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Original Research Article

Association Between Perceived Stress and Coagulation Function in Patients With Coronary Heart Disease Admitted to a Tertiary Care Hospital

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Abstract: *Coronary heart disease (CHD) is a major global health burden, often exacerbated by psychosocial factors such as stress. Emerging evidence suggests that perceived stress may influence coagulation parameters, potentially contributing to adverse cardiovascular outcomes. However, data from low- and middle-income countries, including Pakistan, remain limited.* ***Objective:*** *The objective of the study was to determine the association between perceived stress and coagulation function in patients with coronary heart disease admitted to a tertiary care hospital.* ***Methods:*** *It was a cross-sectional study, conducted at Shaikha Fatima Institute of Nursing and Health Sciences, Lahore, between May to December 2022. Three hundred and ten (310) patients of coronary heart disease were included in the study, a predesigned proforma containing information related to demographic characteristics, medical history, coagulation profile, and perceived stress scale.* ***Results:*** *310 patients with coronary heart disease participated in our study; their mean ± SD of age, BMI, and monthly income were 52.8±14.2 years, 23.5±7.2, and 65000±20000 rupees, respectively. Among study subjects 298(96.1%) were married 189(61.0%) had sedentary occupation 198(63.8%) were diabetic, 269(86.7%) were hypertensive,112(36.1%) were smokers, obesity was observed in 98(31.6%), 34.8% were physically inactive and 129(41.6%) had family history of cardiovascular disease.. Among 310 subjects 174(56.2%) had perceived stress (score<16) and 136(43.8%) didn't have perceived stress (score≤16). Coagulation function (APTT) was assessed; 191(61.6%) had deranged (shortened APTT, i.e., <35 sec) coagulation function, and 119(38.4%) had normal coagulation function. In our study significant association was found between perceived stress and coagulation function in patients with coronary artery disease, P=0.000.* ***Conclusion:*** *Perceived stress is strongly associated with PT and APTT regardless of the type of CHD. The negative impact of high perceived stress on cardiovascular prognosis could partially be explained by the activation of the intrinsic coagulation pathway.*

Keywords: Stress, Psychological Blood Coagulation Tests, Coronary Disease, Activated Partial Thromboplastin Time, Cross-Sectional Studies

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Introduction

Despite the thorough studies on the impact of classical risk factors on cardiovascular diseases (e.g., smoking, raised blood pressure levels, and high serum cholesterol levels) and the progress in diagnosis and treatment, these pathologies remain the primary cause of morbidity and mortality, underlying the importance to find and characterize new risk factors. Several studies linked chronic stress resulting from environmental noise, job strain, dementia caregiving, posttraumatic stress disorder, psychological distress from depressive and anxiety symptoms, and acute stress consequent to a psychological response to a terrifying, traumatic, or surprising experience to cardiovascular diseases (CVDs) (1). Thus, this association attracted the focus of the international societies of cardiology, which is why the European Guidelines for Cardiovascular Disease Prevention mentioned that in the case of high recognized risk or existing CVD, stress should be considered a risk factor (Ib class of recommendation) (2). Strikingly, it is worth noting that the stress risk factor has not been highlighted in the American Guideline on the Primary Prevention of CVD, even though the same standards recommend that adults should be routinely screened for psychosocial stressors before the end being provided with appropriate counselling (3).

New data available give grounds to state that stress seems to have but a moderate impact on the pathway of developing genocide in healthy people (4), while further disease progression and more unfavorable clinical outcomes can be regarded as critical depending on stress in patients with earlier signs of cardiovascular pathology (5). With regards to the TOP study, out of 1,812 patients, 18% were considered to have experienced an event that led to emotional upset prior to MI, and a meta-analysis scrutinized that increased risk of serious emotional event is linked with an increase in risk of MI by about 4-fold. 7 times. Similarly, it has been estimated that acute as well as chronic stress as isolated aspects that are likely to increase VTE (6). Because thrombus formation is essential for both MI and VTE in the pathophysiological mechanisms, acute and chronic stress can be regarded as promoting these CVD complications, predisposing to arterial thrombosis and venous thrombosis (VT).

