DOI: https://doi.org/10.3329/medtoday.v36i2.74822

ORIGINAL ARTICLE OPEN ACCESS

# Association of Chronic Stress with Cardiovascular Diseases: A Single Centre Experience

Md. Shawqat Ali*[1], Golam Mahfuz Rabbani[2], Mohammad Touhidul Islam[3], Muhammad Fazlul Haque Khalid[4], Md. Monirul Islam[5], Md. Hamid Uddin[6]

***Abstract:***

***Introduction:*** *Cardiovascular diseases (CVD) pose a growing global health threat, with a 42.4% increase in deaths between 1990 and 2015 despite a 27.3% decline in age-standardized CVD mortality rates. Risk factors like smoking, inactivity, high blood pressure, obesity, hyperinsulinemia, hypercholesterolemia, and psychological stress contribute to CVD.* ***Aim of the study:*** *The study aims to assess the prevalence of stress and its association with cardiovascular diseases (CVD).* ***Materials and Methods:*** *This prospective study at Jessore Medical College and Hospital, Bangladesh, involved 110 patients aged 25-64 with cardiovascular diseases (CVDs) and chronic stress. The study duration was one year from January 2022 to December 2022.* ***Result:*** *The majority (54.55%) were aged 31-40, with females constituting 57.00% of the total sample. Work experience distribution revealed 50.91% with 1-10 years, 21.82% with 11-20 years, and 27.27% with over 20 years. Stress intensity analysis showed no mild stress, 71.82% with "Average to acute stress," 25.45% with "Average stress," and 2.73% with acute stress. Cardiovascular risk factors included 19.00% lacking sleep, 15.00% with low physical activity, and 12.00% each for smoking, hypercholesterolemia, and arterial hypertension.* ***Conclusion:*** *Research indicates that individuals experiencing stress face significant cardiovascular risk factors. However, the connections between stress and these risk factors appear complex and must be more apparent. This underscores the necessity for additional investigation into the relationship between stress and other cardiovascular risk factors while considering factors such as age, gender, and socio-economic characteristics within the population.*

***Keywords:*** *Association, chronic stress, cardiovascular risk factors and cardiovascular diseases.*

*Number of Tables: 04; Number of Figure: 01; Number of References: 23; Number of Correspondences: 03.*

***1. Corresponding Author:**
**Dr. Md. Shawqat Ali**
Associate Professor & Head
Department of Cardiology
Jashore Medical College
Jashore, Bangladesh.
Email: drshawqatali@gmail.com
Orcid id:0009-0003-2192-3437
Mobile:01712545308

**2. Dr. Golam Mahfuz Rabbani**
Assistant Professor
Department of Cardiology
Jashore Medical College
Jashore, Bangladesh.

**3. Dr. Mohammad Touhidul Islam**
Senior Consultant
Department of Cardiology (CCU)
250 Bedded General Hospital
Jashore, Bangladesh.

**4. Dr. Muhammad Fazlul Haque Khalid**
Junior Consultant
Department of Cardiology (CCU)
250 Bedded General Hospital
Jashore, Bangladesh.

**5. Dr. Md. Monirul Islam**
Medical Officer
250 Bedded General Hospital
Jashore, Bangladesh.

**6. Dr. Md. Hamid Uddin**
Medical Officer
250 Bedded General Hospital
Jashore, Bangladesh.

## Introduction:

Cardiovascular diseases are one of the emerging global health concerns, and public health professionals now view them as a primary concern. Despite a drop of 27.3% in age-standardized CVD mortality rates during the past few decades, the number of deaths rose by 42.4% between 1990 and 2015[1]. In industrialized


