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Evaluation of the Psychological Relationship between Personal Type D and Blood Factor Fluctuations in Patients Ready for Surgery

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A B S T R A C T

Introduction: Personality type D, characterized by traits such as anxiety and negative affectivity, can significantly influence individuals' mental and physical health. This study aims to investigate the relationship between personality type D and fluctuations in blood factors in patients preparing for surgery at Imam Hospital in Ilam City.

Materials & Methods: The instruments used included a Type D personality questionnaire and assessments of blood factors. A total of 60 participants were selected through convenience sampling. The Chi-square and Pearson correlation coefficients were applied in the significance less than 0.01. Data analysis performed using SPSS software version 16.

Results: The results indicated a significant relationship between personality type D and certain blood factors, specifically white blood cells (WBC), red blood cells (RBC), neutrophils (NeU), and lymphocytes (Lym) ($P < 0.01$). However, no significant correlation was found between personality trait D and other blood factors ($P < 0.056$).

Conclusion: These findings suggest that personality type D may impact patients' physiological responses to stress, reflected in changes in specific blood factors. The lack of significant correlations with other blood factors underscores the complexity of interactions between psychological states and biological responses. Addressing mental health and stress reduction prior to surgery may improve outcomes and enhance overall patient well-being.

Keywords: Personality Type D, Blood Factors, Surgery, Stress

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Introduction

The concept of personality type D encompasses a combination of traits that may adversely affect health (1). Specifically, this personality type is characterized by a tendency toward negative emotions (e.g., anxiety and irritability) and social inhibition (e.g., self-doubt). The classification of personality type D is based on the framework developed by Denollet et al. (2), which includes two dimensions: negative emotions and social inhibition (3). Individuals with personality type D often exhibit low self-esteem and are more susceptible to negative emotions such as worry, stress, depression, and anger (4).

In the past decade, numerous studies have examined the relationship between personality type D and various psychological and social issues (5). Common symptoms associated with this personality type include depression, anxiety, post-traumatic stress disorder (PTSD), chronic stress, pessimism, and low self-esteem (5). These symptoms can lead to a diminished quality of life and reduced psychological well-being (5).

Surgery inherently involves stress and anxiety, triggering physiological (endocrine) and psychological reactions that can exacerbate fear and anxiety (6). Annually, over 6 million patients worldwide undergo surgical procedures. Upon admission, patients may experience mild, moderate, or severe anxiety, which necessitates a tailored approach to medical and nursing care based on their anxiety levels (6). Patients who are mentally and physically prepared for surgery typically experience smoother surgical outcomes due to their increased relaxation (6). This state of relaxation can help mitigate complications, resulting in milder pain tolerance, a reduced need for medication, and shorter hospital stays (7).

Furthermore, social conflicts, isolation, and recurrent anxiety can elevate levels of depression and negatively impact immune function (8). White blood cells play a crucial role in the body's defense against viruses and bacteria, as well as in the replacement of old cells with new ones (8, 9). Blood types represent significant traits that vary among populations worldwide; understanding these variations may facilitate the recognition of other traits, including personality characteristics (9). Research indicates that women typically require more blood than men during surgical procedures. This increased demand is often attributed to lower preoperative hematocrit levels among female patients (6).

Stress and anxiety are common in life, particularly in situations such as surgery. Each year, many individuals undergo surgical procedures, and the resultant stress can be profound (8). This anxiety and stress can lead to cognitive and physiological changes, including diminished immunity, increased heart rate, elevated blood pressure, alterations in blood factors due to bleeding, heightened pain perception, and delayed recovery (9).

Therefore, identifying individuals with personality type D and implementing strategies to reduce their stress and anxiety prior to surgery is critical. Addressing these concerns can significantly impact surgical outcomes, minimize complications, and mitigate detrimental effects on the immune system and overall physiology.

