International Journal of Research in Medical Sciences
Bhattacharya D et al. Int J Res Med Sci. 2025 May;13(5):1824-1830
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20251276

Original Research Article

Association of poor sleep quality and short sleep duration on the development of coronary artery disease

Debabrata Bhattacharya[1]*, Prabir Kumar Das[1], Anisul Awal[2], Trisha Biswas[3], G. M. Selim[4], Kalpita Bhattacharjee[5], Mohammed Abdur Rahim[1], Sahadat Hossain[6], Partha Bhattacharya[7], Sayem Bin Latif[8]

[1]Department of Cardiology, Chittagong Medical College, Chittagong, Bangladesh
[2]National Institute of Cardiovascular Diseases & Hospital, Dhaka, Bangladesh
[3]Buckinghamshire Healthcare NHS Trust, Stoke Mandeville Hospital, Buckinghamshire, Aylesbury, United Kingdom
[4]Cox bazar Sadar Hospital, Cox Bazar, Bangladesh
[5]Department of Gynaecology, Chittagong Medical College Hospital, Chittagong, Bangladesh
[6]Companigonj Health Complex, Noakhali, Bangladesh
[7]Lohagara Health Complex, Chittagong, Bangladesh
[8]Department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh

Received: 21 January 2025
Revised: 15 February 2025
Accepted: 20 February 2025

***Correspondence:**
Dr. Debabrata Bhattacharya,
E-mail: drdebabrata.b14@gmail.com

ABSTRACT

Background: Sleep disturbances, including poor sleep quality and short sleep duration, are strongly linked to cardiovascular disorders. However, limited data exist on the relationship between sleep parameters and coronary artery disease (CAD) in Bangladesh. This study analyzed the association of sleep quality and duration with CAD in Bangladeshi population.
Methods: This case-control study was conducted in the Department of Cardiology, Chittagong Medical College Hospital. It included 139 patients hospitalized with acute coronary syndrome (ACS) as cases and 139 age-matched, healthy individuals with no CAD history as controls. Sleep quality and duration were assessed using the Pittsburgh Sleep Quality Index (PSQI), with poor sleep quality defined as a PSQI score ≥5 and short sleep duration as <6 hours. Logistic regression models, adjusted for sex and other CAD risk factors, were used to analyze the data.
Results: The baseline characteristics of cases and controls were similar except for gender. Short sleep duration (<6 hours) was independently associated with CAD (Odds Ratio (OR)=2.01, 95% Confidence Interval (CI)=1.09-4.24), as was poor sleep quality (PSQI score ≥5, OR=1.89, 95% CI=1.02-3.24).
Conclusions: Poor sleep quality and short sleep duration are significantly associated with CAD in Bangladeshi adults. These findings suggest that improving sleep quality and duration could serve as potential strategies for CAD prevention. Further research is warranted to explore these relationships and implement targeted interventions in this population.

Keywords: ACS, Confidence interval, CAD, Odds ratio, PSQI

INTRODUCTION

Sleep is a vital neurophysiological state that plays a central role in maintaining overall health and resilience. During sleep, distinct stages including non-REM and REM sleep occur, with slow-wave sleep (N3) being particularly important for hormonal regulation and cardiovascular function.[1,2] Disruptions in sleep duration and quality can

interfere with metabolic, neuroendocrine and vascular pathways, increasing the risk of chronic conditions such as cardiovascular disease (CVD).[3] As a result, understanding the impact of sleep on cardiovascular health is essential for developing preventive measures.

Globally, CVD remains the leading cause of death, with coronary artery disease (CAD) being one of the most prevalent conditions contributing to this burden. Recent studies have established a growing body of evidence linking poor sleep quality and short sleep duration with an increased risk of CAD.[4-6] Despite the increasing prevalence of CVD in Bangladesh, the role of sleep as a potential risk factor for CAD remains underexplored.[7] This gap in knowledge has prompted this study, which seeks to investigate the association between sleep quality and duration and CAD in Bangladeshi adults hospitalized with acute coronary syndrome (ACS).

