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Sleep Quality and Risk of Hypertension among Young Adults: A Cross-sectional Study

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Abstract **Original Research Article**

Background: Hypertension is a major modifiable risk factor for cardiovascular disease. Poor sleep quality and inadequate sleep duration may contribute to elevated blood pressure and hypertension. However, evidence on this association among young adults in Bangladesh is limited. This study aimed to assess the association between sleep quality and hypertension among young adults and identify associated risk factors. ***Methods:*** A hospital-based cross-sectional study was conducted among 310 young adults aged 18–35 years at the Department of Cardiology, Naogaon Medical College, Naogaon, Bangladesh, from May 2025 to April 2026. Participants were recruited consecutively. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), with scores >5 indicating poor sleep quality. Blood pressure, BMI, lifestyle factors, and relevant clinical characteristics were recorded. Associations between sleep quality and hypertension were assessed using chi-square tests, t-tests, and multivariable logistic regression. Adjusted odds ratios (aORs) with 95% confidence intervals were reported, with $p<0.05$ considered statistically significant. ***Results:*** Among 310 young adults, 57.7% had poor sleep quality and 15.5% had hypertension. Hypertension was more common with poor sleep quality (21.2% vs. 7.6%; OR=3.26, 95% CI: 1.55–6.86; p=0.002). Hypertensive participants had higher PSQI scores and shorter sleep duration ($p<0.05$). Poor sleep quality (aOR=2.91, 95% CI: 1.38–6.15), overweight/obesity (aOR=2.38), and family history of hypertension (aOR=2.61) were independently associated with hypertension. ***Conclusion:*** Poor sleep quality was common among young adults and was significantly associated with hypertension. Addressing sleep quality alongside modifiable risk factors such as overweight/obesity may support early cardiovascular risk reduction in this population.

Keywords: Sleep Quality, Risk of Hypertension, Young Adults, Pittsburgh Sleep Quality Index (PSQI).

INTRODUCTION

Hypertension, particularly elevated systolic blood pressure (SBP), is the leading modifiable risk factor for cardiovascular disease (CVD) and all-cause mortality worldwide, contributing to approximately 10.4 million deaths annually [1,2].

A large cross-sectional study found that hypertension affected approximately one-quarter of young and middle-aged adults, while low awareness and treatment rates may further increase the risk of adverse cardiovascular outcomes [3]. Hypertension can be prevented or delayed through healthy lifestyle practices, including regular physical activity, reduced salt intake, and weight management [4,5]. However, sustained lifestyle modification remains challenging because of low motivation and limited resources [4,5]. Sleep may represent an additional modifiable factor, as sleep deprivation can attenuate the benefits of weight-related lifestyle changes, while adequate sleep may provide a simple and cost-effective approach to improving cardiovascular health [6].

Disturbed sleep may contribute to nocturnal hypertension and impaired blood pressure dipping. Both short and long sleep durations have been associated with higher clinic and nocturnal BP and increased cardiovascular risk [7–9]. Poor sleep, including short sleep duration, insomnia, and obstructive sleep apnea,

may also increase the risk of hypertension and CVD through sympathetic activation and inflammation [10,11]. The Pittsburgh Sleep Quality Index (PSQI) is a widely validated and reliable tool for assessing subjective sleep quality and identifying sleep dysfunction in both clinical and non-clinical populations [12]. Global studies among young and middle-aged adults have demonstrated significant associations between poor sleep quality and new-onset hypertension, while systematic review evidence has linked abnormal sleep duration with hypertension risk [2,13].

In Bangladesh, studies have reported a substantial burden of cardiovascular risk factors among adults, while recent research among university students has identified a notable prevalence of prehypertension, indicating an emerging burden of elevated BP among younger populations [14,15]. However, Bangladesh-specific evidence regarding the association between sleep quality and hypertension among young adults remains limited, as local research has largely focused on conventional cardiovascular risk factors. Therefore, this study aimed to assess the association between sleep quality and hypertension among young adults in Bangladesh and identify other factors associated with elevated blood pressure.

Materials and Methods

Study Design and Setting

A hospital-based cross-sectional study was conducted to assess the relationship between sleep quality and the risk of hypertension among young adults. The study was carried out in the Department of Cardiology, Naogaon Medical College, Naogaon, Bangladesh, over a period of 12 months, from May 2025 to April 2026.