Arterial thrombi can be defined regarding most platelet infiltration and fibrin deposition historically, and it relates well with high shear rate and proximity to the injured atherosclerotic plaque. Intravascular coagulation has thus been assumed where venous thrombi are rich in fibrin and red blood cells, and occur in a breached endothelial wall at regions of slow-moving blood flow. However, the structural distinction between arterial and venous thrombi drawn here has been challenged recently based on tangible differences. Arterial and venous thrombi have a similar structure of the fibrin net, which is filled with platelets, leukocytes, and red blood cells; however, the degree of their concentration differs (7). The underlying mechanisms of thrombus formation might be extended by the points: imbalance in the haemostatic system and hypercoagulable state, changes in the blood flow velocity, endothelial dysfunction in connection with inflammation, and oxidative stress. All these processes are detected in the CVD patients and also in the individuals who are under acute and chronic stress. After that, the understanding of how stress can affect the players engaged in thrombotic processes is very helpful. Stress is generally defined as a fundamental physiological and psychological pattern of response to any condition that is demanding or threatening, which facilitates the physical organism's adaptation and enhances the odds of its survival (8). The two systems elicited by stress are the ANS

and HPA axis, which are primary stress response mechanisms. The ANS acts quickly, within a few seconds, in response to a stressor, while the HPA sustains a response (9). All vertebrates, during brief S (short-term stress) situations, develop the so called syndrome "fight or flight" which is accompanied by the launch of chemical mediators, hormones and catecholamines capable of inducing physiological changes in the behavior, cardiovascular system, endocrine and metabolic signals, and in immune response in order to restore the internal balance to a state of stability referred to as allostasis (translated literally from Greek it means 'establish On the other hand, if a buildup of stressors and stress-responses is repeated, it leads, due to the above discussed physiological alterations, to an unhealthy, pathophysiological adaptation which is referred to as "allostatic load" (11).

Objective

The main objective of the study is to determine the association between perceived stress and coagulation function in patients with coronary heart disease admitted to a tertiary care hospital.

Methodology

It was a cross-sectional study, conducted at Shaikha Fatima Institute of Nursing and Health Sciences, Lahore, between May to December 2022. Three hundred and ten (310) patients of coronary heart disease were included in the study, a predesigned proforma containing information related to demographic characteristics, medical history, coagulation profile, and perceived stress scale. At the start, a pilot study was done by filling out 20 questionnaires, and some modifications were made to the questionnaire. Data were collected through a Non-Probability consecutive sampling technique.

The reliability of the questionnaire was assessed by applying the reliability coefficient Cronbach's Alpha, α=0.82, which is statistically acceptable.

After taking approval from the institutional ethical committee, 315 admitted patients with coronary heart disease were included. Written informed consent was taken for their participation in the study and for using their data for research purposes. Participants were assured about the confidentiality of their personal information. Patients requiring urgent percutaneous coronary intervention, intensive care, and patients prehospital taking anticoagulants were excluded. Participants' socio-demographic information was noted, including age, weight, height, BMI, marital status (single, married), occupation, were noted. Medical history, including diabetes, hypertension, smoking, hyperlipidemia, obesity, family history of any cardiovascular disease and sedentary lifestyle, and any other stress, was noted from their available medical record. At the time of presentation, as a routine protocol, blood samples were taken and samples were sent for coagulation functions along with other investigations. When the results of the investigations were received, the Coagulation profile (APTT) was noted and categorized as per the operational definition. PSS was employed to assess perceived stress among the patients, and the total score was categorized according to the operational definition. All this information was collected by a pre-designed questionnaire completed by researchers themselves.

All the collected information will be entered and analyzed using SPSS version 22.0. The quantitative variables, age, monthly income, and BMI, will be presented by calculating the mean and standard deviation. The qualitative variables, marital status (single, married), occupation, medical history including presence of diabetes, hypertension, smoking, obesity, family history of any cardiovascular disease, physical activity, deranged coagulation function, and perceived stress (present, absent), were presented by calculating frequency and percentages. Association between coagulation function and perceived stress was assessed by applying the chi-square test. $p \leq 0.05$ was taken as significant.

