Original Article
DOI: https://doi.org/10.70749/ijbr.v3i3.946

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://induspublishers.com/IJBR
ISSN: 2960-2793/ 2960-2807

A Study to Evaluate Association of Sleep Quality with Blood Pressure and Obesity

Munwar us Salam[1], Binafsha Manzoor Syed[2], Husan Bano Channar[1], Fasiha Shah[3], Shaneela Khowaja[1], Rubina Parveen[4]

[1]People's Nursing School, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan.
[2]Medical Research Council & Clinical Research Faculty, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan.
[3]Medical Research Centre, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan.
[4]Begum Bilqees Sultana Institute of Nursing, Peoples University of Medical Health Sciences for Women Nawabshah, SBA.

ARTICLE INFO

Keywords
Sleep, Sleep Quality, Blood Pressure, Obesity, Hypertension, Association

Corresponding Author: Munwar us Salam,
MSN (Scholar), People's Nursing School, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan.
Email: munwarsalam@pumhs.edu.pk

Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.
Conflict of Interest: No conflict of interest.
Funding: No funding received by the authors.

Article History
Received: 11-01-2025, Revised: 08-03-2025
Accepted: 19-03-2025, Published: 31-03-2025

ABSTRACT

Background: sleep is crucial for health, influencing both wellbeing and bodily functions. Melatonin, a hormone secreted primarily at night, regulates sleep patterns and supports appropriate behavior. Abnormal sleep pattern can potentially affect different body function and lead to disorders such as obesity and hypertension. **Research Methodology:** descriptive cross-sectional study was conducted at Medical Research Center, Jamshoro, Pakistan, patients were recruited from Medical outpatient Department; of Liaquat University Hospital Hyderabad/ Jamshoro from May to October 2024. A total of 362 patients included were from both genders and of 18 years and above. Data was collected through structures questionnaire including PSQI, measurement of blood pressure and BMI. Data were analyzed through SPSS (Version 25). Spearman correlation, and regression were used for quantitative variables with 95% CI, Chi Square for categorical variables, p>.05 was considered as significant value. **Results:** the mean age of the participants was 41 years, SD ± 10.654. Out of the 362 participants 60% were females, and 59% had poor sleep quality. urban dwellers were 63%, married 79%, house wives 57%. There was a significant association with sleep quality, mean of PSQI score was 13.05 ± 4.621. A 63% of participants had no formal education, poor Socioeconomical status (77%), and single type family was 51%, 90% nonsmokers, Muslims were 93%, Sindhi 43%. There was non-significant associated with sleep quality was found. Obesity (mean of BMI 25.88±6.077) was significantly associated with sleep quality, $\beta = 0.039$, $R = 0.025$, $r(362) = 0.164$, $p = 0.002$. The mean of blood pressure was (SBP; 121.6±25.442 and DBP 76.69±18.272) not significantly associated with sleep quality respectively $\beta = 0.237$, $R^2 = 0.002$, $r(362) = 0.034$, $p = 0.524$, $\beta = 0.257$, $R^2 = 0.004$, $r(362) = 0.068$, $p = 0.2$. **Conclusion:** findings concluded that there is a strong relationship between sleep quality and obesity. However, it does not directly affect blood pressure. Though obesity has proven impact on development of hypertension. Further large scale studies are required to explore the relationship further.

INTRODUCTION

Sleep is one of the most essential activity and basic need of human life. Sleep quality (SQ) is one of the important measures of sleep that helps in maintaining human health and quality of life. The duration and quality of sleep are the main pillars of the medical field known as Sleep Health[1]. According to a pilot study, within three months of follow-up, optimizing sleep length and quality to more than six hours per night improved BP control and was linked to a significant delta change in SBP[2]. A longitudinal study conducted (2023) in China showed that short duration positive effect, long duration a negative effect with BMI[3]. It has been found that SQ has a greater role in improving the quality of individual's life, directly and indirectly influence on the physical, cognitive, and behavioral dimensions of the well-being[4]. The indicators of sleep quality were arousal count, arterial oxygen saturation, sleep architecture, respiratory disturbance index, and sleep time[5].