Study Population and Participants

The study population comprised young adults aged 18–35 years attending the Department of Cardiology during the study period. A total of 310 eligible participants were enrolled in the study. Participants were included if they were aged 18–35 years, were able to provide the required information, and gave written informed consent to participate. Individuals with severe acute illness, major psychiatric or neurological disorders that could substantially affect sleep, or those taking medications known to significantly influence sleep patterns were excluded. Participants who were unable or unwilling to complete the questionnaire were also excluded.

Sampling and Data Collection

Participants were selected using a consecutive sampling technique until the required sample size was achieved. Data were collected through face-to-face interviews using a structured questionnaire. The questionnaire included information on sociodemographic characteristics, lifestyle factors, medical history, family history of hypertension, physical activity, sleep duration, and other relevant sleep-related characteristics.

Anthropometric measurements were obtained using standard procedures. Body weight was measured in kilograms and height in meters, and body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m²). Participants were categorized into normal BMI and overweight/obese groups according to the predefined study criteria.

Assessment of Sleep Quality

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a standardized instrument for evaluating sleep quality and disturbances during the preceding month. The PSQI consists of seven components, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The component scores were summed to generate a global PSQI score ranging from 0 to 21, with higher scores indicating poorer sleep quality. In the present study, a PSQI score ≤5 was considered good sleep quality, whereas a score >5 was considered poor sleep quality.

Assessment of Blood Pressure and Hypertension

Blood pressure was measured using a validated blood pressure measuring device following standard procedures. Participants were allowed to rest before measurement, and an appropriately sized cuff was used. Blood pressure measurements were obtained with the participant in a seated position. Hypertension was classified according to the pre-specified diagnostic criteria used in the study, incorporating blood pressure measurements and relevant clinical history. Participants were subsequently categorized as hypertensive or non-hypertensive.

Study Variables and Outcomes

The primary outcome of the study was hypertension status, while the principal exposure variable was sleep quality. Sleep quality was categorized as good or poor according to the PSQI score. Other variables assessed included age, sex, BMI, family history of hypertension, physical activity, sleep duration, sleep latency, sleep efficiency, and other relevant sleep characteristics.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 27.0. Continuous variables were presented as mean ± SD, while categorical variables were expressed as frequencies and percentages. The independent-samples t-test was used for continuous variables, and the chi-square or Fisher's exact test was used for categorical variables. Factors associated with hypertension were assessed using univariate analysis, followed by multivariable binary logistic regression. Adjusted odds

ratios (aORs) with 95% CIs were reported, and a two-sided p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the appropriate institutional ethics committee before initiation of the study. Written informed consent was obtained from all participants after explaining the purpose and procedures of the study. Participation was voluntary, and confidentiality of participants' personal and clinical information was maintained throughout the study.

RESULTS

A total of 310 young adults were included in the study. The analysis assessed the participants' sociodemographic and clinical characteristics, sleep quality, sleep-related characteristics, and their association with hypertension.

Sociodemographic and Clinical Characteristics of the Participants

Table 1 shows the mean age of the participants was 27.2 ± 4.5 years, with the largest proportion belonging to the 26–30-year age group (42.3%). Males constituted 55.2% of the study population, while females accounted for 44.8%. The mean BMI was 24.3 ± 3.7 kg/m², and 39.4% of participants were overweight or obese. A family history of hypertension was reported by 27.4% of participants, while 42.6% reported insufficient physical activity. Regarding sleep quality, 57.7% had poor sleep quality (PSQI >5), with a mean PSQI score of 6.3 ± 3.1 and mean sleep duration of 6.6 ± 1.1 hours per night. Overall, 48 (15.5%) participants were hypertensive, whereas 262 (84.5%) were non-hypertensive.