Materials and Methods

This study was conducted to be a cross-sectional study. The purpose of this study was to identify individuals with personality type D and implement strategies to reduce their stress and anxiety prior to surgery in Ilam City (Iran) in 2020. The research population comprised 60 samples who referred to Imam Khomeini hospitals in Ilam City. By considering the first error of 0.05 and the second error of 0.90 and putting in the below formula, total participants were shown to be 60 samples.

$$\frac{2\left(Z_{1-\alpha/2}+Z_{1-\beta}\right)^2}{\Delta^2}$$

Inclusion criteria included 18 years old or older, men and women, must be scheduled for surgery and deemed medically stable by their treating

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physician, willing to complete the D-Type Personality Questionnaire, and written informed consent must be obtained from all participants prior to inclusion in the study. Exclusion consisted of individuals with severe psychiatric disorders, cognitive impairments, or serious medical conditions—such as chronic infections or cancer—that could affect personality assessment or blood parameters will be excluded from the study. Participants taking medications that impact blood cell counts, such as chemotherapy or steroids, or those who have undergone surgery within the past three months will also be excluded. Pregnant women are not eligible to participate. Furthermore, individuals who refuse to provide informed consent or complete the personality assessment will not be included in the study.

Measurement & Validity and Reliability

1. Demographic form

Demographic variables included age, gender, education level and, type of surgery.

2. D-Type Personality Questionnaire (DS-14)

This tool has 14 questions developed in 2005 by Denollet et al. (2). This scale is graded incorrect, partially incorrect, no idea, partially correct, and correctly in the five-point Likert scale, which is assigned to each of the grades, zero, one, two, three, and four. The highest score that a person can get in this questionnaire is 56, and the lowest is zero. The closer a person's score is to 56, it means that the person is in type D personality. The validity of this tool has been done, and its reliability is calculated based on Cronbach's alpha calculation equal to 0.86. In this research, validity was acceptable and reliability was 0.85 (Cronbach's alpha).

In order to select the study population, patients admitted to the surgical section were selected to participate in the study. Thirty adult males and thirty females undergoing rhino, cesarean section, sinus, and other surgeries were randomly selected by convenience sampling. Using a researcher-made questionnaire, initial information was obtained after obtaining written consent. Before surgery, patients received two milliliters of blood to count blood cells. A personality type D questionnaire (DS-14) was completed by patients to assess the personality traits of patients before surgery. Using a cell counter, the number of red blood cells (RBC) and white blood cells (WBC) (including neutrophils, lymphocytes, eosinophils, basophils, and monocytes), as well as platelets, can be quantified. Additionally, some of these devices are capable of measuring hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and the morphology of red blood cells.

Ethical consideration

The ethical considerations include guaranteeing integrity in the library collection and data report, securing written informed consent from all participants in compliance with the Declaration of Helsinki's requirements, and following rules for performing treatments with human beings.

Statistical and Data analysis

Statistical tests conducted in this study included chi-square (to observe demographic variables among groups) and person correlation (to assess the relationship between personality trait D and blood factors). A significance level of less than 0.05 was considered in the analysis. Data analysis was performed using SPSS software version 16.

Results

The majority of male genders were married, had high school degrees, and underwent sinus surgery, whereas the majority of female genders were married, had a higher degree in diploma, and underwent rhinoplasty surgery. The chi-square test showed no significant differences between the demographic variables of the control and intervention groups (Table 1).

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Table 1. Demographic Characteristics of Participants

Variable		Male (30)	Female (30)	P Value (Chi-Square)
Marital Status	Single	12(%40)	9(%30)	0/760
	Married	18(%60)	21(%70)	
Education	Illiterate	3(%10)	6(%20)	0/967
	Elementary	6(%20)	3(%10)	
	Secondary School	1(%3)	3(%10)	
	High School	18(%60)	0(%0)	
	Diploma or higher	2(%6)	18(%60)	
Types of Surgeries	Rhinoplasty	4(%7)	12(%40)	0/399
	Sinus	12(%40)	3(%10)	
	Cesarean	0(%0)	3(%10)	
	Mammoplasty	0(%0)	0(%0)	
	Hernia	6(%20)	9(%30)	
	Prostatectomy	2(%6)	0(%0)	
	Thorax	2(%6)	3(%10)	
	Cataract	2(%6)	2(%6)	
	Cholecystectomy	2(%6)	10(%33)	