Results

310 patients with coronary heart disease participated in our study; their mean±SD age was 52.8±14.2 years, mean±SD 23.5±7.2, and mean±SD of average monthly income was 65000±20000 rupees. Among study subjects, 189(61.0%) had sedentary occupations while 121 (39.0%) had active occupations. Medical history of study participants was asked, 198(63.8%) subjects were diabetic, 36.2% were non-diabetics, 269(86.7%) were hypertensive while 19.3% were normotensives, 112(36.1%) were smokers and 63.9% were nonsmokers, obesity was observed in 98(31.6%) of cases and 68.4% cases had normal BMI. 202(65.0%) participants were physically active, while 34.8% were physically inactive and 129(41.6%) had a family history of cardiovascular disease, and 58.4% didn't have a family history of cardiovascular disease. The Perceived Stress Scale was employed on study participants to assess perceived stress among them, and their total scores were obtained. Among 310 subjects 174(56.2%) had perceived stress (score<16) and 136(43.8%) didn't have perceived stress (score≤16). Coagulation function (APTT) was assessed; it was noted that out of 310 cases, 191(61.6%) had deranged (shortened APTT, i.e., <35 sec) coagulation function and 119(38.4%) had normal coagulation function. 174(56.1%) of our subjects were detected as having perceived among these 149(85.6%) had deranged coagulation function and 25(14.4%) had normal coagulation function on the other hand 136(43.9%) subjects were detected as not having perceived stress, out of these only 42(30.8%) had deranged coagulation function and normal coagulation function was found in 94(69.2%). P=0.000 shows that there is a significant association between perceived stress and coagulation function in patients with coronary artery disease.

Mean APTT and mean PT were compared concerning perceived stress, in a group of participants with perceived PSS>16 had a lesser mean±SD (35.62±5.21) than participants with PSS≤16, and 39.01±4.36, the difference between means of APTT between the groups was found significant (P=0.002). PT levels were also compared concerning perceived stress, mean ±SD in participants with PSS>16 was lower (13.78±0.92) than in PSS ≤16, as 14.04±0.73, but the difference between means of PT concerning perceived stress was insignificant, as indicated by the P=0.54.

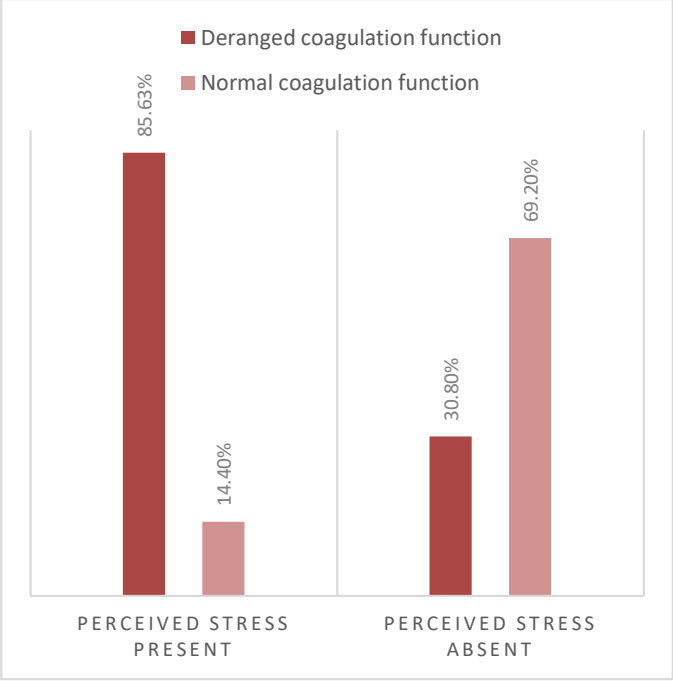

Figure 01: Graphical presentation of coagulation function and perceived stress among study participants.

