



RESEARCH ARTICLE

# Relationship between sleep patterns and hypertension incidence among young adults at Medan Johor Primary Health Center

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## ABSTRACT

**Background:** Hypertension is a non-communicable disease that remains a public health problem with increasing prevalence. One factor hypothesized to be associated with hypertension is sleep pattern. Poor sleep pattern may affect the cardiovascular system through increased sympathetic nervous system activity, contributing to elevated blood pressure. This study aimed to analyze the relationship between sleep pattern and the incidence of hypertension among young adults (aged 20–40 years) in the working area of Medan Johor Community Health Center.

**Method:** This quantitative study used a cross-sectional design. A sample of 100 respondents was selected using stratified random sampling. Sleep pattern data were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire, and hypertension status was determined through direct blood pressure measurement. Univariate and bivariate analyses were performed using the Chi-square test with a 95% confidence level.

**Results:** Most respondents had poor sleep patterns (69.0%) and were hypertensive (68.0%). All respondents with good sleep patterns had normal blood pressure (31 respondents, 100.0%), whereas among those with poor sleep patterns, 68 (98.6%) were hypertensive. The Chi-square test yielded  $p < 0.001$ , indicating a significant relationship between sleep pattern and hypertension among young adults in this population.

**Conclusion:** There is a significant relationship between sleep pattern and hypertension incidence in young adults. Improving sleep quality and duration should be promoted as part of hypertension prevention efforts.

**Keywords:** sleep pattern, hypertension, young adults, blood pressure

## Introduction

Hypertension is a condition in which a person's blood pressure rises above normal limits, potentially causing health problems and even leading to morbidity and mortality. A person is diagnosed with hypertension when blood pressure exceeds 140/90 mmHg.<sup>1</sup> It is estimated that approximately 1.4 billion adults aged 30–79 years worldwide had hypertension in 2024, equivalent to about 33% of the global population in that age group. Of these, 933 million (67%) were in low- and middle-income countries, highlighting gaps in prevention, detection, and control. Furthermore, 600 million (44%) were unaware of their hypertensive status, placing them at risk of serious complications without appropriate treatment. Meanwhile, 630 million (44%) had been diagnosed and received treatment, but only 320 million (23%)

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achieved optimal blood pressure control.<sup>2</sup> This situation makes hypertension a leading cause of premature death globally, and a global target has been set to reduce uncontrolled hypertension prevalence by 25% between 2010 and 2025 as part of non-communicable disease control efforts.<sup>3</sup>

Similar conditions occur in developing countries such as Indonesia. According to the 2023 Indonesian Health Survey (SKI), the prevalence of hypertension in Indonesia has reached alarming levels. Approximately 70 million people (34.1% of the population) have hypertension, meaning about one in three adults in Indonesia has high blood pressure. This high figure places Indonesia fifth in the world for the number of hypertension cases.<sup>4</sup> At the provincial level, North Sumatra shows a relatively high incidence of hypertension. Data from 2019 recorded about 4.3 million residents (29.19% of the total population of 14.7 million) with hypertension, with a similar prevalence (29.19%) among residents aged 18 years and older, and 41,131 identified cases. This high number ranks North Sumatra as the fourth province with the highest hypertension diagnosis in Indonesia.<sup>5</sup>

Based on the 2023 North Sumatra Health Office report, the number of hypertension patients in North Sumatra was estimated at approximately 834,360 people, representing a prevalence of 5.52%. In Medan City, the estimated number of hypertension patients was about 124,250 people, with a prevalence of 4.97% of the total population.<sup>6</sup> A similar phenomenon is observed in the working area of Medan Johor Community Health Center. In 2021, 1,722 cases (1.8%) of hypertension were recorded among residents aged over 15 years. In 2022, 468 cases (4.7%) were recorded. This number increased to 2,126 cases (21.4%) in 2023 and then rose sharply to 7,337 cases (73.9%) in 2024. These data indicate a significant increasing trend in hypertension cases from year to year in the working area of Medan Johor Community Health Center. This study aimed to analyze the relationship between sleep pattern and the incidence of hypertension among young adults (aged 20–40 years) in the working area of Medan Johor Community Health Center.

## Method

This quantitative study used an analytic observational approach with a cross-sectional design. Independent and dependent variables were measured simultaneously at a single time point. No intervention was provided; data were collected to identify the relationship between sleep pattern and the incidence of hypertension among young adults (aged 20–40 years). The study was conducted at Medan Johor Community Health Center starting in June 2026 until completion.

