

Type D personality is associated with hyperlipidemia in patients with myocardial infarction

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Objective: There are many studies indicating the role of psychological factors in the pathogenesis of cardiovascular disorders. Type D as a new personality construct has been proposed by Denollet, characterized by the joint global traits including negative affectivity and social inhibition. The purpose of this study was to examine the link between type D personality and hyperlipidemia in patients with myocardial infarction (MI). **Materials and Methods:** One hundred and seventy-six consecutive patients admitted to the cardiac care unit (CCU) wards of nine hospitals in Isfahan, Iran, following MI, were selected based on the inclusive and exclusive criteria. The patients completed demographic questionnaire and Type D Personality Scale (DS14). Their medical data were obtained from medical records. Chi-squared test, Student's *t*-test, and multivariate logistic regression were used to analyze the data. **Results:** Of the 176 subjects, 63 patients (35.8%) were type D. In univariate analysis, hyperlipidemia was the only significant variable (56% vs. 40%, $P = 0.041$) found to be associated with type D. Also, by multivariable logistic regression analysis, hyperlipidemia [Odds Ratio (OR) 0.374; 95% confidence interval (CI) 0.175–0.796] was the only independently significant variable found to be linked with type D personality. No other statistically significant differences were found between the two groups on demographic and medical factors characteristics. **Conclusion:** The type D personality was associated with hyperlipidemia. Thus, personality factors may make people vulnerable to metabolic syndromes.

Key words: Hyperlipidemia, negative affectivity, psychological factors, social inhibition, type D personality

INTRODUCTION

Today, it has widely been promoted in psychosomatic researches that personality factors may affect vulnerability to specific diseases.^[1] Although many studies have proved associations between elevated lipid levels and some risk factors like age, weight, blood pressure, diet, exercise, smoking, and alcohol intake,^[2] the role of psychological factors in hyperlipidemia is not yet clear.

Friedman and Rosenman suggested that behavioral factors may affect serum cholesterol levels independent of diet.^[3] Up to now, the most well-known of these factors has been the type A behavior pattern (TABP).^[3,4] Some studies indicated higher serum cholesterol levels and clinical manifestations of *coronary heart disease* (CHD)

in type A relative to non-TABP.^[5] For example, Weidner *et al.*^[6] and Chikani *et al.*^[2] realized that individuals scoring high on type A behavior and hostility had elevated levels of total plasma cholesterol and *low-density lipoprotein* (LDL) cholesterol.

Recently, type D, as a new personality construct, has been proposed by Denollet.^[7] The taxonomy of type D personality (the distressed personality) is based on two global and stable personality traits, including negative affectivity and social inhibition.^[3,5] Type D individual is characterized by the joint tendency to experience negative emotions including depressed mood, anxiety, anger, and hostile feelings, and to inhibit these emotions in social interactions.^[3]

Type D individuals tend to experience psychological stress and negative affects across time and situations and deal with emotions in a characteristic way.^[5] There have been various investigations confirming type D personality is related to increased mortality and poor health outcomes in patients with cardiovascular diseases.^[8-10] A possible underlying pathway may be the metabolic syndrome.^[9] Although there have been various investigations conducted to study the toxic effect of psychological factors on high blood

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pressure, atherosclerosis, and adverse lipid profiles,^[2,11] to our knowledge, very few studies have investigated the relationship between type D personality and plasma lipid levels, and also the findings are not consistent.^[9,12]

The present study examined the association between type D personality and hyperlipidemia. We hypothesized that type D personality is associated with hyperlipidemia in myocardial infarction (MI) patients.

MATERIALS AND METHODS

The data used in this study were collected as part of the research project on prediction of post-MI depression, a prospective study of risk factors for depression following MI. Informed consent was obtained from each patient and the study protocol conforms to the ethical guidelines.

