood pressure with the characteristics of respondents listed in table 1. It was found that there was no significant correlation except for sleep patterns and light in the sleep environment. And take note that in this study, respondents had an age range of 19-21 years old which is considered young and from the theory Choi et al (2022) that as a person gets older there can be a decrease in autonomic innervation, an increase in sympathetic drive resulting in more noradrenaline production, a decrease in parasympathetic drive which causes an imbalance in the autonomic nervous system and in the elderly has higher sympathetic acceleration [14]. So the age factor in this study is very influential because the autonomic nervous system at a young age is still good which can compensate for the changes that occur.

## **5. Conclusion**

The research results found that most medical students in Universitas Prima Indonesia in 2023 had poor sleep patterns (57,6%) and pre-hypertension blood pressure (41,2%). Additionally, there is no correlation between sleep patterns and blood pressure. On the other hand, there is significant correlation between sleep pattern and light in the sleep environment, which most of the respondents with good sleep pattern sleep in dark environment (69,4%). And in this research the respondents were university students which were still young, their autonomic nervous system is still working well to compensate for the changes that were occurring.

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## **Conflict of Interest**

The authors declare no conflicts of interest in preparing this article.

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