Numerous international studies have explored the relationship between sleep duration, quality and CAD. For instance, a study conducted in Japan found that men who slept less than 5 hours per night had a 2.3-fold increased risk of acute myocardial infarction (AMI).[9] Similarly, the Nurses' Health Study highlighted a higher risk of coronary heart disease (CHD) in women who slept less than 6 hours per night.[10] These studies, along with others, suggest that sleep duration may have a U-shaped relationship with CAD risk, where both short and long sleep durations can increase the risk of cardiovascular events.

In addition to short sleep duration, sleep disturbances themselves have been identified as an independent risk factor for CAD.[11] Further research has emphasized that poor sleep quality and short sleep duration are particularly associated with CAD in populations at higher cardiovascular risk.[12,13] However, despite the wealth of international evidence, there remains a lack of studies focusing on ACS patients in South Asia. This study aims to fill this gap by exploring the relationship between sleep quality, duration and CAD among ACS patients at Chattogram Medical College Hospital (CMCH).

South Asian countries, including Bangladesh, bear the highest global burden of CVD.[8] Given the emerging evidence linking poor sleep duration and quality with CAD, understanding this association in Bangladesh could provide crucial insights for public health strategies and inspire further research into mitigating cardiovascular risk through improved sleep practices.

Objectives

This study investigates the association between sleep duration, quality and CAD. The hypothesis posits that short sleep duration and poor sleep quality contribute to CAD. The primary objective is to evaluate this association, while specific objectives include comparing CAD risk factors, sleep quality and total sleep duration between CAD patients and healthy controls. Key variables include socio-demographics (age, sex, occupation), clinical factors (diabetes, hypertension, smoking, dyslipidemia, ACS type) and sleep-related measures (duration, quality). Sleep quality is assessed via the PSQI, with a score>5 indicating poor quality and short sleep duration defined as<6 hours.

METHODS

This case-control study was conducted at the Department of Cardiology, Chittagong Medical College and Hospital (CMCH), Chattogram, Bangladesh, from June 2019 to May 2020. The study included patients diagnosed with acute coronary syndrome (ACS) during the study period.

Convenience sampling was used to select 139 ACS cases and an equal number of healthy controls. The PSQI questionnaire was adapted for local use through forward and backward translation. Informed consent was obtained from all participants and demographic and medical history were collected through interviews.

Sleep quality and total sleep time (TST) were assessed using the PSQI. Data were recorded on a pre-designed sheet and analyzed using SPSS-23. Continuous variables were expressed as mean±standard deviation and categorical variables as frequencies. Independent t-tests and chi-square tests were used for comparisons, with binary logistic regression identifying predictors of coronary artery disease (CAD). Ethical approval was obtained from the CMCH Ethical Committee.

Enrolment criteria

A. Case of CAD

Inclusion criteria: ACS diagnosis, symptoms onset within 7 days, aged 18-60 years.

Exclusion criteria: Unwilling participants, sleep disorders (e.g., obstructive sleep apnea), significant medical conditions affecting sleep, cognitive or social impairments (e.g., memory issues, mood swings).

B. Control group

Inclusion criteria: Age-matched (±5 years) with cases, no pre-existing illnesses (especially CAD or stroke), able to communicate and complete the interview.

Exclusion criteria: Unwilling participants, psychiatric illness, pregnancy or lactation.

RESULTS

The study aimed to evaluate the effect of sleep quality and total sleep duration on CAD development. Data were collected from 139 ACS patients and an equal number of age-matched healthy controls. The comparison of data between these two groups is summarized below.

There was no significant difference in mean age between the case and control groups. The age of ACS patients ranged from 38 to 60 years, with a mean of 50.99 (±6.32) years (Table 1). Although controls were mainly selected from the attendants of ACS patients, it was not possible to match sex for every case and control. Table 2 shows a significantly higher representation of males in the case group (male-to-female ratio 2.02:1).

Regarding residential status, both ACS and control groups were predominantly from urban or suburban areas, with no significant difference between groups (p=0.998) (Table 3).

Similarly, Table 4 reveals that both groups had similar monthly family income (p=0.998), with 74.1% of ACS participants earning between 10,000 to 20,000 Bangladeshi Taka (BDT).