Patients

One hundred and seventy-six consecutive patients with MI admitted to the CCU wards of nine hospitals in Isfahan, Iran, over a 5-month period were selected based on the inclusive and exclusive criteria for the prediction of post-MI depression study. In that study, patients were eligible if they met at least two of the following three criteria^[13,14]: (1) chest pain for at least 20 min, (2) creatinine phosphokinase (CPK) value twice or more than the normal, and (3) the presence of new pathological Q wave on the electrocardiogram in at least two leads. Patients were excluded if they had a life expectancy less than 1 year because of comorbid noncardiac disease, had poor cognitive functions, had major psychiatric disorders, were unable to speak or read Persian, and had visual or auditory problems that precluded participation. Thus, the sample was composed of 176 post-MI patients. The mean age of the sample was 55.9 (SD = 10.05).

Data collection

All patients completed a questionnaire that included questions about demographic characteristics, social and economic factors, and they were underwent a physical examination. Medical data were obtained from medical records. In this study, hyperlipidemia refers to an elevation of lipids including total cholesterol (above 200), triglycerides (above 200), and low-density lipoprotein (LDL) (above 150) in the bloodstream.^[15] Diagnosis was based on medical history (specific treatment for this lipid abnormality), or blood tests done immediately after MI (done after overnight fasting) in order to determine the specific levels of LDL cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides.

Type D personality was measured with Iranian version of the 14-item Type D Personality Scale (DS14).^[16] The scale comprises two subscales, negative affectivity (NA) and

social inhibition (SI), containing seven items each. The items are answered on a 5-point Likert scale from 0 (false) to 4 (true). A predetermined cut-off of ≥ 10 on both subscales is used to determine those with a type D personality.^[17] In an investigation on psychometric properties of Type D Personality Scale (DS14) conducted by Denollet, the NA and SI subscales were internally consistent ($\alpha = 0.88/0.86$; $n = 3678$) and stable over a 3-month period (test-retest $r = 0.72/0.82$). NA correlated positively with neuroticism ($r = 0.68$); SI correlated negatively with extraversion ($r = 0.59/0.65$). Scale-level factor analysis confirmed the construct validity of the DS14 against the NEO Five-Factor Inventory.^[17]

Both subscales of Iranian version of the 14-item type D have good test-retest reliability and high internal consistency, with Cronbach's alpha coefficient of 0.84 and 0.86 for the NA and SI subscales, respectively, and the construct validity of NA and SI subscales was confirmed against neuroticism ($r = 0.65$) and extroversion ($r = -0.62$) subscales of Eysenck's questionnaire, respectively.^[16]

Statistical analysis

Demographic and medical variables were compared between type D patients and non-type D patients. Discrete variables were compared with the chi-squared test and continuous variables with Student's *t*-test.

Then, multivariate logistic regression analyses were used to assess the independent association between type D personality and demographic and medical variables. $P = 0.05$ defined statistical significance and Odds Ratio (OR) with 95% confidence intervals (CI) were reported. SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) for windows was applied for data analysis.

RESULTS

One hundred and seventy-six subjects were included in the study and these, 63 patients (35.8%) were type D. The mean age of subjects was 55.9 (SD = 10.053) years, with 148 (84%) being males.

Table 1 compares the demographic and medical factors of those subjects with and those without type D personality, and hyperlipidemia was the only significant variable (56% vs. 40%, $P = 0.041$) associated with type D. No other statistically significant differences were found between the two groups on demographic and medical factors characteristics. But these comparisons showed a trend toward significance for relationships between type D and left ventricular ejection fraction (LVEF) $>40\%$ (59% vs. 46%, $P = 0.072$) and history of heart disease (40% vs. 28%, $P = 0.085$).

Also, by multivariable logistic regression analysis, hyperlipidemia (OR 0.374; 95% CI 0.175-0.796) was the only independently significant variable found to be linked with type D personality [Table 2]. Although no other demographic or medical factors were associated with type D, history of hypertension was found to trend toward significant association with type D (OR 0.487; 95% CI 0.0.214-1.109; $P = 0.087$).