*Received:* 26 April 2024 *Accepted revised version:* 03 July 2024

nations, cardiovascular illnesses account for almost 50% of all deaths[2]. The existence of certain risk factors, such as smoking, inactivity, high blood pressure, obesity, hyperinsulinemia, and hypercholesterolemia, is strongly linked to the occurrence of cardiovascular diseases[2]. It is becoming more well understood that psychological stress plays a significant role in cardiovascular disease and may be a modifiable risk factor[3]. Stress has an impact on cardiovascular health at various phases of the disease process, including the development of atherosclerosis and subclinical coronary heart disease (CHD) over time, the acute induction of cardiac events in patients with advanced CHD, and exposure to cardiovascular risk factors (such as the reduction in physical activity caused by stress). Furthermore, stress can deteriorate recovery and have a long-term negative impact on quality of life in those who have survived an acute coronary syndrome or stroke[4,5]. The INTERHEART study, which involved a diverse sample of 24,767 individuals from 52 countries, revealed that experiencing stress increases the likelihood of acute myocardial infarction by twofold[6]. In a UK-based study, 134 South Asian men and women encountered higher levels of chronic stress, characterized by financial difficulties, crowded living conditions, family discord, social deprivation, and discrimination, compared to their European counterparts. Despite having larger social networks, South Asians experienced lower social support along with increased levels of depression and hostility. Consequently, the notable psychosocial challenges faced by the South Asian group, in contrast to Europeans, align with the observed heightened susceptibility to coronary artery disease (CAD) in this population[7].An additional prospective investigation examining the impact of cumulative stress on cardiovascular risk reveals connections with factors such as age, ethnicity, marital status, along with habits like smoking and conditions like obesity, diabetes, depression, and anxiety[8]. While stress management is advised by certain recommendations for patients who are at high risk of cardiovascular disease (CVD), it is not yet recognized as a key preventive measure for the general public[9,10]. Since chronic stress and stress-related disorders are becoming more common in modern society, it is vital to address the public health problems of identifying stress as an independent risk factor for CVD and developing innovative preventative methods[11]. Nevertheless, until recently, there was not many research looking at the effects of stress on cardiovascular diseases, and the available data has long been insufficient. The study aims to assess the prevalence of stress and its association with cardiovascular diseases (CVD).

**Materials and Methods:**

This prospective study was conducted at the Department of Cardiology in Jessore Medical College and Hospital, Jessore, Bangladesh. A total of 110 patients were enrolled and analyzed in this study from January 2022 to December 2022. The questionnaire survey provided information on socio-demographic characteristics (sex, age, education, marital status, employment), stress, behavioral habits (alcohol, smoking, lack of sleep, and low physical activity), history of CVD (arterial hypertension, coronary artery disease (CAD), cerebrovascular accident, diabetes mellitus), economic conditions (financial wealth), quality of life. Prior to inclusion in the study, written informed consent was obtained from all participants.

**Inclusion criteria** were patients aged from 25 to 64 years, both male and female patients, participants with a documented history of cardiovascular diseases, such as coronary artery disease, heart failure, stroke, or peripheral vascular disease and individuals experience chronic stress for six months or more and participants are willing to provide informed consent to participate in the study. Exclusion criteria were individuals experiencing acute stress without a history of chronic stress, participants with severe mental health disorders, such as schizophrenia or bipolar disorder, might confound the association between chronic stress and cardiovascular diseases, pregnant individuals, as pregnancy itself, can influence stress levels and cardiovascular parameters and individuals who decline or are unwilling to participate in the study despite meeting other inclusion criteria. The analysis of stress prevalence depending on the socio-demographic characteristics of the sample, presence of cardiovascular diseases, and CVR factors was carried out using Pearson's Chi-square test. Significant differences in stress prevalence depending on socio-demographic characteristics may affect the association of stress with CVDs and SSR factors. Logistic regression analysis was used to eliminate the modifying effect of socio-demographic characteristics. At the same time, the associations studied were adjusted for the impact of gender, age, employment, level of education, marital status, urban/rural residence, and financial well-being.

**Result:**

In this prospective study, a total of 110 patients were enrolled and studied. Table I presents the age distribution of the study population. The majority of 60(54.55%) individuals fell within the age range of 31 to 40 years, constituting the total sample. In contrast, the 20-30 age range accounted for 14.55% and 23(20.91%) were aged 4, respectively. Figure 1 illustrates the gender distribution within the study population. The data reveals a slightly higher representation of females, constituting 57.00% of the total sample, while males accounted for 43.00%. Table II provides a comprehensive overview of the distribution of work experience. The largest segment is represented by individuals with 1-10 years of work experience, constituting 56(50.91%) of the total sample. The second category, comprising those with 11-20 years of work experience, accounts for 21.82% of the study population, and the third category, individuals with over 20 years of work experience, represents 27.27% of the participants.