The population comprised all hypertension patients aged 20–40 years registered at Medan Johor Community Health Center, totaling 7,337 individuals. The sample size of 100 respondents was calculated using the Slovin formula with a 10% margin of error. Stratified random sampling was used to ensure proportional representation from each village area. Inclusion criteria were: hypertension patients with blood pressure  $\geq 140/90$  mmHg seeking care at the health center, aged 20–40 years, willing to sign informed consent, and willing to be respondents. Exclusion criteria were: hypertension patients with comorbidities and those unable to read or write. Sleep pattern data were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Sleep pattern was categorized as good (PSQI score  $\leq 5$ ) or poor (PSQI score  $> 5$ ). Hypertension status was determined through direct blood pressure measurement using a sphygmomanometer.

Data were processed using SPSS version 24 through editing, coding, data entry, tabulation, and cleaning. Univariate analysis described the frequency distribution of respondent characteristics, sleep patterns, and hypertension status. Bivariate analysis used the Chi-square test with a significance level of  $\alpha = 0.05$  to examine the relationship between sleep pattern and hypertension. Results were presented in tables and narratives.

## Results

Table 1 presents the distribution of sleep patterns among the 100 respondents. The majority of respondents (69 respondents, 69.0%) had poor sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI) with a score  $> 5$ . In contrast, only 31 respondents (31.0%) had good sleep quality (PSQI score  $\leq 5$ ). This indicates that more than two-thirds of young adult patients in this health center experienced clinically significant sleep disturbances, which may predispose them to various health problems including hypertension.

Table 1. Distribution of sleep pattern among respondents (N=100)

| Sleep pattern | Frequency (n) | Percentage (%) |
|---------------|---------------|----------------|
| Good          | 31            | 31.0           |
| Poor          | 69            | 69.0           |
| Total         | 100           | 100.0          |

Table 2 provides a comprehensive breakdown of sociodemographic characteristics. Regarding sex, female respondents (72.0%) outnumbered male respondents (28.0%) by more than twofold. The age distribution showed that the largest group was aged 30–35 years (57 respondents, 57.0%), followed by those aged 25–30 years (31, 31.0%) and 35–40 years (12, 12.0%). Most respondents were married (83, 83.0%), with only 17 (17.0%) unmarried. In terms of number of children, the highest proportion had 3–4 children (41 respondents, 41.0%), followed by those with 1–2 children (22, 22.0%), 5–6 children (19, 19.0%), and none (18, 18.0%).

Table 2. Distribution of respondent characteristics (N=100)

| Characteristic     | Category           | Frequency (n) | Percentage (%) |
|--------------------|--------------------|---------------|----------------|
| Sex                | Male               | 28            | 28.0           |
|                    | Female             | 72            | 72.0           |
| Age                | 25-30 years        | 31            | 31.0           |
|                    | 30-35 years        | 57            | 57.0           |
|                    | 35-40 years        | 12            | 12.0           |
| Marital status     | Unmarried          | 17            | 17.0           |
|                    | Married            | 83            | 83.0           |
| Number of children | None               | 18            | 18.0           |
|                    | 1-2                | 22            | 22.0           |
|                    | 3-4                | 41            | 41.0           |
|                    | 5-6                | 19            | 19.0           |
| Education          | Elementary school  | 2             | 2.0            |
|                    | Junior high school | 3             | 3.0            |
|                    | Senior high school | 44            | 44.0           |
|                    | Diploma            | 6             | 6.0            |
|                    | Bachelor           | 44            | 44.0           |
| Occupation         | Postgraduate       | 1             | 1.0            |
|                    | Unemployed         | 6             | 6.0            |
|                    | Private employee   | 9             | 9.0            |
|                    | Civil servant      | 6             | 6.0            |
|                    | Self-employed      | 39            | 39.0           |
| Village            | Housewife          | 40            | 40.0           |
|                    | Gedung Johor       | 30            | 30.0           |
|                    | Pangkalan Mansyur  | 37            | 37.0           |
|                    | Kwala Bekala       | 33            | 33.0           |

Education levels were concentrated at senior high school (44, 44.0%) and bachelor's degree (44, 44.0%), with smaller proportions at diploma (6, 6.0%), junior high school (3, 3.0%), elementary school (2, 2.0%), and postgraduate (1, 1.0%). Occupations were predominantly housewives (40, 40.0%) and self-employed individuals (39, 39.0%), followed by private employees (9, 9.0%), civil servants (6, 6.0%), and unemployed (6, 6.0%). Regarding village of residence, the largest group came from Pangkalan Mansyur (37, 37.0%), followed by Kwala Bekala (33, 33.0%) and Gedung Johor (30, 30.0%).