Further, SQ can also help in improving the adenosine and melatonin levels by regulating the circadian rhythm in the brain. Moreover, SQs is also associated with growth hormone secretion which can reduce the cortisol secretion, drop in BP and improve the muscle tone as found in sleep studies[6]. The American Heart Association (AHA) has stated that quality of good sleep protects from Cardiovascular Diseases (CVDs) or high BP, it is also one of the risk factors for hypertension. Another study has also revealed that the sleep quality helps in weight reduction[7]. However, poor sleep contributes to metabolic

dysfunction and cardiovascular issues, making it a key area of public health research. Nowadays in the world, the burden of poor sleep is so great that at least one-third of the adult population in America, Europe, and Asia get <7 hours/ night sleep which public health experts recommend for maintaining good health[8].

The quality of sleep plays a critical role in influencing overall health of an individual, particularly its association with blood pressure and obesity. When a person gets < 6 hours of sleep, their chances of cardiovascular disease, poor BP control, and mortality are all raised[9]. Evidence suggest that the insufficient amount of sleep increased the risk of obesity by 14% (p = <0.001), and high BP by 15% (p < 0.01) respectively[10]. In another studies, it is concluded that high blood pressure and cardiovascular disorders were increased due to poor sleep among adults[11]. According to Centers for Disease Control and Prevention (CDC & P, 2020), that every night about 15% a month, people were suffering from trouble falling asleep[12]. A cross-sectional studies showed that poor sleep duration (<6 hours/night) was linked to an increased risk for impaired central adiposity (12%), and hypertension (8%)[13]. Another hospital-based study in Northwest Ethiopia (2022), the prevalence of poor SQ is 37.7% associated with age, gender obesity, and high blood pressure (AOR = 4.07, 2.55, 1.68,1.78, 95% CI)[14]. According to recent research, there are several risk factors associated with being overweight or obese, including high energy intake, low consumption of fruits and vegetables, decreased physical activity, genetics, and poor sleep quality. Inadequate sleep is also an increasingly important component. The intricate brain process of sleep provides for the body's fundamental physiological requirements. People of all ages suffer in many nations across the world from sleeping less than the prescribed amount of sleep[15].

There are some modifiable risk factors like screen timing, early school timing, academic workload, consumption of caffeine, physical inactivity, dietary habits, lifestyle changes, and hormonal changes like leptin and ghrelin levels reduce the sleep duration and quality, it is evidence that there is a link between sleep duration to insulin resistance, bad eating habits, and sedentary activities[16].

Therefore, it is recommended that night sleep 7-9 hours, regular exercise, meditation, yoga, positive thoughts, sleep timing, and an awake schedule promote the good quality of sleep. It is also suggested that there were some risk factors like heavy foods at night, caffeine, alcohol, and light rays that affect the quality of sleep[17].

Poor quality of sleep is unique of the major contributors in raising blood pressure and the development of obesity, which is a global public health issue. However, there is limited literature available evaluating the influence of sleep disorders on blood pressure rise and weight disorders. During the literature reading, it was observed that most of the past studies were conducted among students and healthcare providers. Consequently, this study is designed to measure sleep quality and its association with blood pressure and obesity in an adult population. This may lead to the achievement of the Sustainable Development Goal (SDGs) 3 of the World Health Organization (WHO).

MATERIALS AND METHODS

The Descriptive Cross-Sectional study design was used to seek association between sleep quality with blood pressure and obesity among adult population at Medical Research Center, Jamshoro, Pakistan, and Medical Outpatient Department (OPD) Number: 05 Liaquat University Hospital (LUH) Hyderabad from May 2024, to October 2024 after approval from the Research Ethics Committee (REC) of LUMHS. There are 362n study participants were included who visited the medical OPD for follow-up, and non-consenting, pregnant women and any neurological patients were excluded. The data was collected through structured questionnaire with non-Probability convenient sampling into two sections one was demographic information and the second section is related to blood pressure measurement (Systolic and diastolic), obesity or BMI measurement (Height & weight), and sleep quality according to the Pittsburgh Sleep Quality Index (0.83 internal reliability, test and retest reliability 0.85 sensitivity 89.6%, and specificity 86.5%). Data was analyzed by statistical package for Social Sciences version 25 (SPSS). Continuous variables were presented in mean and standard Deviation. Categorical variables were presented in numbers and frequencies. Furthermore, a confidence level of 95% was used for the study. P value <0 .05 was considered statistically significant. Confounding was controlled by stratification.