Table 1: Sociodemographic and clinical characteristics of the participants (n=310)

Variable	Frequency (%) / Mean ± SD
Age (years)	27.2 ± 4.5
Age group	
18–25 years	113 (36.5)
26–30 years	131 (42.3)
31–35 years	66 (21.3)
Sex	
Male	171 (55.2)
Female	139 (44.8)
BMI (kg/m²)	24.3 ± 3.7
Normal BMI	188 (60.6)
Overweight/obese	122 (39.4)
Family history of hypertension	85 (27.4)
Insufficient physical activity	132 (42.6)
Sleep quality	
Good (PSQI ≤5)	131 (42.3)
Poor (PSQI >5)	179 (57.7)
PSQI score	6.3 ± 3.1
Sleep duration (hours/night)	6.6 ± 1.1
Hypertension	
Hypertensive	48 (15.5)
Non-hypertensive	262 (84.5)

Sleep quality and baseline characteristics

According to the Pittsburgh Sleep Quality Index (PSQI), 179 (57.7%) participants had poor sleep quality (PSQI >5), whereas 131 (42.3%) had good sleep quality. The mean global PSQI score was 6.3 ± 3.1. Poor sleep quality was more frequently observed among participants with higher BMI, insufficient physical activity, and shorter sleep duration.

Association between sleep quality and hypertension

Table 2 shows hypertension was more prevalent among participants with poor sleep quality than among those with good sleep quality. Among the 179 participants with poor sleep quality, 38 (21.2%) were hypertensive, compared with 10 (7.6%) among the 131 participants with good sleep quality. The difference was statistically significant (χ^2 = 10.12, p = 0.001). Participants with poor sleep quality had approximately 3-fold higher odds of hypertension compared with participants with good sleep quality (OR = 3.26, 95% CI: 1.55–6.86, p = 0.002).

Table 2: Association between sleep quality and hypertension

Sleep quality	Hypertensive n (%)	Non-hypertensive n (%)	Total	OR (95% CI)	p-value
Good	10 (7.6)	121 (92.4)	131	1.00 (Reference)	
Poor	38 (21.2)	141 (78.8)	179	3.26 (1.55–6.86)	0.002
Total	**48 (15.5)**	**262 (84.5)**	**310**		

Sleep characteristics according to hypertension status

Table 3 shows the mean global PSQI score was significantly higher among hypertensive participants than among non-hypertensive participants (7.6 ± 3.0 vs. 6.1 ± 3.1; p = 0.004). The mean sleep duration was also lower among hypertensive participants (6.1 ± 1.0 hours vs. 6.7 ± 1.1 hours; p <0.001). Sleep duration of less than 6 hours/night was reported by 18 (37.5%) hypertensive participants, compared with 44 (16.8%) non-hypertensive participants (p = 0.001). Similarly, poor sleep efficiency and frequent sleep disturbances were more common among hypertensive participants.

Table 3: Comparison of sleep characteristics between hypertensive and non-hypertensive participants

Sleep characteristic	Hypertensive (n=48), n(%)	Non-hypertensive (n=262), n(%)	p-value
PSQI score, mean ± SD	7.6 ± 3.0	6.1 ± 3.1	0.004
Sleep duration, hours	6.1 ± 1.0	6.7 ± 1.1	<0.001
Sleep duration <6 hours	18 (37.5)	44 (16.8)	0.001
Sleep latency >30 min	22 (45.8)	80 (30.5)	0.047
Sleep efficiency <85%	20 (41.7)	53 (20.2)	0.002
Frequent sleep disturbances	21 (43.8)	70 (26.7)	0.019
Use of sleep medication	4 (8.3)	12 (4.6)	0.286

Factors associated with hypertension

Table 4 presents univariate analysis, poor sleep quality, age ≥30 years, overweight/obesity, family history of hypertension, insufficient physical activity, and sleep duration <6 hours were associated with hypertension. In multivariable logistic regression analysis, poor sleep quality remained independently associated with hypertension (adjusted OR = 2.91, 95% CI: 1.38–6.15, p = 0.005). Overweight/obesity (aOR = 2.38, 95% CI: 1.21–4.69, p = 0.012) and family history of hypertension (aOR = 2.61, 95% CI: 1.32–5.17, p = 0.006) were also independently associated with hypertension.

Table 4: Multivariable logistic regression analysis of factors associated with hypertension

Variable	Adjusted OR	95% CI	p-value
Poor sleep quality	2.91	1.38–6.15	0.005
Age ≥30 years	1.82	0.91–3.64	0.091
Overweight/obesity	2.38	1.21–4.69	0.012
Family history of hypertension	2.61	1.32–5.17	0.006
Insufficient physical activity	1.72	0.88–3.37	0.112
Sleep duration <6 hours	1.98	0.97–4.05	0.061

Overall, the findings demonstrated that poor sleep quality was common among young adults and was significantly associated with hypertension. Participants with poor sleep quality had nearly three times higher odds of hypertension than those with good sleep quality, and this association remained significant after adjustment for potential confounding factors.

