

Original Paper

The Role of Type D Personality in Acute Coronary Syndrome



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ABSTRACT

Introduction: Acute Coronary Syndrome (ACS) is one of the most common causes of death in patients with Cardiovascular Diseases (CVD). In addition to the known physical factors influencing the incidence of CVD, some psychologists have pointed to the role of psychological factors such as personality type.

Objective: This study aimed to determine the role of type D personality in ACS patients in Iran in 2019.

Materials and Methods: In a case-control study, 112 participants were included. A total of 56 patients with ACS were compared with 56 matched people without ACS. They were selected by the convenience sampling method. Type D scale 14 (DS14) was used to assess the type D personality. The Chi-squared test, independent t-test, and multivariate logistic regression were used to analyze the obtained data.

Results: The Mean±SD age in the case group was 57.23±8.562 years, and in the Mean±SD age in the control group was 57.25±8.529 years. Also, most participants in both groups were men (71.4%). The result showed that type D personality was more prevalent in patients with ACS (26% vs 7.1%; P=0.006). Based on multivariate regression analysis and after controlling for demographic and clinical risk factors, type D personality was independently associated with ACS (OR=5.323, 95% CI; 0.987-28/712, P=0.052). Also, after investigating subscales, only social inhibition had a significant association with ACS (P=0.008).

Conclusion: Type D personality is an independent risk factor of the ACS. Thus, type D personality may make people vulnerable to the ACS. Therefore, besides medical interventions, clinicians must consider behavioral interventions to reduce the incidence of ACS.

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Highlights

- Cardiovascular diseases are among the leading causes of death worldwide.
- Personality types are among the most modifiable risk factors for cardiovascular disease.
- This study suggests that type D personality can be a risk factor for the acute coronary syndrome

Plain Language Summary

This study investigates the role of type D personality in acute coronary syndrome. Today, the evidence shows the relationship between cardiovascular disease and personality characteristics. Type D personality includes two subscales of negative emotions and social inhibition. In this study, 112 patients were divided into two groups: case (with acute coronary syndrome) and control (without acute coronary syndrome). Demographic indices, clinical risk factors, and personality type were examined in two groups. The results showed that type D personality was associated with the acute coronary syndrome. Also, in the study of subscales, only social inhibition was associated with the acute coronary syndrome. Considering the results of this research, it is necessary to pay attention to behavioral interventions in addition to medical interventions.

Introduction

Cardiovascular Diseases (CVDs) are among the most significant public health concerns and leading causes of death worldwide [1, 2]. It is estimated that 17.9 million people died in 2016 due to CVDs, accounting for 31% of total world deaths. About 85% of these deaths are due to heart attack and stroke. More than three-quarters of CVD deaths occur in low- and middle-income countries. Out of 17 million premature deaths (under 70) due to non-communicable diseases in 2015, 82% occurred in low- and middle-income countries, and 37% were due to CVDs [3]. The effects of CVDs go beyond mortality and morbidity and create important health and economic consequences. With an increasing demand for health care, health costs rise, and productivity decreases, leading to low economic growth and deepening poverty and inequality [4, 5].

Acute Coronary Syndrome (ACS) is one of the most common causes of death in patients with CVDs that includes unstable angina, non-ST-segment elevation myocardial infarction, and ST-segment elevation myocardial infarction [6]. A series of risk factors, including modifiable and non-modifiable, for CVDs have been identified. These factors only predict 50% of CVD cases [7]. In addition to common risk factors, the association of psychological stress with CVD has been investigated. Recent evidence suggests a link between CVD and personality traits, especially type D personality [8].

Denollet first introduced type D or “distressed” personality [9]. This type of personality is a combination of two characteristics: Negative Affectivity (NA) and Social inhibition (SI). Individuals with type D personality tend to experience negative emotions, including anxiety, depressed mood, anger, and hostile feelings, over time and situations. They inhibit the expression of emotions and behaviors in social interaction because of fear of rejection or judgment by others [10, 11]. The frequency of type D personality is 25% to 28% in CVA patients [12] and 10% to 40% in the general population [12, 13].

Some studies show that people with type D personality tend to have unhealthy behaviors such as smoking, inactivity, and an unhealthy diet. These results suggest that type D personality may be a risk factor for coronary artery disease with a poor prognosis [13]. Also, type D personality characteristics such as stress, fear, anger, depression affect the autonomic nervous system and cardiovascular function [14]. In different studies, conflicting results have been reported about the relationship between type D personality and the incidence of CVD. Garcia-Retamero et al. reported that type D personality predicts the ACS severity in patients with a history of CVD [15]. In contrast, Condén et al. concluded that type D personality was not associated with the recurrence of acute myocardial infarction and all-cause mortality [2]. A meta-analysis conducted indicates that type D personality is an independent predictor of adverse health status and major cardiovascular events in patients with CVDs [16]. Another meta-analysis concluded that previ-

ous studies exaggerated the impacts of type D personality on cardiac events and mortality [17].