Educational qualifications were compared between groups, showing no significant difference (Table 5). Smoking was significantly higher among ACS patients (33.1%) compared to controls (12.2%) (Table 6). Prevalence of hypertension (Table 6) and diabetes mellitus (Table 7) was significantly higher in ACS patients (25.2% vs. 10.5% and 18% vs. 5%, respectively). Additionally, only 17 patients (12.2%) of CAD had dyslipidemia and none of the control had dyslipidemia. This difference was statistically significant (p=<0.001) (Table 7).

Out of 139 patients with ACS 9 (6.5%) of them were diagnosed as UA, 30 (21.6%) as NSTEMI and 100 (71.9%) were diagnosed as STEMI (Figure 1).

In terms of sleep duration, 34.5% of ACS patients reported less than 6 hours of sleep, compared to 19.4% of controls (Table 8), a significant difference.

Regarding sleep quality, the PSQI score≥5 was considered as poor quality of sleep in this study. Table 8 also shows that 28.8% CAD cases reported poor sleep quality compared to 15.8% among the control subjects. This difference was statistically significant.

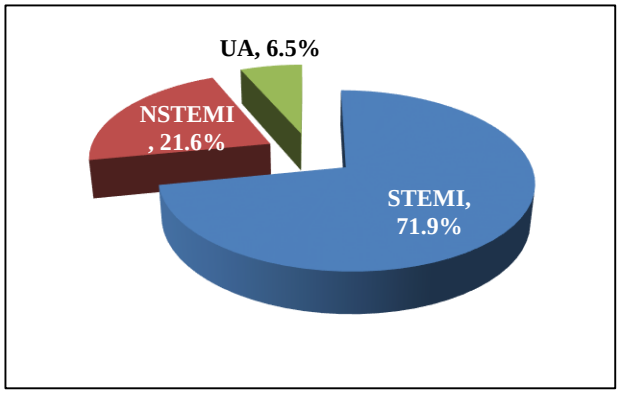

Figure 1: Distribution of the CAD patients by ACS type (n= 139).

Univariate analysis found significant associations between sex, smoking, dyslipidemia, hypertension, diabetes, sleep duration and sleep quality with CAD. Binary logistic regression analysis (Table 9) showed that the association between HTN, DM, sleep duration and sleep quality with CAD persist after adjustment.

Subjects with sleep duration of less than 6 hours were 2.01 times more likely to have CAD compared to those with sleep duration 6 hours or more (adjusted OR=2.01, 95% CI=1.09 to 4.24). Similarly, subjects with poor sleep quality were 1.89 times more likely to have CAD compared to those with better sleep (adjusted OR=1.89, 95% CI=1.02 to 3.24).

Table 1: Distribution of age of the participants, stratified by case and control.

Variables	Response		P value*
Age (years)	**Case (n=139)**	**Control (n=139)**	
Mean±SD	50.99±6.32	49.43±6.73	0.110
Range	38-60	36-60	

*Independent sample t test, not significant statistically.

Table 2: Distribution of sex of the participants, stratified by case and control.

Variables	Response		P value *
Sex, N (%)	**Case (n=139)**	**Control (n=139)**	
Male	93 (68.9)	60 (43.2)	<0.001
Female	46 (33.1)	79 (56.8)	

Data are expressed as frequency (percentage); *Chi-square test, statistically significant.

Table 3: Distribution of residential location of the participants, stratified by case and control.

Residential location	Case (n=139)	Control (n=139)	P value*
Urban	52 (37.4)	53 (38.1)	
Semi-urban	34 (24.5)	33 (23.7)	0.998
Rural	53 (38.1)	53 (38.1)	

***statistically significant

Table 4: Distribution of monthly family income of the participants, stratified by case and control.

Monthly family income	Case (n=139)	Control (n=139)	P value*
<10,000 BDT	19 (13.7)	23 (16.5)	0.999
10,000-20000 BDT	103 (74.1)	100 (71.6)	
>20000BDT	17 (12.2)	16 (11.5)	

*statistically significant

Table 5: Distribution of educational status of the participants, stratified by case and control.