Table III outlines the distribution of stress intensity. Interestingly, none of the participants reported experiencing mild stress. The most prevalent category is "Average to acute stress," with a frequency of 79(71.82%) participants. The "Average stress" category represents 25.45% of participants, with 28 individuals falling into this group. A smaller percentage, 2.73%, reported experiencing acute stress. Table IV presents the distribution of cardiovascular risk factors. Notable findings include a prevalence of 19.00% for lack of sleep, 15.00% for low physical activity, and 12.00% for smoking, hypercholesterolemia, and arterial hypertension.

**Table 1: Age distribution of the study population (N=110).**

| Age | Frequency (n) | Percentage (%) |
|---|---|---|
| 20-30 | 16 | 14.55 |
| 31-40 | 60 | 54.55 |
| 41-50 | 23 | 20.91 |
| 51-60 | 11 | 10.00 |

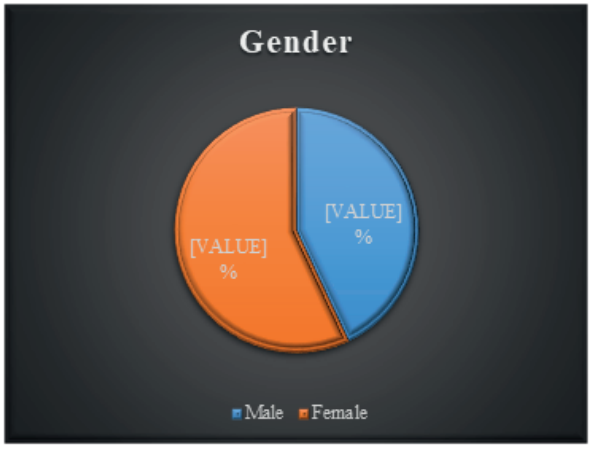


**Figure 1:** Gender distribution of the study population (N=110).

**Table II: Distribution work experience of the study population (N=110).**

| Work experience | Frequency (n) | Percentage (%) |
|---|---|---|
| 1-10 | 56 | 50.91 |
| 11-20 | 24 | 21.82 |
| > 20 | 30 | 27.27 |

**Table III: Patients stress intensity of the study population (N=110).**

| Stress intensity | Frequency (n) | Percentage (%) |
|---|---|---|
| Mild stress | 0 | 0.00 |
| Average stress | 28 | 25.45 |
| Average to acute stress | 79 | 71.82 |
| Acute stress | 3 | 2.73 |

**Table IV: Cardiovascular risk factors of the study populations.**

| Risk factors | Frequency (n) | Percentage (%) |
|---|---|---|
| Lack of sleep | | |
| Yes | 20 | 19.00 |
| No | 90 | 81.00 |
| Low physical activity | | |
| Yes | 16 | 15.00 |
| No | 94 | 85.00 |
| Smoking | | |
| Yes | 13 | 12.00 |
| No | 97 | 88.00 |
| Alcohol | | |
| Yes | 10 | 9.00 |
| No | 100 | 91.00 |
| Hypercholesterolemia | | |
| Yes | 13 | 12.00 |
| No | 97 | 88.00 |
| Hyperglycemia | | |
| Yes | 4 | 4.00 |
| No | 106 | 96.00 |
| Arterial hypertension | | |
| Yes | 10 | 9.00 |
| No | 100 | 91.00 |
| Coronary artery disease | | |
| Yes | 6 | 6.00 |
| No | 104 | 94.00 |
| Stroke | | |
| Yes | 2 | 2.00 |
| No | 108 | 98.00 |
| Obesity | | |
| Yes | 8 | 8.00 |
| No | 102 | 92.00 |
| Diabetes mellitus | | |
| Yes | 2 | 2.00 |
| No | 108 | 98.00 |

**Discussion:**

The research aimed to explore the association between stress and cardiovascular risk factors, mainly focusing on occupational stress. A notable prevalence of occupational stress was identified within the study group with a working tenure of 1-10 years. In a prior investigation, 68% of participants were classified in a medium-to-high-stress category[12]. In the present study, 71.82% reported experiencing average and acute stress, yet no statistically significant variations were detected in cardiovascular disease risk factors. Potential reasons for this lack of significance include the study's brief duration, insufficient