Given that the frequency of CVDs, including ACS, is increasing in developing countries, especially in Iran, identifying effective psychological factors in developing CVD is very important. Also, the results of various studies on the effect of type D personality in CVD are contradictory. This study aimed to investigate the role of type D personality in ACS.

Materials and Methods

This research is a case-control study. The sample size was determined after a pilot study on 10 patients in the case group and 10 in the control group. According to the pilot study, 5 out of 10 patients with ACS and 2 out of 10 patients without ACS had type D personality. Finally, based on the pilot study results, with a test power of 90% and a significance level of less than 0.05, the overall sample was estimated at 112 participants assigned into the case (ACS group) and control (non-ACS group). The study data were collected from two hospitals in Rasht City, Iran (56 patients in the case group from the Cardiovascular Center and 56 patients in the control group who were matched in terms of age and sex with the case group from Ophthalmology Center). All samples were selected by a convenience sampling method.

The inclusion criteria for the case group were diagnosis of ACS by a cardiologist. The inclusion criteria for the control group were no previous history of ACS based on the self-report and being matched in terms of age and sex with the case group. General inclusion criteria were being more than 18 years old, orientation to time, place, and persons, understanding the Persian language, the desire to participate, and not using psychiatric drugs based on the medical record.

All participants were evaluated in terms of demographic variables (age, sex, education, marital status) and clinical risk factors (smoking, alcohol use, hypertension, and taking antihypertensive drugs), diabetes mellitus (oral hypoglycemic/taking insulin), family history of cardiovascular diseases, history of cardiovascular diseases, body mass index with self-report questionnaires and medical records in the hospital. Type D personality was measured using the psychometric Iranian version of the type D scale personality (DS14) [18]. The scale consists of two subscales, Negative Affectivity (NA) and social inhibition (SI), and each subscale contains 7 items. Each item was scored from 0 (false) to 4 (true) on a

5-point Likert scale. Individuals scoring above 10 in both subscales were classified as having a type D personality.

All participants in the study were divided into two groups with type D personality and non-type D. Each subscale of type D personality, such as NA (NA>10) and SI (SI>10), was compared separately in both groups. Demographic variables, and clinical risk factors in type D personality, non-type D personality, and subscales were compared. In the next step, to determine whether type D personality can be considered an independent factor in predicting ACS, factors that may be predictive were identified and evaluated.

In total, the researcher selected 124 participants from two hospitals in Rasht, Iran (56 patients in the case group from Cardiovascular Center, and 56 patients in the control group who were matched in terms of age and sex with the case group from Ophthalmology Center) from September to December 2019. In the case group, out of 63 participants, 4 took psychiatric drugs, and 3 were reluctant to participate and were excluded from the study. In the control group, out of 61 participants, 3 took psychiatric drugs, and 2 reported a history of ACS, so they were not entered in the study. Finally, 56 participants in the case group and 56 participants in the control group were examined.

Analyses were conducted using SPSS software version 21. To compare qualitative data, the Chi-square test and Fisher exact-test were used. For quantitative data, the independent t-test was used. Multiple logistic regressions (backward LR method) was used to investigate the independent predictive role of type D personality in the incidence of ACS. All variables with a significant level of less than 0.2 were included in the logistic regression model. Statistical significance was considered as $P<0.05$.

Results

A total of 112 subjects were included in the study. Baseline characteristics were compared between ACS and non-ACS. The case and control groups were compared in terms of each demographic variable and clinical risk factor. The Mean \pm SD ages of the subjects in the case and control groups were 57.23 \pm 8.56 and 57.25 \pm 8.52 years, respectively. Also, 28.6% of participants were women, and 71.4% were men. There was no significant difference in education level and marital status in both groups

In the study of clinical risk factors, patients with the ACS were significantly and more likely to have diabetes ($P=0.036$), history of CVD ($P=0.001$), family history of

Table 1. Demographic and clinical characteristics of the case (n=56) and control (n=56) groups