Educational level	Case (n=139)	Control (n=139)	P value*
Illiterate	59 (42.4)	51 (36.7)	0.078
Class I-X	57 (41.0)	69 (49.6)	
Class XI and above	23 (16.5)	19 (13.7)	

*statistically significant

Table 6: Comparison of smoking habit and hypertension between cases and controls.

Smoking habit	Case (n=139)	Control (n=139)	P value*
Absent	93 (66.9)	122 (87.8)	<0.001
Present	46 (33.1)	17 (12.2)	
Hypertension			
Absent	104 (74.8)	124 (89.2)	0.002
Present	35 (25.2)	15 (10.5)	

*statistically significant

Table 7: Comparison of prevalence of diabetes mellitus & Dyslipidemia between cases and controls.

Diabetes mellitus	Case (n=139)	Control (n=139)	P value*
Absent	114 (82.0)	132 (95.0)	0.001
Present	25 (18.0)	7 (5.0)	
Dyslipidemia			
Absent	122(87.8)	139 (100.0)	0.001
Present	17(12.2)	0 (0)	

*statistically significant

Table 8: Comparison of sleep duration & Sleep Quality between cases and controls.

Sleep duration	Case (n=139)	Control (n=139)	P value*
≥6 hours	91 (65.5)	112 (80.6)	0.005
<6 hours	48 (34.5)	27 (19.4)	
Sleep quality			
PSQI <5	99 (71.2)	117 (84.2)	0.01
PSQI ≥5	40 (28.8)	22 (15.8)	

*statistically significant

Table 9: Binary logistic regression for independent association of risk factors with CAD.

Variables	Odds ratio	95% CI for OR		P value*
		Lower	Upper	
Sex				0.456
Male	Reference			
Female	2.31	0.45	5.21	
Smoking				0.213
Absent	Reference			
Present	1.59	0.19	4.21	
Dyslipidemia				0.382

Continued.

Variables	Odds ratio	95% CI for OR		P value*
		Lower	Upper	
Absent	Reference			
Present	1.01	0.035	3.21	
HTN				
Absent	Reference			0.004
Present	3.87	2.11	6.01	
DM				
Absent	Reference			0.001
Present	3.12	2.01	5.46	
Sleep duration				
≥6 hours	Reference			0.012
<6 hours	2.01	1.09	4.24	
Sleep quality				
PSQI<5	Reference			0.023
PSQI≥5	1.89	1.02	3.24	

*****statistically significant

DISCUSSION

This case-control study was conducted to explore the relationship between poor sleep quality and short sleep duration with the development of CAD. A total of 139 ACS patients admitted to the Cardiology Department of CMCH and an equal number of age-matched healthy controls, selected from attendants of admitted patients, were included. The study findings highlight a positive association between CAD manifestation and both poor sleep quality and short sleep duration.

The mean age of ACS patients in this study was 50.99 (±6.32) years, ranging between 38 and 60 years. Patients above 60 years were excluded to align with the National Sleep Foundation's sleep recommendations, which differ for adults and the elderly. Previous studies have reported varying mean ages for CAD patients, such as 51.51 (±11.58) years in India and 68.69 (±6.28) years in Korea. (12;14) Notably, a global study reported the mean age for AMI among Bangladeshis as 51.9 years, the lowest among South Asians and six years younger than non-South Asians.[15] These differences may stem from variations in life expectancy, geographical factors and genetic predisposition.