DISCUSSION

Although the prevalence of type D personality among patients with MI in this study was 35.8%, which is high compared with the rates reported from general population (21%),^[18] this rate was similar to the rates in patients with cardiovascular disorders (18–53%).^[19]

Table 1: Comparisons between patients with and without type D On demographic and medical variables

Variables	Type D (n =63)	Non-type D (n =116)	Test	P value
Age (<60 years) n (%)	46 (74.4)	72 (60.4)	$\chi^2 = 1.58$	0.242
Gender (Male) n (%)	52 (82)	96 (85)	$\chi^2 = 0.176$	0.414
Marital status				
Married n (%)	54 (86)	102 (90)	$\chi^2 = 0.832$	0.25
Socio-economic status, n (%)			$\chi^2 = 0.628$	0.73
High	8(13)	15(13)		
Medium	20(32)	42(37)		
Low	35(56)	56(50)		
History of heart disease(%)	25(40)	32(28)	$\chi^2 = 2.385$	0.085
History of MI (%)	23(37.8)	30(27)	$\chi^2 = 1.906$	0.114
History of Ischemia (%)	32 (51)	48(42)	$\chi^2 = 1.128$	0.183
History of hypertension, n (%)	15 (24)	39(34)	$\chi^2 = 2.179$	0.095
Diabetes, n (%)	16(25)	34 (30)	$\chi^2 = 0.438$	0.315
Hyperlipidemia n (%)	35(56)	46(40)	$\chi^2 = 3.59$	0.041
History of other chronic illnesses, n (%)	9(14)	21(19)	$\chi^2 = 0.529$	0.306
LVEF> 40%, n (%)	37(59)	52(46)	$\chi^2 = 2.615$	0.072
Killip class > 2, n (%)	19(30)	31(27)	$\chi^2 = 0.148$	0.414
Log max CK (Mean)	2.8059	2.8022	t = 0.047	0.962
smoking, n (%)	32(51)	57 (50)	$\chi^2 = 0.002$	0.545
Alcohol abuse, n (%)	8(13)	7 (6)	$\chi^2 = 2.195$	0.116
Drug abuse, n (%)	12(19)	19 (17)	$\chi^2 = 0.139$	0.429

Table 2: Summary results for multivariable logistic regression analysis of relationship between type D and, demographic and medical variables

Variables	Beta	Wald Chi-Squared	P Value	Odds ratio	95% CI
Age (<60 years)	0.502	1.306	0.253	1.652	0.698 -3.906
Gender (Male)	0.399	0.416	0.519	1.491	0.443 -5.014
Marital status					
Married	-1.022	2.593	0.107	0.360	0.104 -1.249
Socio-economic status		0.989	0.610		
High					
Medium					
Low					
History of heart disease	0.403	0.898	0.343	1.497	0.650 -3.445
History of MI	0.095	0.052	0.819	0.909	0.401 - 2.060
History of Ischemia	0.357	0.891	0.345	1.428	0.681 - 2.995
History of hypertension	0.719	2.935	0.087	0.487	0.214- 1.109
Diabetes	0.602	1.854	0.173	0.548	0.231 - 1.302
Hyperlipidemia	0.984	6.515	0.011	0.374	0.175 - 0.796
History of other chronic illnesses	0.505	0.986	0.321	0.603	0.222 - 1.636
LVEF> 40%	0.536	1.953	0.162	0.585	0.276 - 1.241
Killip class > 2	-0.030	0.005	0.941	0.970	0.434 - 2.170
Log max CPK	0.108	0.084	0.772	1.114	0.536-2.314
smoking,	0.387	0.891	0.345	0.679	0.304-1.516
Alcohol abuse	0.826	1.556	0.212	2.284	0.624-8.364
Drug abuse	0.090	0.30	0.862	1.094	0.397-3.019

CI= Confidence interval

The findings of this study showed that type D personality was associated with hyperlipidemia. Hence, the results of this study support the hypothesis that psychological factors play a considerable role in elevated plasma lipid levels.

In recent years, two studies were conducted on the link between type D personality and metabolic syndrome. While Mommenting and colleagues^[12] indicated no association between type D personality and metabolic syndrome, Tziallas and colleagues confirmed this relationship in their cross-sectional study.^[9]

In respect of frequently experiencing negative affects including depressive mood and anxiety in type D individuals, we can consider some studies on the relationship between these negative affects and the metabolic syndrome. The results are consistent with a few other studies supporting the relationship between depressive symptoms and the metabolic syndrome.^[20,21] ^[22,23] For example, Vogelzangs *et al.*^[24] found that higher levels of depressive symptoms are significantly associated with an increased prevalence of the metabolic syndrome. They showed that this relationship might be partially mediated by urinary cortisol levels.