Table 3 shows the blood pressure classification of respondents. A total of 68 respondents (68.0%) were classified as hypertensive (systolic  $\geq 140$  mmHg or diastolic  $\geq 90$  mmHg), while the remaining 32 respondents (32.0%) had normal blood pressure. This finding indicates that more than two-thirds of the young adult sample already had hypertension, which is a notably high proportion for this age group and underscores the urgency of preventive interventions.

Table 3. Distribution of hypertension status (N=100)

| Blood pressure category | Frequency (n) | Percentage (%) |
|-------------------------|---------------|----------------|
| Normal                  | 32            | 32.0           |
| Hypertension            | 68            | 68.0           |
| Total                   | 100           | 100.0          |

Table 4 displays the cross-tabulation between sleep pattern and hypertension status. Among the 31 respondents with good sleep patterns, all 31 (100.0%) had normal blood pressure, and none (0.0%) were hypertensive. In contrast, among the 69 respondents with poor sleep patterns, the vast majority (68 respondents, 98.6%) were hypertensive, and only 1 respondent (1.4%) had normal blood pressure. The Chi-square test yielded a p-value of less than 0.001, which is far below the significance threshold of 0.05. Therefore, the null hypothesis is rejected, and it is concluded that there is a statistically significant relationship between sleep pattern and the incidence of hypertension among young adults in this population. The strength of this association is notable, as nearly all individuals with poor sleep patterns were hypertensive, while all those with good sleep patterns remained normotensive.

Table 4. Relationship between sleep pattern and hypertension (N=100)

| Sleep pattern | Normal n (%) | Hypertension n (%) | Total | p-value |
|---------------|--------------|--------------------|-------|---------|
| Good          | 31 (100.0)   | 0 (0.0)            | 31    | <0.001  |
| Poor          | 1 (1.4)      | 68 (98.6)          | 69    |         |
| Total         | 32 (32.0)    | 68 (68.0)          | 100   |         |

Table 5 summarizes the relationships between other sociodemographic variables and hypertension. Age showed a significant association ( $p = 0.003$ ), with the highest proportion of hypertension (80.7%) observed in the 30–35 years age group. Marital status was also significantly associated ( $p = 0.009$ ); married individuals had a much higher prevalence of hypertension (73.5%) compared to unmarried individuals (41.2%). Number of children was significantly associated ( $p = 0.008$ ), with hypertension prevalence increasing with the number of children: 38.9% among those with no children, 59.1% among those with 1–2 children, 80.5% among those with 3–4 children, and 78.9% among those with 5–6 children. In contrast, sex ( $p = 0.985$ ), education ( $p = 0.571$ ), occupation ( $p = 0.158$ ), and village of residence ( $p = 0.806$ ) did not show statistically significant associations with hypertension, indicating that these factors may not directly influence blood pressure status in this sample.

Table 5. Summary of bivariate analyses for other variables (N=100)

| Variable             | p-value |
|----------------------|---------|
| Sex                  | 0.985   |
| Age                  | 0.003   |
| Marital status       | 0.009   |
| Number of children   | 0.008   |
| Education            | 0.571   |
| Occupation           | 0.158   |
| Village of residence | 0.806   |

## Discussion

This study found a significant relationship between sleep pattern and hypertension incidence among young adults aged 20–40 years in the working area of Medan Johor Community Health Center. Respondents with poor sleep patterns were overwhelmingly more likely to be hypertensive compared to those with good sleep patterns. This finding aligns with physiological mechanisms whereby poor sleep quality activates the sympathetic nervous system, increases cortisol and adrenaline levels, and leads to sustained vasoconstriction and elevated blood pressure.<sup>7</sup> Chronic sleep deprivation also impairs nocturnal blood pressure dipping, a normal physiological decline, which is associated with increased cardiovascular risk.<sup>8</sup>

The high prevalence of poor sleep patterns (69.0%) and hypertension (68.0%) in this young adult population is concerning. Young adulthood is often characterized by lifestyle changes, increased work and family responsibilities, and potentially poor sleep hygiene due to modern habits such as prolonged screen time and irregular schedules.<sup>9</sup> The study also found that age, marital status, and number of children were significantly associated with hypertension. Older age within the young adult range (30–40 years), being married, and having more children likely increase psychological stress and reduce opportunities for adequate rest, further exacerbating hypertension risk.<sup>10</sup> The finding that sex, education, and occupation were not significantly associated may reflect that sleep pattern is a stronger direct determinant of blood pressure in this age group, overriding some demographic influences.