Variables		No. (%)		P
		Case	Control	
Sex	Male	40(71.4)	40(71.4)	0.999*
	Female	16(28.6)	16(28.6)	
Education	Elementary school	23(41.1)	32(57.1)	0.325*
	Secondary school	14(25)	8(14.3)	
	High school	14(25)	11(19.6)	
	University	5(8.9)	5(8.9)	
Marital status	Never married	2(3.6)	1(1.8)	0.999**
	Married	50(89.3)	51(91.1)	
	Divorced	0(0)	1(1.8)	
	Widowed	4(7.1)	3(5.4)	
Smoking	Yes	21(37.5)	23(41.1)	0.699*
	No	35(62.5)	33(58.9)	
Alcohol use	Yes	12(21.4)	13(23.2)	0.820*
	No	44(78.6)	43(76.8)	
Hypertension (taking antihypertensive drugs)	Yes	27(48.2)	19(33.9)	0.124*
	No	29(51.8)	37(66.1)	
Diabetes mellitus (Taking insulin/oral hypoglycemic)	Yes	21(37.5)	11(19.6)	0.036*
	No	35(62.5)	45(80.4)	
Family history of cardiovascular disease	Yes	34(60.7)	11(19.6)	0.001*
	No	22(39.3)	45(80.4)	
History of cardiovascular disease	Yes	18(32.1)	2(3.6)	0.001*
	No	38(67.9)	54(96.6)	
Body mass index	Underweight	2(3.6)	3(5.4)	0.029**
	Normal	11(19.6)	24(42.9)	
	Overweight	25(44.6)	20(35.7)	
	Obesity	18(32.1)	9(16.1)	

*Chi-square test; **Fisher exact-test.

CVD ($P=0.001$), obese and overweight body mass index ($P=0.029$). There were no significant statistical differences between the two groups regarding smoking, alcohol consumption, and hypertension (Table 1).

In the case group, the frequency of type D was 26.8% (15 patients), while in the control group, it was 7.1% (4 people). Thus, the frequency of type D personality was significantly higher in patients with ACS ($P=0.006$). Besides, in the study of type D personality subscales in both groups, the frequency of NA in the ACS group was higher than in non-ACS groups. Nevertheless, it was not statistically significant. However, SI subscales were significantly higher in patients with ACS ($P=0.008$) (Table 2).

The survey of type D personality and its subscales with demographic and clinical risk factors showed that individuals with type D personality were significantly

and more likely to have diabetes, family history of CVD (Table 3). Furthermore, by comparing demographics and clinical risk factors between individuals with $NA>10$ and $NA<10$, we found that individuals with $NA>10$ had lower levels of education ($P=0.041$) and were significantly and more likely to have hypertension ($P=0.023$), alcohol consumption ($P=0.032$), and family history of CVD ($P=0.011$). Also, individuals with $SI>10$ were more likely to have diabetes ($P=0.032$), family history of CVD ($P=0.024$), and history of CVD ($P=0.003$) compared to people with $SI<10$ (Table 4).

Logistic regression results showed that history of CVD (OR=7.365; 95%CI; 1.271-42.654, $P=0.026$), family history of CVD (OR=7.241, 95%CI; 2.493-21.032, $P=0.001$), type D personality (OR=5.323; 95% CI: 0.987-28.712; $P=0.052$), obese and overweight body mass index (OR=8.019; 95%CI; 2.479-25.936, $P=0.001$) were

Table 2. Distribution of type D personality, negative affect, and social inhibition in the case (n=56) and control groups

Variables	No. (%)		p*
	Case	Control	
Type D personality	15(26.8)	7.1(4)	0.006
Non-type D personality	41(73.2)	92.9(52)	
NA ¹ >10	4(7.3)	58.9(33)	0.110
NA<10	15(26.8)	41.1(23)	
SI ² >10	16(28.6)	8.9(5)	0.008
SI<10	40(71.4)	91.1(51)	

¹ Negative Affect; ² Social Inhibition; * Chi-square test.

independent significant predictors of ACS. The result showed that after controlling demographic and clinical risk factors, type D personality was the independently significant variable related to ACS (P=0.052) (Table 5).

Discussion

In this study, the role of type D personality in ACS was investigated. The frequency of type D personality among patients with ACS in this study was 26.8%. This rate was similar to the rates of type D personality in patients with cardiovascular disorders (25%-28%) [11]. Also, the present study's findings showed that the frequency of type D personality was higher in the ACS group (case group) compared with the non-ACS group (control group). These findings were in line with Prata et al. [19] and Christodoulou et al. [20] findings. Prata et al. found the type D personality was significantly more prevalent among the ACS group than the non-ACS group [19]. Christodoulou et al. reported that the frequency of type D personality was higher in patients with stable coronary heart disease than in people from the general population [20]. In addition, regression results showed that type D personality as an independent risk factor could predict ACS.