Table 01: Demographic data of participants

Characteristics	n (%)/Mean ± SD
Age (years)	52.8 ± 14.2
BMI (kg/m²)	23.5 ± 7.2
Average monthly income (rupees)	65,000 ± 20,000
Marital Status	
Married	298 (96.1%)
Unmarried	12 (3.9%)
Occupation	
Sedentary	189 (61.0%)
Active	121 (39.0%)
Medical History	
Diabetic	198 (63.8%)
Non-diabetic	112 (36.2%)
Hypertensive	269 (86.7%)
Normotensive	41 (13.3%)
Smoker	112 (36.1%)
Non-smoker	198 (63.9%)
Obese	98 (31.6%)
Normal BMI	212 (68.4%)
Physical Activity	
Physically active	202 (65.0%)
Physically inactive	108 (34.8%)
Family History of Cardiovascular Disease	
Yes	129 (41.6%)
No	181 (58.4%)

Table 02: Perceived stress among study participants and coagulant profile

Characteristics	Frequency	Percentage
Perceived Stress		
Yes	174	56.2%
No	136	43.8%
Total	310	100.0%
Coagulation Profile		
Deranged coagulation function		
Yes	191	61.6%
No	119	38.4%
Total	310	100.0%

Table 03: Association between coagulation profile and perceived stress

Perceived stress	Deranged coagulation function		Total	p-value
	Yes	No		
Yes	149(85.6%)	25 (14.4%)	174 (100.0%)	0.000**
No	42 (30.8%)	94 (69.2%)	136 (100.0%)	

Table 04: Comparison of coagulation profile (PT, APTT) concerning perceived stress

Coagulation profile	PSS >16	PSS≤16	P-value
APTT	35.62±5.21	39.01±4.36	0.002**
PT	13.78±0.92	14.04±0.73	0.54

Discussion

Our research showed that 174 (56.1%) of our subjects were detected as having perceived among these 149(85.6%) had deranged coagulation function and 25(14.4%) had normal coagulation function on the other hand 136(43.9%) subjects were detected as not having perceived stress, out of these only 42(30.8%) had deranged coagulation function and normal coagulation function was found in 94(69.2%). P=0.000 shows that there is a significant association between perceived stress and coagulation function in patients with coronary artery disease. Yin ET. In another study noted that despite the efforts above, Deacon Ordinands and other readers also for bishops both for themselves and the people, were found to have the disease at a varying level. Al., 2021, in the univariate and multivariate analysis, it was illustrated that a high perceived stress level is related to shortened APTT in CHD patients (12). When compared to depression or anxiety, perceived stress showed a more direct correlation with APTT. This implied that the adverse effect of perceived stress on cardiovascular results was 'partially mediated through hypercoagulability within the intrinsic pathway' (13). When all the clinical predictors were considered, high perceived stress remained a predictor of MACE and the composite outcomes. Despite a low number of articles against this (14), APTT was described as being unrelated to depression or anxiety (15), and this study has supported the findings. Considering the relationship revealed between mood disturbance and perceived stress, it was rather surprising to see an

intensive relationship between APTT and perceived stress. In comparison with mood disturbance, perceived stress assessed through PSS-10 could be a more precise measure indicating the stress delivered to the human body. As for the shortened APTT, the fact, to the best of our knowledge, has not been previously related to perceived stress; however, it should be noted that shortened APTT and platelet hyperreactivity in the patients with mood disorders are going to be reversed after the improvement of psychiatric symptoms (15) would support the rationality. The processes that mediate the relationship between perceived stress and APTT remain unknown to a certain extent. A similar prior study among the Chinese population showed there was an association between the PSS-14 score and the level of epinephrine and norepinephrine. Under the regulation of perceived stress, it is assumed that catecholamine, cortisol have a critical role in hemostasis (17). There is one more potential explanation – an increase in the concentration of the endogenous clotting factors. Doulalas et al. 2006 showed that in healthy people with a depressed affective state, coagulation factors VII and X were raised (18) as reported in earlier studies (19). Our outcomes indicated that hypercoagulability was associated with a poorer cardiovascular outcome. Although perceived stress has indeed been associated with the increase in cardiovascular risk in the general population for a long time (20), however, the contribution of perceived stress in the context of patients with CHD has been a topic of research discussion for a comparatively shorter time.

Conclusion

Perceived stress is strongly associated with PT and APTT regardless of the type of CHD. The negative impact of high perceived stress on cardiovascular prognosis could partially be explained by the activation of the intrinsic coagulation pathway.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-PICLR-014-24)
Consent for publication
Approved
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Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

IC (Head Nurse)
Manuscript drafting, Study Design,
KI (Staff Nurse)
Review of Literature, Data entry, Data analysis, and drafting article.
FKB (Staff Nurse)
Conception of Study, Development of Research Methodology Design, Study Design, manuscript review, and critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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