The mean scores of WBC 9165 with a standard deviation of 4.10, the mean scores of RBC 4192 with a standard deviation of 0.61, the mean scores of NeU were 64.52 with a standard deviation of 12.79, and Lym with a mean of 39184 and a standard deviation of 10.10 (Table 2). The blood factors before surgery indicate that Table 2 provides the mean and standard deviation for various blood factors prior to surgery, reflecting the baseline physiological status of the participants. The mean white blood cell (WBC) count was 9.56, which falls within the normal range, while the mean red blood cell (RBC) count was 4.92. The hemoglobin (Hb) level of 14.00 indicates an adequate capacity for oxygen transport (Table 2).

The psychological variables and blood factors revealed that Pearson correlation coefficients indicated a relationship between the psychological variables (assessed through the D personality questionnaire) and blood factors. Significant correlations were observed, some of which were statistically significant at the 1% level, while others were significant at the 5% level (marked with -). For instance, there was a significant positive correlation between WBC and D personality (r=0.348, p=0.006), suggesting that individuals with higher D personality scores may also have higher WBC counts. Other significant correlations included Lym (the lymphocyte count) and D personality (r = 0.354, p = 0.006), indicating that as D personality scores increase, lymphocyte levels may also rise. In summary, this comprehensive analytical study explores the relationship between psychological variables and blood factors among a surgical population. The demographic analysis reveals the distribution of participants based on age and education, while the results of the D personality questionnaire indicate a trend towards negative emotions and social insecurity. Correlation analysis demonstrates that certain psychological traits, particularly those measured by the D personality questionnaire, have significant relationships with specific blood factors, notably WBC and lymphocyte levels. This may imply that individuals with positive personality traits exhibit better physiological responses, as indicated by their blood factor profiles (Table 3).

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Table 2. Analysis of blood factors before and after surgery

Blood factors	Mean	Standard deviation
WBC before surgery	9.56	4.10
RBC before surgery	4.92	0.60
Hb before surgery	14.00	1.96
MHC before surgery	28.42	2.93
MCV before surgery	83.37	6.40
MCHE before surgery	34.05	2.19
Platelet before surgery	249.43	61.19
Neu before surgery	64.52	12.79
Lym before surgery	39.84	10.10
Eos before surgery	2.31	1.04
Mono before surgery	2.64	1.11
HB: Haemoglobin, HCT: Haematocrit, MCV: mean cell volume, MCH: Mean cell haemoglobin, MCHC: Mean cell haemoglobin concentration, PLT: platelet count		

Table 3. Correlation coefficients and level of significance of psychological variables and blood factors

Blood factors / Psychological variables	WBC	RBC	HET	HB	MCH	MCV	MCHE	Platelet	Neu	Lym	Eos
Correlation coefficient R	0.348**	0.256*	-0.174	-0.182	0.009	0.168	-0.164	0.024	0.282*	0.354**	-0.077
P value	0.006	0.048	0.184	.163	0.945	0.199	0.211	0.855	0.031	0.006	0.645
Correlation coefficient R	0.054	0.239	-.030	.249	-0.257*	-0.183	0.105	-0.070	0.042	-0.096	0.058
P value	0.682	.066	.823	.055	0.047	0.162	0.426	0.593	0.755	0.472	0.729
HB: Haemoglobin, HCT: Haematocrit, MCV: mean cell volume, MCH: Mean cell haemoglobin, MCHC: Mean cell haemoglobin concentration, PLT: platelet count											