In this study, type D personality was associated with increased odds of ACS. The result of this study is consistent with previous studies finding. For example, Leu et al. reported the incidence of cardiac events in type D personality after adjustment confounders were associated with a significantly higher risk of future cardiovascular events [8]. In Kupper et al. study, type D personality was independently associated with the major adverse cardiac events [21]. In Wang et al. study, type D personality was significantly related to the formation of atherosclerotic plaque, thin-cap fibro atheroma, and

plaque rupture, which leads to cardiac events [22]. But the results of the Larson et al. study have been inconsistent. In their study, which examined the association between type D personality and coronary artery disease in apparently healthy adults, no significant association was found between type D and coronary heart disease [23]. Also, the findings of this study showed that people with type D personality, compared to non-type D significantly, were more likely to have diabetes mellitus, history of CVD, and family history of CVD, which may explain the association between type D personality and ACS.

In this study, the rate of NA was not significantly higher in patients with ACS, but the rate of SI was higher in the case group than in the control group. This finding is in line with Compare et al. study that found coronary artery plaque formation was significantly associated with SI, but it was not significantly related to the NA component [24]. Also, Batselle et al. reported that the mean score of NA was higher in the ACS group than that in the non-ACS group, but this increase was not significant [25]. It seems that people with SI avoid expressing their feelings because of fear of being rejected. Because these people avoid social interactions, they do not experience enough social support, so they cannot have a good emotional relationship with others. These people often do not express their feelings and face problems in their personal, social, and daily life. They keep negative emotions that cause stress, which triggers the release of cortisol. Cortisol disrupts the endothelial function of blood vessels and releases monocytes, and converts them to macrophages, causing coronary atherosclerosis, which increases susceptibility to CVDs [21]. More specifically, NA of type D was related to lower education levels, consuming more alcohol, higher incidence of hypertension, and family history of CVD; SI was associated with diabetes, a history of CVD, and family his-

Table 3. Demographic and clinical parameters in type D and non-type D personality

Variables		No. (%) / Mean \pm SD		p*
		Type D (n=19)	Non-type D (n=93)	
Age (y)		57.16 \pm 8.59	57.26 \pm 8.53	0.963***
Sex	Male	11(57.9)	69(47.2)	0.152*
	Female	8(42.1)	24(25.8)	
Education	Elementary school	9(47.4)	46(49.5)	0.453**
	Secondary school	5(26.3)	17(18.3)	
	High school	5(26.3)	20(21.5)	
	University	0(0)	10(10.8)	
Marital status	Never married	1(5.3)	2(2.2)	0.379**
	Married	16(84.2)	85(91.4)	
	Divorced	0(0)	1(1.1)	
	Widowed	2(10.5)	5(5.4)	
Smoking	Yes	8(42.1)	36(38.7)	0.782*
	No	11(57.9)	57(61.3)	
Alcohol	Yes	4(21.1)	21(22.6)	0.991***
	No	15(78.9)	72(77.4)	
Taking antihypertensive drugs) (Hypertension)	Yes	9(47.4)	37(39.8)	0.540*
	No	10(52.6)	56(60.2)	
Diabetes mellitus (Taking Insulin/oral hypoglycaemic drugs)	Yes	9(47.4)	23(24.7)	0.047*
	No	10(52.6)	70(75.3)	
Family history of cardiovascular disease	Yes	12(63.2)	33(35.5)	0.025*
	No	7(36.8)	60(64.5)	
History of cardiovascular disease	Yes	9(47.4)	11(11.8)	0.001*
	No	10(52.6)	82(88.2)	
BMI	Underweight	1(5.3)	4(4.3)	0.335**
	Normal	9(47.4)	26(28)	
	Overweight	6(31.6)	39(41.9)	
	Obesity	3(15.8)	24(25.8)	

* Chi-square test; ** Fisher exact-test; *** Independent t-test. BMI: Body Mass Index.

tory of CVD. Taken together, it appears that people with NA traits cannot overcome emotions, stressors or minimize and deal with them efficiently. Depression in these people can also be an influential factor in that students leave school early or do not adapt to stressful situations. Maybe these people consume alcohol to elevate their positive mood, alleviate negative mood and anxiety, or increase their confidence. Future longitudinal studies are needed to support this hypothesis.