DISCUSSION

In our study, poor sleep quality was common, affecting 57.7% of participants, with a mean PSQI score of 6.3 ± 3.1 and mean sleep duration of 6.6 ± 1.1 hours. This finding is consistent with previous research among Bangladeshi students reporting a high prevalence of poor sleep quality [16]. Hypertension was present in 15.5% of participants, while overweight/obesity and insufficient physical activity were also common. Similar evidence from Bangladesh has reported associations between insomnia, obesity, psychological distress, and hypertension [17].

Hypertension was significantly more prevalent among participants with poor sleep quality than among those with good sleep quality, and poor sleep quality was associated with approximately threefold higher odds of hypertension. This finding is consistent with a meta-analysis of observational studies showing that poor subjective sleep quality was associated with higher blood pressure and increased hypertension risk [18].

Hypertensive participants also had significantly higher PSQI scores and shorter sleep duration, along with lower sleep efficiency, longer sleep latency, and more frequent sleep disturbances. Similarly, longitudinal evidence found lower sleep efficiency among individuals with hypertension (β = −1.1, 95% CI: −2.1 to −0.1),

greater wake time after sleep onset, and longitudinal changes in REM and N3 sleep [19].

After adjustment for potential confounders, poor sleep quality remained independently associated with hypertension (aOR 2.91, 95% CI: 1.38–6.15; p=0.005). Overweight/obesity (aOR 2.38, 95% CI: 1.21–4.69; p=0.012) and family history of hypertension (aOR 2.61, 95% CI: 1.32–5.17; p=0.006) were also independently associated with hypertension. These findings are consistent with studies among young adults in Kenya and Bangladesh identifying obesity, family history, and other modifiable factors as important contributors to hypertension [20,21].

Overall, our findings indicate that poor sleep quality is significantly associated with hypertension among young adults, alongside established risk factors such as overweight/obesity and family history.

Conclusion

Poor sleep quality was common among young adults and was significantly associated with hypertension. Poor sleep quality, overweight/obesity, and a family history of hypertension were independently associated with hypertension. These findings highlight the importance of considering sleep quality as a potential modifiable factor in cardiovascular risk assessment among young adults. Further longitudinal and multicenter studies are needed to confirm these associations and clarify their causal relationships.