RESULTS

Figure 1

Age Distribution of Study Participants

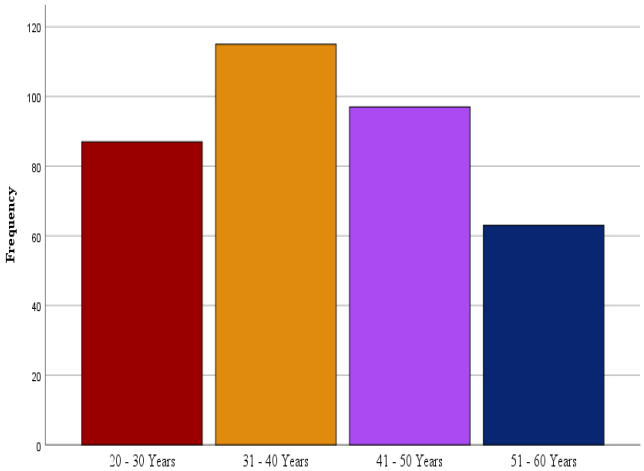

Figure 2

Gender Distribution of Study Participants

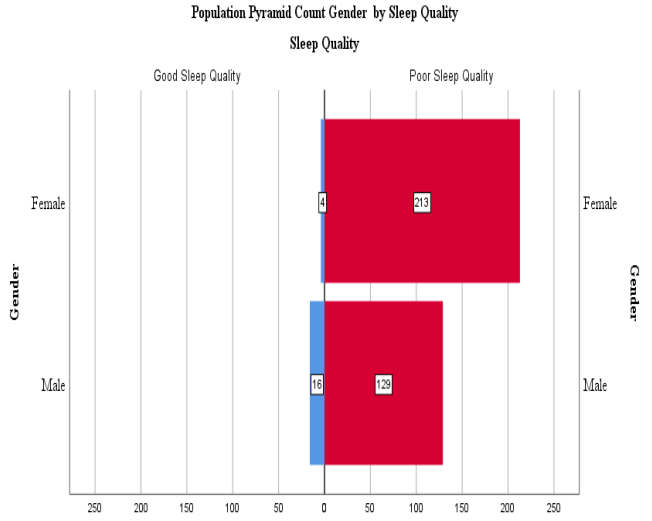

Table 1

Association of Sleep Quality with Demographic Variables

Description	Sleep Qaulity		χ2	df	P Value
Gender	Good Sleep Quality	Poor Sleep Quality	14.068	1	0.00
Females	4 (1%)	213 (59%)			
Males	16 (4%)	129 (36%)			
Marital Status					
Single	4 (1%)	23 (5%)	9.140	3	0.02
Married	15 (4%)	270 (75%)			
Divorced	-	6 (2%)			
Widow	-	45 (13%)			
Residence			4.668	1	0.03
Urban	8 (2%)	219 (61%)			
Rural	12 (3%)	123 (34%)			
Occupation			23.231	4	0.00
House Wife	3 (0.8%)	203 (56%)			
Labour	14 (3.9%)	83 (23%)			
No Work	-	23 (6.4%)			
Govt/Private Job	2 (0.5%)	20 (5.5%)			
Driver	-	14 (3.9%)			

The majority of the participants were female (60%), Good Sleep Quality (1%), poor sleep quality (59%), Male (40%), Good Sleep Quality (4%), Poor Sleep Quality (36%) and Sleep quality is associated with highly significant, $\chi 2$ (1) = 14.068, N = 362, p = 0.00 with Mean age was 40.96 Years, SD ± 10.654. The Participants were urban (63%), rural (3%) residence, most of the them were housewives (79%) Married, (12%) Widow/ Widower, (8%), and occupation was significant association with sleep quality.