In terms of sex distribution, 68.9% of ACS patients were male, with a male-to-female ratio of 2.02:1. This male predominance aligns with findings from other studies.[7,12,14] The distribution of traditional risk factors in this study was consistent with previous literature. Among ACS patients, the prevalence of smoking was 33.3%, hypertension 25.2%, diabetes mellitus 18% and dyslipidemia 12.2%. Similar prevalence rates for smoking, hypertension and diabetes have been reported among Bangladeshi patients.[16,17] However, the dyslipidemia prevalence in this study was lower than reported by another study due to differences in defining dyslipidemia.[18]

This study relied on self-reported dyslipidemia without considering admission lipid profiles. In contrast, the control group reported lower prevalence rates for smoking (12.2%), hypertension (10.5%), diabetes (5%) and dyslipidemia (0%), reflecting the general Bangladeshi population. A significant finding of this study was the positive association between short sleep duration (<6 hours) and CAD. Multivariate logistic regression analysis revealed that short sleepers were twice as likely to develop CAD compared to those sleeping six or more hours (adjusted OR=2.01, 95% CI=1.09 to 4.24). This aligns with prior research.

A study reported a 2.3-fold increased risk of AMI among individuals sleeping less than five hours.[9] Another researcher observed increased odds of heart disease with six hours of sleep versus seven hours (OR=1.11).[19] In India, it was found that, a significant association between sleep duration under six hours and CAD events (OR=3.81).[12] Biological mechanisms linking short sleep duration to CAD include dysregulation of the autonomic nervous system, impaired endothelial function, inflammation, metabolic disturbances and changes in coagulation.[20]

Similarly, this study found an independent association between poor sleep quality and CAD. Patients with poor sleep quality were 1.89 times more likely to develop CAD than those with better sleep (adjusted OR=1.89, 95% CI=1.02 to 3.24). Sleep quality is crucial for physiological recovery during sleep and its impairment may exacerbate cardiovascular risks.[21] Another research reported that short sleep with disturbances heightened CHD risk, while another journal concluded in their meta-analysis that poor sleep quality moderately increased CHD risk (risk ratio=1.44; 95% CI=1.09–1.90).[11,13]

Despite extensive literature on sleep and CAD, this study is unique in exploring this relationship among Bangladeshi patients. The findings underscore the need for clinicians to address sleep duration and quality in patient assessments. Public health campaigns promoting good sleep practices could significantly reduce CAD risk in this population.

Clinicians in primary care settings should routinely discuss sleep habits to encourage healthier behaviours.

In conclusion, this study provides evidence that both short sleep duration and poor sleep quality are significant risk factors for CAD in the Bangladeshi population. These findings highlight the importance of integrating sleep assessments into routine clinical practice and public health initiatives to improve cardiovascular outcomes.

This study had several limitations. As a case-control study, it could not establish cause-and-effect relationships. Sleep quality and duration were self-reported, introducing the potential for bias. Similarly, the medical history of hypertension, diabetes and dyslipidemia relied on participants' self-reports. Additionally, the study was conducted in a single center with a relatively small, conveniently collected sample, which may limit the generalizability of the findings.

CONCLUSION

Recognition of short sleep duration and poor sleep quality as modifiable risk factors is an important area of research with the potential to significantly impact the prevention and management of CAD. Given the insufficient domestic research on this issue, this study was undertaken to address the gap.