The current study had some limitations. Although the results showed that type D personality is associated with an increased risk of ACS, the results are based on the samples selected non-randomly. Therefore, the generalization of the results should be made with caution. The next limitation is related to the method of data collection and, at some point in time and limited to only one specialized heart hospital. This study only investigated one psychological factor (type D personality), while other psychological factors, such as anxiety, and depression, may also affect the severity of the ACS. Stress caused by ACS in the case group may affect the

Table 4. Demographic and clinical parameters in type D personality subscales

Variables	No. (%) / Mean ± SD		p	No. (%) / Mean ± SD		p	
	NA>10 ¹	NA<10		SI>10 ²	SI<10		
Age(y)	56.3±8	58.9±9.2	0.123***	57.8±8.4	57.1±8.5	0.715***	
Sex	Male	49(66.2)	0.088*	12(57.1)	68(74.7)	0.108*	
	Female	25(33.8)		9(42.9)	23(25.3)		
Education	Elementary school	37(50)	0.041*	11(52.4)	44(48.4)	0.485**	
	Secondary school	19(25.7)		5(23.8)	17(18.7)		
	High school	14(18.9)		5(23.8)	20(22)		
	University	4(5.4)		0(0)	10(11)		
Marital status	Never married	3(4.1)	0.445**	1(4.8)	2(2.2)	0.507**	
	Married	64(86.5)		18(85.7)	83(91.2)		
	Divorced	1(1.4)		0(0)	0(0)		1(1.1)
	Widowed	6(8.1)		2(9.5)	5(5.5)		
Smoking	Yes	30(30.5)	0.704*	8(38.1)	36(39.6)	0.901*	
	No	44(59.5)		13(61.9)	55(60.4)		
Alcohol use	Yes	21(28.4)	0.032*	4(19)	21(23.1)	0.780**	
	No	53(71.6)		17(81)	70(76.9)		
Hypertension (taking antihypertensive drugs)	Yes	36(48.6)	0.023*	9(42.9)	37(40.7)	0.854*	
	No	38(51.4)		12(57.1)	54(59.3)		
Diabetes mellitus (Taking Insulin/oral hypoglycaemic)	Yes	22(29.7)	0.705*	10(47.6)	22(24.2)	0.032*	
	No	52(70.3)		11(52.4)	69(75.8)		
Family History of cardiovascular disease	Yes	36(48.6)	0.011*	13(61.9)	32(35.2)	0.024*	
	No	38(51.4)		8(38.1)	59(64.8)		
History of cardiovascular disease	Yes	13(17.6)	0.911*	9(42.9)	11(12.1)	0.003**	
	No	61(82.4)		12(57.1)	80(87.9)		
BMI	Underweight	3(4.1)	0.773**	1(4.8)	4(4.4)	0.283**	
	Normal	21(28.4)		10(47.6)	25(27.5)		
	Overweight	31(41.9)		7(33.3)	38(41.8)		
	Obesity	19(25.7)		3(14.3)	24(26.4)		

* Chi-square test; ** Fisher exact-test; *** Independent t-test; ¹ Negative affect; ² Social inhibitor; BMI: Body Mass Index.

Table 5. Multivariable logistic regression analysis of relationship between type D and acute coronary syndrome

Variables	Beta	Wald	P	OR	95%CI	
					Lower	Upper
History of cardiovascular disease	1.997	4.961	0.026	7.365	1.271	42.684
Family History of cardiovascular disease	1.980	13.241	0.001	7.241	2.493	21.032
Type D personality	1.672	3.781	0.052	5.323	0.987	28.712
BMI (over weight-obesity)	2.082	12.082	0.001	8.019	2.479	25.936
Constant	-2.629	0.606	0.001			

scores of NA and SI scales, and therefore this factor may affect type D personality.

The study results confirm that the prevalence of type D personality is higher in patients with ACS. Besides, the type D personality was introduced as a strong predictor for the incidence of ACS. Investigating the subscales of the type D personality revealed that the SI is significantly associated with the ACS frequency. However, further research is needed to determine whether type D personality is an independent variable to predict the ACS. Moreover, in this study, other psychological factors such as anxiety and depression were not studied as mediating variables, so it is suggested that in future studies, the effect of three factors, type D personality, anxiety, and depression, on the incidence of ACS be evaluated.

Ethical Considerations

Compliance with ethical guidelines

This research was approved by the Ethics Committee of Guilan University of Medical Sciences (Code: IR.GUMS.REC.1398.234).

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Author's contributions

Conceptualization: Sara Khoshamouz, Mohammad Taghi Moghadamnia, Iraj Aghaei, and Sareh Shamsipoor; Draft preparation, resources, and investigation: Sara Khoshamouz, and Mohammad Taghi Moghadamnia; Data analysis: Ehsan Kazemnejhad Leili, Sara Khoshamouz, Mohammad Taghi Moghadamnia, and Iraj Aghaei; Psychological counseling: Sareh Shamsipoor.

Conflict of interest

The authors declared no conflict of interest.

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