The results of this study showed that the mean PSQI Score of participants is 13.05±4.621, with the mean of Systolic blood pressure is 121.6 ±25.442. PSQI Score not significantly associated with Systolic Blood Pressure (SBP), β = 0.237, R^2 = 0.002, r (362) = 0.034, p = 0.524. It was also not significantly associated with diastolic blood pressure 76.69±18.272, β = 0.257, R^2 = 0.004, r (362) = 0.068, p= 0.2.

This study was revealed that the majority of the participants were (55%) obese, (36%) normal weight, (9%) underweight, Mean BMI is 25.88±6.077, PSQI Score highly significant associated with obesity with β = 0.039, R = 0.025, r (362) = 0.164, p = 0.002.

Table 2

Association of Sleep Quality with Blood Pressure and Obesity

Description	Descriptive Statistics		Inferential Statistics			
Blood Pressure	Frequency	Mean ±SD	β	R^2	Spearman's Correlation	P Value
Low SBP < 120 mmHg	172 (48%)					
N. SBP 120 mmHg	45 (12%)	121.60 ±25.442	0.237	0.002	0.034	0.524
High SBP >120 mmHg	145 (40%)					
Low DBP < 80 mmHg	161 (45%)					
Normal DBP 80 mmHg	87 (24%)	76.69 ±18.272	0.257	0.004	0.068	0.2
High DBP > 80 mmHg	114 (31%)					
BMI						
Under Weight	34 (9%)	25.876 ±6.0766	0.039	0.025	0.164	0.002
Normal Weight	131 (36%)					
Obese	197 (55%)					

DISCUSSION

The analysis of this study data showed that the age distribution of the study participants' were 20 – 30 years 87(24%), 31- 40 years 115 (32%), 41 – 50 years 97 (27%) and 51 – 60 years 63 (17%) with the mean of age 40.96 ±10.654 years. The findings of this study also revealed that the majority of the participants were female (60%), Good Sleep Quality (1%), poor sleep quality (59%), Male (40%), Good Sleep Quality (4%), Poor Sleep Quality (36%) and Sleep quality is associated with highly significant, $\chi 2$ (1) = 14.068, N = 362, p = 0.00. it was also revealed that more poor sleep quality was observed in among the married women (75%), urban (61%) and housewives (56%) were suffering from the poor sleep quality and these were highly significant association. Previous studies showed a significant relationship between sleep quality with these demographic patterns of the participants[18,19,20]. One of the observational descriptive cross-sectional study (2022) of Salamanca Spain shown that Mean age 54.8, Gender Female (59%), poor sleep quality[21]. These similar findings were found significant in the other large-scale epidemiological study (2020) conducted at Hebei China publicized that poor sleep quality associated with female gender, rural areas (22.3%), married X^2 = 10.0, (p <. 002), an education level (p <. 001) highly

significant[22]. Another study findings were found in the study (2021) of Delhi India that was highlighting the highly significant association between the PSQI score among working women 8.04±1.54, F = 25.08 (p < .001)[23]. However, in oppose to earlier studies, the current study showed that there was no significantly association of sleep quality with age, educational level, socio-economic status, family type, smoking status, religion and ethnicity.

While sleep deprivation is known to impact cardiovascular health, the findings of the current study indicate, that PSQI was not significantly associated with blood pressure. This discrepancy could be due to confounding factors such as life style, stress, or medication use that were not accounted for in this model. Previous empirical evidences also support with the current study that there was no significant association (p> 0.1) between blood pressure and sleep qaulity[24]. However, there are number of studies suggest that chronic poor sleep is more likely to contribute to long term hypertension and metabolic disorders. For instance, as a study conducted in Indonesia (2024) showed on the contrary, one of the studies was revealed that SBP 118 ±15, DBP 73 ±11, and poor sleep quality was significantly associated with SBP and DBP[25,26]. Nonetheless, our research showed that PSQI score is positively associated with obesity as higher BMI (p< 0.002). Similar results were observed in the Korean study, which highlighted that obese males (43.6%) had poor quality of sleep[27]. This study was strength by including the structures question are with high validity and reliability sleep scale with the measurement of blood pressure and obesity as per Who criteria and accurate sample size, data collection techniques and it may help for the controlling the blood pressure and maintaining the normal body weight and reduce the burden of hypertension and early diagnosis of the hidden cases of hypertension. This was also limited by study design, participants recall information regarding the past month of sleep status information accurately, study setting, sampling technique and also the confounding variables like anxiety, stress, Socioeconomical status, and it may create the biases in the results of this study.