The lack of significant association for education and occupation suggests that even among those with higher education or employment, poor sleep pattern remains a key risk factor. This highlights the need for targeted sleep hygiene interventions regardless of socioeconomic background. The study's results are

consistent with previous research among young adults showing that poor sleep quality is associated with elevated blood pressure.<sup>9–11</sup>

This study used a validated instrument (PSQI) and direct blood pressure measurement, enhancing data accuracy. The stratified random sampling ensured representation from different villages. However, limitations include the cross-sectional design, which cannot establish causality; the relatively small sample size (n=100); and the single health center setting, which limits generalizability. Self-reported sleep patterns may be subject to recall bias. Future studies should use longitudinal designs, objective sleep monitoring (e.g., actigraphy), and larger, multi-site samples.

Community health centers should integrate sleep pattern assessment into routine hypertension screening for young adults. Health education programs should emphasize the importance of good sleep hygiene, including consistent bedtimes, limiting screen time before sleep, and managing stress. Workplace and community-based interventions that address sleep quality, particularly for married individuals and those with children, may help reduce hypertension risk. Further research should explore mediating factors such as stress, physical activity, and dietary habits.

## Conclusion

This study found a significant relationship between sleep pattern and the incidence of hypertension among young adults (aged 20–40 years) in the working area of Medan Johor Community Health Center ( $p < 0.001$ ). Most respondents had poor sleep patterns and were hypertensive. Age, marital status, and number of children were also significantly associated with hypertension. Improving sleep quality should be promoted as an effective strategy for hypertension prevention in young adults.

## References

1. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. *Nat Rev Nephrol*. 2020 Apr 5;16(4):223–37.
2. Zhou B, Carrillo-Larco RM, Danaei G, Riley LM, Paciorek CJ, Stevens GA, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet*. 2021 Sep;398(10304):957–80.
3. Zhou B, Perel P, Mensah GA, Ezzati M. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. *Nat Rev Cardiol*. 2021 Nov 28;18(11):785–802.
4. Kementerian Kesehatan Republik Indonesia. *Survei Kesehatan Indonesia 2023*. Jakarta: Kementerian Kesehatan Republik Indonesia; 2024.
5. Khaira N, Utami DF, Anindya N. Analisis kepatuhan kontrol pasien hipertensi rawat jalan Klinik Pratama Kesuma Bangsa tahun 2023. *Prepotif J Kesehat Masy*. 2024 Aug 19;8(2):3477–83.
6. Purba MM, Purba IE, Tarigan YG, Kembaren SO, Hutajulu J. Hubungan kepatuhan minum obat antihipertensi terhadap kualitas hidup pada pasien hipertensi di Martubung. *Prepotif J Kesehat Masy*. 2024;8(2).
7. Hamzah EB, Rusnoto, Kartikasari F. Hubungan Pola Tidur, Pola Makan, dan Aktivitas Fisik dengan Kejadian Hipertensi di Wilayah Puskesmas Ngembal Kulon Kudus. *J Penelit Sains dan Kesehat Avicenna* [Internet]. 2025 Sep 17;4(3):222–32. Available from: <https://jurnal.itk-avicenna.ac.id/index.php/jkma/article/view/191>
8. Nurhikmawati N, Widiyastuti NF, Syahrudin FI, Wisudawan W, Wahyu S. Hubungan Kualitas Tidur dengan Tekanan Darah pada Pasien Hipertensi di Rumah Sakit Ibnu Sina Makassar. *UMI Med J*. 2024 Jun 29;9(1):41–7.
9. Chang AK, Lee KH, Chang CM, Choi JY. Factors Affecting the Quality of Sleep in Young Adults. *J Korean Acad Community Heal Nurs*. 2021;32(4):497.
10. Wahyuni S, Nur Pratiwi W. Depresi, Stres, Kecemasan, dan Faktor Demografi terhadap Kejadian Hipertensi Usia 35–65 Tahun: Studi Cross-Sectional. *Judika J Nusantara Med*. 2022 May 23;6(1):46–55.
11. Taira K, Fukumine Y, Nakamura K. Simple Subjective Sleep Quality and Blood Pressure in Individuals With Optimal Sleep Duration: A Cross-Sectional Study. *J Clin Med Res*. 2024 Dec;16(12):600–7.