consideration of stress effects over an extended period, and the relatively young age of participants. Contrary findings reported no significant correlation between cardiovascular disease risk factors and work stress; this study revealed a positive but non-significant association between smoking and occupational stress[13]. These findings also align with previous studies[14]. While Belkic et al. (2004) established a significant link between cardiovascular disease risk factors and work stress[15], Demiral et al.'s results in 2006 did not confirm these findings[16]. Another noteworthy discovery was a significant relationship and robust correlation between work stress and blood glucose levels. Golmohammadi reported a similar association in diabetic patients[17]. However, a direct comparison between their results and ours is challenging due to the differing assessment tools employed in the studies. No significant correlation was observed between occupational stress and changes in blood lipid profiles, and the positive correlation detected was weak. Our study findings show similarity with various studies, where there is no significant link between stress and blood cholesterol[18,19]. Similarly, Kobayashi (2005) and Yadegarfar et al. (2010) reported no significant association between occupational stress and blood triglycerides[20,21]. Despite discrepancies with Kobayashi's study, which did find a significant relationship between blood cholesterol and stress[21], variations may stem from differences in methodology and study group composition. Although participants reported a high rate of diastolic blood pressure, no significant associations were identified between diastolic blood pressure and occupational stress. Another study found no correlation between occupational stress and cardiovascular disease risk factors despite their study participants' high-stress prevalence[22]. The study revealed that drivers worked an average of 13.62±3.64 hours per day, potentially contributing to elevated occupational stress. This finding is comparable with a previous study, indicating a link between occupational stress and extended working hours[23].

**Conclusion and Recommendations:**

This study investigated the association between chronic stress and cardiovascular diseases (CVD) among 110 patients in Jessore, Bangladesh. Despite a high prevalence of average to acute stress, no statistically significant variations in cardiovascular risk factors were observed, possibly due to the study's brief duration and the relatively young age of participants. Noteworthy was the positive but non-significant association between smoking and occupational stress, aligning with prior research. A significant relationship between work stress and blood glucose levels was identified, echoing previous findings. However, no significant correlations were found for blood lipid profiles or diastolic blood pressure. The study emphasizes the complexity of stress-CVD relationships and calls for further exploration. Given the growing significance of chronic stress in modern society, further longitudinal studies with diverse populations are crucial to understanding its nuanced impact on cardiovascular health.

**Conflict of Interest:** None.

**References:**

1. Low Wang CC, Hess CN, Hiatt WR, Goldfine AB. Clinical update: cardiovascular disease in diabetes mellitus: atherosclerotic cardiovascular disease and heart failure in type 2 diabetes mellitus-mechanisms, management, and clinical considerations. Circulation. 2016 Jun 14;133(24):2459-502.
https://doi.org/10.1161/CIRCULATIONAHA.116.022194
PMid:27297342 PMCid:PMC4910510

2. Pagliaro BR, Cannata F, Stefanini GG, Bolognese L. Myocardial ischemia and coronary disease in heart failure. Heart Failure Reviews. 2020 Jan;25(1):53-65.
https://doi.org/10.1007/s10741-019-09831-z
PMid:31332663

3. Shah MS, Brownlee M. Molecular and cellular mechanisms of cardiovascular disorders in diabetes. Circulation research. 2016 May 27;118(11):1808-29.
https://doi.org/10.1161/CIRCRESAHA.116.306923
PMid:27230643 PMCid:PMC4888901

4. Chan JC, Malik V, Jia W, Kadowaki T, Yajnik CS, Yoon KH, et al. Diabetes in Asia: epidemiology, risk factors, and pathophysiology. Jama. 2009 May 27;301(20):2129-40.
https://doi.org/10.1001/jama.2009.726
PMid:19470990

5. Hotta N, Nakamura J, Iwamoto Y, Ohno Y, Kasuga M, Kikkawa R, Toyota T. Causes of death in Japanese diabetics: a questionnaire survey of 18,385 diabetics over a 10-year period. Journal of diabetes investigation. 2010 Feb;1(1-2):66-76.
https://doi.org/10.1111/j.2040-1124.2010.00019.x
PMid:24843411 PMCid:PMC4020680

6. Agarwal A, Gossain VV. Diabetes in the Elderly. Drugs in Diabetes. 2021 May 31:183.

7. McAloon CJ, Osman F, Glennon P, Lim PB, Hayat SA. Global epidemiology and incidence of cardiovascular disease. In Cardiovascular Diseases. Academic Press. 2016 Jan 1 (pp. 57-96).
https://doi.org/10.1016/B978-0-12-803312-8.00004-5