CONCLUSION

Overall, in the current study revealed that mostly females gender, residency, and occupation were significantly associated with sleep quality. Furthermore, on PSQI scale, while there was no significant association were found between sleep quality with systolic and diastolic blood, obesity were significantly associated with sleep quality. This study recommended the awareness, promotion and improvement of sleep quality activities in the general population.

REFERENCES

1. Eshera YM, Gavrilova L, Hughes JW. Sleep is Essential for Cardiovascular Health: An Analytic Review of the Relationship between Sleep and Cardiovascular Mortality. American Journal of Lifestyle Medicine. 2024; 18(3):340-50. https://doi.org/10.1177/15598276231211846
2. Ali W, Gao G, Bakris GL. Improved sleep quality improves blood pressure control among patients with chronic kidney disease: A pilot study. American Journal of Nephrology. 2020;51(3):249-54. https://doi.org/10.1159/000505895
3. Zhang Z, Wang J, Wang J, Ma B, Jia Y, Chen O. Sleep duration affects the sequential change of body mass index and muscle strength: a contribution to dynapenic obesity. BMC geriatrics. 2023;23(1):288. https://doi.org/10.1186/s12877-023-03857-7
4. Liu Z, Zhao Y, Zhang T, Wang D. How Does Physical Exercise Improve the Subjective Well-Being of the Chinese Adult Population? A Moderated Mediation Model. InHealthcare 2024 May 20 (Vol. 12, No. 10, p. 1048). MDPI. https://doi.org/10.3390/healthcare12101048
5. Tamura K, Uchida K, Ishigami T. An interesting link between quality of sleep and a measure of blood pressure variability. The Journal of Clinical Hypertension. 2021;23(2):331. https://doi.org/10.1111/jch.14160
6. Sarisozen B, Aslan FS, Akyuz E. Effects of melatonin on the circadian functions of sleep-wake cycle, metabolism, hormonal regulation and immune activity: A recent review. Melatonin Research. 2023 Aug 31;6(3):256-76. https://doi.org/10.32794/mr112500154
7. Fenton S, Burrows TL, Collins CE, Rayward AT, Murawski B, Duncan MJ. Efficacy of a multi-component m-health diet, physical activity, and sleep intervention on dietary intake in adults with overweight and obesity: a randomised controlled trial. Nutrients. 2021;13(7):2468. https://doi.org/10.3390/nu13072468
8. Chan CMH, Siau CS, Wong JE, Wee LH, Jamil NA, Hoe VCW. Prevalence of insufficient sleep and its associated factors among working adults in Malaysia. Nature and science of sleep. 2021:1109-16. https://doi.org/10.2147/nss.s295537
9. Häusler N, Marques-Vidal P, Haba-Rubio J, Heinzer R. Association between actigraphy-based sleep duration variability and cardiovascular risk factors–Results of a population-based study. Sleep