Discussion

The aim of this study was to investigate the relationship between personality trait D and blood factors in patients preparing for surgery. The results indicated a significant relationship between personality trait D and blood factors. This finding is consistent with the research of Ader et al. (10) and Glass & Kiko et Glass (11). In their study, the researchers administered the influenza virus vaccine to the spouses of dementia patients. The subjects were then compared to caregivers whose spouses did not have dementia. The results revealed that chronic stress, due to the feelings of helplessness experienced by dementia caregivers and their frustration over the inability to control the disease, led to weaker antibody responses and a diminished virus-specific T-cell response to the vaccine in these caregivers. This phenomenon was not observed in the control group, whose spouses did not suffer from dementia. A similar study in the UK confirmed these findings. Furthermore, another study using the chronic dementia stress model found that caregivers exhibited lower levels of IgG antibodies compared to their peers (12). Comparable results were also observed with the meningitis vaccine (13, 14). Vaccine studies suggest that individuals who experience higher levels of anxiety, anger, and helplessness are at greater risk of disease and demonstrate weaker responses to viral and bacterial vaccines. These individuals are more likely to show poor responses to these pathogens, putting them at higher risk of infection and disease. This is particularly true for older adults, whose immune systems are often weaker compared to younger individuals. It is evident that there is a highly complex, bidirectional interaction between the central nervous system (CNS) and the immune system, mediated by endocrinological processes. The interaction between cells enhances immunity through cytokines, and changes in cytokine levels provide feedback to the brain, resulting in alterations in the hypothalamic-pituitary-adrenal axis and leading to pathological behaviors such as fever, loss of appetite, changes in sleep patterns, and depression. A clear example of this feedback loop is the effect of interleukin-1 (IL-1) on the hypothalamus's production of corticotrophin-releasing hormone (CRH) (15). CRH can trigger the hypothalamic-pituitary-adrenal axis, leading to elevated levels of stress hormones, making the situation even more complex. However, researchers in the field of psychoneuroimmunology have made significant progress in unraveling these complexities underlying mind-body interactions. These findings suggest that disruptions in vital neuroendocrine balance can easily affect wound healing. In Ader et al.'s study (1), animals that were socially stable had lower

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concentrations of immunodeficiency RNA post-vaccination compared to socially unstable animals. The socially stable animals also lived longer. Moreover, the biological impact of immune variables was more pronounced in animals under higher stress and those with less social support. Ader, in a longitudinal study of men with AIDS, found that those experiencing higher levels of stress and lower social sensitivity were more likely to develop AIDS symptoms over a five-year period. The key takeaway is that disturbances in immune regulation. This descriptive correlational study, conducted on 60 women with breast cancer at Golestan Hospital in Ahvaz, found a significant inverse relationship between Type D personality and perceived stress with health behaviors. Multiple regression analysis revealed that these two variables are strong predictors of patients' health behaviors. The findings suggest that individual factors, particularly negative affect and social inhibition, along with perceptual factors like perceived stress, play a crucial role in the health behaviors of breast cancer patients (24).

Social, economic, and cultural factors that may influence the relationship between type D personality and blood factors were not controlled for in this study. Additionally, the cross-sectional design of the study does not facilitate the identification of causal relationships, and conducting longitudinal studies is recommended for a better understanding of this connection. Moreover, the lack of attention to the psychological status of other participants and its impact on their mental and physical health could impose limitations on the interpretation of the results.

Conclusion

This study reveals a significant positive correlation between Type D personality traits and specific blood markers, particularly white blood cell (WBC) and lymphocyte counts. This indicates that individuals exhibiting higher levels of Type D personality traits may experience heightened immune responses, as reflected in their blood profiles. The study's findings show that Type D personality may play a crucial role in influencing physiological health, especially in surgical contexts. The implications of this correlation are significant; they highlight the potential impact of psychological factors on physiological outcomes, including surgical recovery and overall health. The observed relationship between Type D personality and blood markers points to the necessity of addressing psychological well-being in medical settings, particularly for patients undergoing surgical procedures. Therefore, enhancing social support and reducing stress could be vital strategies to optimize patient recovery and resilience.

Future research should investigate the complex interplay between personality traits and physiological responses in various medical contexts. By developing interdisciplinary approaches that incorporate psychology, immunology, and endocrinology, healthcare providers can better understand the factors influencing patient outcomes. Moreover, replicating this study with diverse patient populations could yield valuable insights into the broader biopsychosocial dynamics that affect recovery and health resilience.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' contributions

EN: Conceptualization, methodology, and data analysis, JM: Data collection and interpretation, AK: Writing—original draft preparation and editing, VA: Supervision and project administration, SK: Literature review and contribution to the final manuscript.

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