In conclusion, the study identified that a significantly higher number of CAD patients admitted to CMCH reported short sleep duration and poor sleep quality compared to age-matched healthy controls. Furthermore, both short sleep duration and poor sleep quality demonstrated an independent association with CAD in this selected Bangladeshi population. These findings emphasize the need for further research and public health interventions targeting sleep as a critical component of cardiovascular health.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Van Cauter E, Holmbäck U, Knutson K, Leproult R, Miller A, Nedeltcheva A, et al. Impact of Sleep and Sleep Loss on Neuroendocrine and Metabolic Function. Hormone Research in Paed. 2007;67(1):2–9.
2. Akerstedt T, Nilsson PM. Sleep as restitution: an introduction. J of Internal Med. 2003;254(1):6–12.
3. Mullington JM, Haack M, Toth M, Serrador JM, Meier-Ewert HK. Cardiovascular, Inflammatory and Metabolic Consequences of Sleep Deprivation. Progress in Cardiovas Dis. 2009;51(4):294–302.
4. Mathers CD, Loncar D. Projections of Global Mortality and Burden of Disease from 2002 to 2030. Samet J, editor. PLoS Medicine. 2006;28;3(11):e442.
5. Lao XQ, Liu X, Deng HB, Chan TC, Ho KF, Wang F, et al. Sleep Quality, Sleep Duration and the Risk of Coronary Heart Disease: A Prospective Cohort Study With 60,586 Adults. J Clin Sleep Med. 2018;14(01):109–17.
6. Quan SF. Sleep Disturbances and Their Relationship to Cardiovascular Disease. American J of Lifestyle Medicine. 2009;19;3(1):55-9.
7. Chowdhury M, Haque MdA, Farhana Z, Anik A, Chowdhury AH, Haque SM, et al. Prevalence of cardiovascular disease among Bangladeshi adult population: a systematic review and meta-analysis of the studies. Vascular Health and Risk Management. 2018;14:165–81.
8. Siegel KR, Patel SA, Ali MK. Non-communicable diseases in South Asia: contemporary perspectives. British Medical Bulletin. 2014;111(1):31–44.
9. Liu Y, Tanaka H. Overtime work, insufficient sleep and risk of non-fatal acute myocardial infarction in Japanese men. Occupational and Environmental Med. 2002;59(7):447–51.
10. Ayas NT, White DP, Manson JE, Stampfer MJ, Speizer FE, Malhotra A, et al. A Prospective Study of Sleep Duration and Coronary Heart Disease in Women. Archives of Internal Med. 2003;27s(2):205.
11. Chandola T, Ferrie JE, Perski A, Akbaraly T, Marmot MG. The Effect of Short Sleep Duration on Coronary Heart Disease Risk is Greatest Among Those with Sleep Disturbance: A Prospective Study from the Whitehall II Cohort. Sleep. 2010;33(6):739–44.
12. Sharma M, Sawhney JPS, Panda S. Sleep quality and duration – Potentially modifiable risk factors for coronary artery disease. Indian Heart J. 2014;66(6):565–8.
13. Kwok CS, Kontopantelis E, Kuligowski G, Gray M, Muhyaldeen A, Gale CP, et al. Self-reported sleep duration and quality and cardiovascular disease and mortality: a dose-response meta-analysis. J American Heart Asso. 2018;7(15):1443.
14. Choi EJ, Ko HJ, Youn CH, Kim NR, Jang EJ, Kim A-Sol, et al. Effects of Sleep on Cardiovascular Disease: A Case-Control Study. Korean J Family Prac. 2018;8(1):107–12.
15. Joshi P, Islam S, Pais P, Reddy S, Dorairaj P, Kazmi K, et al. Risk Factors for Early Myocardial Infarction in South Asians Compared With Individuals in Other Countries. JAMA. 2007;297(3):286.
16. Das PK, Kamal SM, Murshed M. Acute myocardial infarction in young Bangladeshis: A comparison with older patients. J Indian Coll Cardiol. 2015;5(1):20–4.
17. Islam M, Bhattacharjee B, Chowdhury MAY, Siddique AN, Karim AMMR. Outcome of Acute Myocardial Infarction Patients Admitted in a Tertiary Care Hospital. Medicine Today. 2017;28(1):6–8.
18. Alam MZ, Rahman A, Hoque SJ, Irfan SR, Miah MB, Hossain MS. Pattern of dyslipidemia in different type

of myocardial infarction. Bangladesh Critical Care J. 2017;5(2):106–9.
19. Grandner M. Sleep and Health. San Diego Elsevier Science & Technology Ann Arbor, Michigan Proquest. 2019.
20. Tobaldini E, Fiorelli EM, Solbiati M, Costantino G, Nobili L, Montano N. Short sleep duration and cardiometabolic risk: from pathophysiology to clinical evidence. Nature Reviews Cardiol. 2019;16(4):213–24.
21. Smolensky MH, Hermida RC, Castriotta RJ, Portaluppi F. Role of sleep-wake cycle on blood pressure circadian rhythms and hypertension. Sleep Medicine. 2007;8(6):668–80.

Cite this article as: Bhattacharya D, Das PK, Awal A, Biswas T, Selim GM, Bhattacharjee K, et al. Association of poor sleep quality and short sleep duration on the development of coronary artery disease. Int J Res Med Sci 2025;13:1824-30.