In addition, several studies in recent years have reported abnormalities in lipid profiles in anxiety disorders consisting of anxious state,^[22] generalized anxiety disorder,^[25] obsessive-compulsive disorder (Peter *et al.*, 2002), and social anxiety.^[26]

Type D individuals have the tendency to experience negative emotions such as anxiety, anger, hostile feelings, and depressed mood, and to inhibit these emotions while avoiding social contacts.^[3,7] Both type D dimensions (NA and SI) are associated with greater cortisol reactivity to stress.^[27] Also Several experimental studies suggest that negative affect is associated with cortisol activity.^[27,28] Situations involving fear, anxiety, helplessness, and loss of control have been shown to result in release of cortisol.^[27] In type D individuals, social situations may elicit insecurity, anxiety, and other negative emotions, resulting in a more frequent release of cortisol from the hypothalamic-pituitary-adrenal (HPA) axis every time such a situation is encountered. Also, some type D individuals may have alterations within the HPA axis that are similar to HPA axis changes in depressed patients.^[3] Some authors have expressed a theoretical explanation and findings from laboratory investigation in healthy people, suggesting the relationship between type D personality and increased cortisol reactivity.^[29] For example, Whitehead *et al.*^[30] conducted a study and presented empirical evidences on dysfunctional HPA axis in type D as a biological pathway that may explain the link between type D personality

construct and increased risk of adverse clinical events in cardiac patients.

In type D individuals, continued or frequently repeated stress reactions may result in an increased secretion of basal cortisol, with potentially harmful effects on various systems.^[3] HPA axis dysregulation may be linked with many cardiovascular disease risk factors including hypercholesterolemia and hypertriglyceridemia.^[29] Also, Sher^[3] claimed that cortisol is a potent stimulus to visceral fat.

Several studies have shown a relationship between the metabolic syndrome and the increased HPA axis activity based on elevated cortisol concentration and increased cortisol response to corticotrophin.^[31] The metabolic syndrome is present in Cushing's syndrome, which is characterized by primary hypercortisolism. Elevations in total cholesterol and LDL cholesterol and decreases in HDL cholesterol have been reported in patients with Cushing's syndrome, which may persist even years after successful treatment. Also, long-term prescription of corticosteroid therapy is associated with elevated cholesterol in transplant patients, which improves after corticosteroid discontinuation.^[32] Thus, increased cortisol level may be a mediator in the link between type D personality and the increased risk for hyperlipidemia.

The findings of this study should be interpreted with some caution. First, although the results suggested that type D personality was linked with hyperlipidemia, these results were based on a relatively small sample of 176 MI patients. Future studies with larger sample sizes from general population are required to further confirm this association. Second, the present study was cross-sectional. Therefore, the possibility cannot be ruled out that experience of depressive and anxiety symptoms due to MI during the time of study could have influenced the scores of the NA and SI subscales, and hence the prevalence of patients with type D personality. Third, patients with history of major depressive disorders or anxiety disorders were not excluded. This would be as a confounder influencing the results.

CONCLUSION

Type D personality was linked with hyperlipidemia. Thus, the findings supported the notion that personality factors may make people vulnerable to cardiovascular disease. Also, the results of this study support the hypothesis that psychological factors play a considerable role in elevated plasma lipid levels. Regarding the findings of previous studies, elevated cortisol level may be a possible mediator in the link between type D personality and the increased risk for hyperlipidemia. However, further studies are required to examine the potential biological association between type

D personality and vulnerability to cardiovascular diseases. Additional attention is warranted for people having type D personality. Although type D personality seems to be a stable state, it should not be assumed that the individual's level of distress could not be modified. Hence, future research on the effects of psychological interventions on improving the traits of type D is needed.

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