medicine. 2020;66:286-90. https://doi.org/10.1016/j.sleep.2019.02.008
10. Che T, Yan C, Tian D, Zhang X, Liu X, Wu Z. The association between sleep and metabolic syndrome: a systematic review and meta-analysis. Frontiers in Endocrinology. 2021;12:773646. https://doi.org/10.3389/fendo.2021.773646
11. DelRosso LM, Mogavero MP, Ferri R. Effect of sleep disorders on blood pressure and hypertension in children. Current hypertension reports. 2020;22:1-7. https://doi.org/10.1007/s11906-020-01100-x
12. Adjaye-Gbewonyo D, Ng AE, Black LI. Sleep difficulties in adults: United States, 2020. https://doi.org/10.15620/cdc:117490
13. Joo J, Lee JG, Kim S, Lee J, Lee JH, Lee KJ. Association between sleep duration and impaired fasting glucose according to work type in non-regular workers: data from the first and second year (2016, 2017) of the 7th Korean National Health and Nutrition Examination (KNHANE)(a cross-sectional study). Annals of Occupational and Environmental Medicine. 2020;32. https://doi.org/10.35371/aoem.2020.32.e29
14. Ayanaw T, Temesgen M, Azagew AW, Ferede YM. Sleep quality and associated factors among adult hypertensive patients attending a chronic follow up care clinic in northwest Amhara regional state referral hospitals, Northwest Ethiopia. Plos one. 2022 Jul 7;17(7):e0271072. https://doi.org/10.1371/journal.pone.0271072
15. Fan J, Ding C, Gong W, Yuan F, Zhang Y, Feng G, et al. Association of sleep duration and overweight/obesity among children in China. International Journal of Environmental Research and Public Health. 2020;17(6):1962. https://doi.org/10.3390/ijerph17061962
16. Pérez-Chada D, Bioch SA, Schönfeld D, Gozal D, Perez-Lloret S, Group SiACS. Screen use, sleep duration, daytime somnolence, and academic failure in school-aged adolescents. Plos one. 2023;18(2):e0281379. https://doi.org/10.1371/journal.pone.0281379
17. Baranwal N, Phoebe KY, Siegel NS. Sleep physiology, pathophysiology, and sleep hygiene. Progress in cardiovascular diseases. 2023;77:59-69. https://doi.org/10.1016/j.pcad.2023.02.005
18. Papadopoulos D, Sosso FAE. Socioeconomic status and sleep health: a narrative synthesis of 3 decades of empirical research. Journal of Clinical Sleep Medicine. 2023;19(3):605-20. https://doi.org/10.5664/jcsm.10336
19. Rao M, Bhushan S, Ranganath T. Poor quality of sleep and it's associated factors among urban slum-dwellers of Bengaluru-a cross-sectional study. F1000Research. 2023;12. https://doi.org/10.12688/f1000research.140184.2
20. Waqas A, Siddique I, Ahsen M, Zubair M, Naeem M, Memon AR, et al. Exploring relationship of poor sleeping habits with prenatal stress among pregnant women in Pakistan: a cross-sectional study. BMC Research Notes. 2024;17(1):110. https://doi.org/10.1186/s13104-024-06756-1
21. Fuentes-Senise C, García-Corpas JP. Prevalence of poor sleep quality and associated lifestyle habits: A cross-sectional study in community pharmacies. 2022. https://doi.org/10.30827/ars.v64i1.26223
22. Zhang Y-S, Jin Y, Rao W-W, Jiang Y-Y, Cui L-J, Li J-F, et al. Prevalence and socio-demographic correlates of poor sleep quality among older adults in Hebei province, China. Scientific Reports. 2020;10(1):12266. https://doi.org/10.1038/s41598-020-68997-x
23. Sharma C, Kukreti P, Zafar S, Sahu PK, Alam S. Impact of Lockdown on Women Health and Sleep Quality: A Comparative Study.
24. Irwan M, Irfan I, Evawaty E, Rahmin R, Risnah R, Arafah S. The Relationship Between Sleep Quality and Blood Pressure in Students. Journal of Public Health and Pharmacy. 2024;4(1):19-27. https://doi.org/10.56338/jphp.v4i1.4865
25. Li C, Shang S. Relationship between Sleep and Hypertension: Findings from the NHANES (2007–2014). International journal of environmental research and public health. 2021;18(15):7867. https://doi.org/10.3390/ijerph18157867
26. Yılmaz Y, Aşılar RH. Effect of Sleep Quality on Self Care Agency and Blood Pressure Control in Hypertensive Patients. 2022. https://doi.org/10.4274/jtsm.galenos.2022.19970
27. Hur S, Oh B, Kim H, Kwon O. Associations of diet quality and sleep quality with obesity. Nutrients. 2021;13(9):3181. https://doi.org/10.3390/nu13093181