References

1. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, Barengo NC, Beaton AZ, Benjamin EJ, Benziger CP, Bonny A. Global burden of cardiovascular diseases and risk factors, 1990–2019: update from the GBD 2019 study. Journal of the American college of cardiology. 2020 Dec 22;76(25):2982-3021.
2. Yuan Y, Heizhati M, Wang L, Li M, Lin M, Gan L, Cai X, Yang W, Yao L, Wang Z, Abudereyimu R. Poor sleep quality is associated with new-onset hypertension in a diverse young and middle-aged population. Sleep medicine. 2021 Dec 1;88:189-96.
3. Mahajan S, Feng F, Hu S, Lu Y, Gupta A, Murugiah K, Gao Y, Lu J, Liu J, Zheng X, Spatz ES. Assessment of prevalence, awareness, and characteristics of isolated systolic hypertension among younger and middle-aged adults in China. JAMA network open. 2020 Dec 8;3(12):e209743.
4. Gay HC, Rao SG, Vaccarino V, Ali MK. Effects of different dietary interventions on blood pressure: systematic review and meta-analysis of randomized controlled trials. Hypertension. 2016 Apr;67(4):733-9.
5. Olsen MH, Angell SY, Asma S, Boutouyrie P, Burger D, Chirinos JA, Damasceno A, Delles C, Gimenez-Roqueplo AP, Hering D, López-Jaramillo P. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. The Lancet. 2016 Nov 26;388(10060):2665-712.
6. Kim CW, Chang Y, Kang JG, Ryu S. Changes in sleep duration and subsequent risk of hypertension in healthy adults. Sleep. 2018 Nov;41(11):zsy159.
7. Makarem N, Shechter A, Carnethon MR, Mullington JM, Hall MH, Abdalla M. Sleep duration and blood pressure: recent advances and future directions. Current hypertension reports. 2019 May;21(5):33.
8. Wang C, Bangdiwala SI, Rangarajan S, Lear SA, AlHabib KF, Mohan V, Teo K, Poirier P, Tse LA, Liu Z, Rosengren A. Association of estimated sleep duration and naps with mortality and cardiovascular events: a study of 116 632 people from 21 countries. European heart journal. 2019 May 21;40(20):1620-9.
9. Krittanawong C, Tunhasiriwet A, Wang Z, Zhang H, Farrell AM, Chirapongsathorn S, Sun T, Kitai T, Argulian E. Association between short and long sleep durations and cardiovascular outcomes: a systematic review and meta-analysis. European Heart Journal: Acute Cardiovascular Care. 2019 Dec 1;8(8):762-70.
10. Lombardi C, Tobaldini E, Montano N, Losurdo A, Parati G. Obstructive Sleep Apnea Syndrome (OSAS) and Cardiovascular System. La Medicina del lavoro. 2017 Aug 28;108(4):276-82.
11. Fleming JA. Insomnia: epidemiology, subtypes, and relationship to psychiatric disorders. InSleep Disorders in Psychiatric Patients: A Practical Guide 2018 Jun 8 (pp. 99-107). Berlin, Heidelberg: Springer Berlin Heidelberg.
12. Mollayeva T, Thurairajah P, Burton K, Mollayeva S, Shapiro CM, Colantonio A. The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis. Sleep medicine reviews. 2016 Feb 1;25:52-73.
13. Yang L, Hu FX, Wang K, Wang ZZ, Yang J. Association of sleep duration with hypertension in young and middle-aged adults: A systematic review and meta-analysis. International Journal of Cardiology Cardiovascular Risk and Prevention. 2025 Jun 1;25:200387.
14. Nisa NA, Das AK, Moumi SA, Moutusi AA, Arifin MA, Mohona MA, Momtaz AT, Chowdhury S, Hasan MR. Prehypertension among Undergraduates: A Cross-Sectional Study of Medical and Non-Medical Students in Bangladesh. Pathfinder of Research. 2025 Oct 20;3(3):25-46.
15. Khanam F, Hossain MB, Mistry SK, Afsana K, Rahman M. Prevalence and risk factors of cardiovascular diseases among Bangladeshi adults: findings from a cross-sectional study. Journal of

epidemiology and global health. 2019 Sep;9(3):176-84.
16. Mamun MA, Hossain MS, Kamruzzaman M, Khalil MI, Sikder MT, Manzar MD, Griffiths MD. Prevalence of poor sleep quality and its determinants among Bangladeshi students: a pilot study. Sleep and vigilance. 2020 Dec;4(2):185-93.
17. Akter S, Aupsory AR, Ahmed MF, Abir JM, Naly FN, Mardia M, Dilower R, Islam T. Interplay of Psychological Distress, Obesity, and Insomnia Among Hypertensive Patients: A Cross-Sectional Study in Bangladesh. Qeios [Internet]. 2024 Dec 18;7.
18. Lo K, Woo B, Wong M, Tam W. Subjective sleep quality, blood pressure, and hypertension: a meta-analysis. The Journal of Clinical Hypertension. 2018 Mar;20(3):592-605.
19. Chooza MO, Hagen EW, Johnson HM, Brown RL, Peppard PE. Longitudinal sleep characteristics and hypertension status: results from the Wisconsin Sleep Cohort Study. Journal of hypertension. 2021 Apr 1;39(4):683.
20. Ali N, Mahmud F, Akter SA, Islam S, Sumon AH, Barman DN, Islam F. The prevalence of general obesity, abdominal obesity, and hypertension and its related risk factors among young adult students in Bangladesh. The journal of clinical hypertension. 2022 Oct;24(10):1339-49.
21. Ondimu DO, Kikuvi GM, Otieno WN. Risk factors for hypertension among young adults (18-35) years attending in Tenwek Mission Hospital, Bomet County, Kenya in 2018. The Pan African Medical Journal. 2019 Jul 16;33:210.