8. Kannel WB, McGee DL. Diabetes and cardiovascular disease: the Framingham study. Jama. 1979 May 11;241(19):2035-8.
https://doi.org/10.1001/jama.241.19.2035
PMid:430798

9. Grundy SM, Benjamin IJ, Burke GL, Chait A, Eckel RH, Howard BV, et al. Diabetes and cardiovascular

disease: a statement for healthcare professionals from the American Heart Association. Circulation. 1999 Sep 7;100(10):1134-46.

https://doi.org/10.1161/01.CIR.100.10.1134

PMid:10477542

10. Kim JA, Koh KK, Quon MJ. The union of vascular and metabolic actions of insulin in sickness and in health. Arteriosclerosis, thrombosis, and vascular biology. 2005 May 1;25(5):889-91.

https://doi.org/10.1161/01.ATV.0000164044.42910.6b

PMid:15863720

11. Kaur J, Singh P, Sowers JR. Diabetes and cardiovascular diseases. American Journal of therapeutics. 2002 Nov 1;9(6):510-5.

https://doi.org/10.1097/00045391-200211000-00009

PMid:12424509

12. Rahmani A, Farjami A, Mahmodkhani S, Gharagozlo F, Ahmadnezhad I, Karchani M, et al. Determination of job stresses and their consequences in drivers in Ilam. Electron Physician. 2013;5(1):594-8.

13. Pelfrene E, De Backer G, Mak R, De Smet P, Kornitzer M. Job stress and cardiovascular risk factors. Arch Public Health. 2002;60:245-68.

14. Kouvonen A, Kivimaki M, Virtanen M, Pentti J, Vahtera J. Work stress, smoking status, and smoking intensity: An ob servational study of 46190 employees. J Epidemiol Community Health. 2005;59(1):63-9.

https://doi.org/10.1136/jech.2004.019752

PMid:15598729 PMCid:PMC1763376

15. Belkic K, Landsbergis PA, Schnall PL, Baker D. Is job strain a major source of cardiovascular disease risk? Scand J Work Environ Health. 2004:85-128.

https://doi.org/10.5271/sjweh.769

PMid:15127782

16. Demiral Y, Soysal A, Can Bilgin A, Kiliç B, Unal B, Uçku R, et al. The association of job strain with coronary heart dis ease and metabolic syndrome in municipal workers in Tur key. J Occup Health. 2006;48(5):332-8.

https://doi.org/10.1539/joh.48.332

PMid:17053299

17. Golmohammadi R, Abdulrahman B. Relationship between occupational stress and non-insulin-dependent diabetes in different occupation in Hamadan (West of Iran). J Med Sci. 2006;6(2):241-4.

https://doi.org/10.3923/jms.2006.241.244

18. Su C-T. Association between job strain status and cardiovas cular risk in a population of Taiwanese white-collar work ers. Circ J. 2001;65(6):509-13.

https://doi.org/10.1253/jcj.65.509

PMid:11407732

19. Netterstrøm B, Kristensen TS, Damsgaard MT, Olsen O, Sjøl A. Job strain and cardiovascular risk factors: A cross sectional study of employed Danish men and women. Br J Ind Med. 1991;48(10):684-9.

https://doi.org/10.1136/oem.48.10.684

PMid:1931727 PMCid:PMC1012061

20. Kobayashi Y, Hirose T, Tada Y, Tsutsumi A, Kawakami N. Relationship between two job stress models and coronary risk factors among Japanese part-time female employees of a retail company. J Occup Health. 2005;47(3):201-10.

https://doi.org/10.1539/joh.47.201

PMid:15953841

21. Yadegarfar G, Alinia T, Gharaaghaji Asl R, Allahyari T, Sheikhbagloo R. [Assessing the relationship between occu pational stress and risk factors of cardiovascular in the Ur mia petrochemical company employees]. J Isfahan Med Sch. Persian. 2010;28(112):645-60.

22. Franke WD, Kohut ML, Russell DW, Yoo HL, Ekkekakis P, Ramey SP. Is job-related stress the link between cardiovas cular disease and the law enforcement profession? J Occup Environ Med. 2010;52(5):561-5.

https://doi.org/10.1097/JOM.0b013e3181dd086b

PMid:20431405

23. Uehata T. Long working hours and occupational stress related cardiovascular attacks among middle-aged workers in Japan. J Hum Ergol. 1991;20(2):147-53.