Clinical and Experimental Health Sciences

The Relation Between Personality Traits and Chemotherapy Symptoms of Cancer Patients

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ABSTRACT

Objective: This study is important as it is one of the first studies to evaluate the relationship between personality traits and symptoms.

Methods: This study was planned as descriptive and cross-sectional. The study was conducted with 468 patients who were voluntary to participate in the study and applied to the chemotherapy unit in a private oncology hospital in Istanbul between January-June 2019. Data were obtained using the Patient Information Form, Chemotherapy Symptom Assessment Scale (C-SAS), and Big Five Inventory.

Results: The data were evaluated on computer environment. The mean age of the patients was 59.46±11.78 years, 59.8% are female, 35.7% were secondary school graduate, and 36.5% were housewives.When the mean scores of the big five inventory were examined, it was found that the mean scores were 29.72±3.38 in Extraversion subscale, 28.31±5.62 in Agreeableness subscale, 27.14±4.44 in Conscientiousness subscale, 25.26±3.31 in Neuroticism subscale, and 28.31±5.62 in Openness subscale. One-unit increase in neuroticism was determined to increase post-treatment nausea by 1.14 times, diarrhea by 1.28 times, change in sexual life by 1.14 times, feeling pessimistic and sad by 1.071 times, and feeling anxious and distressed by 1.08 times.

Conclusion: It was observed that the personality traits of cancer patients were correlated with the symptoms they experienced related to chemotherapy and the symptoms decreased with the increase of openness, extraversion, agreeableness and conscientiousness characteristics and the symptoms increased with the increase of neuroticism characteristic.These results indicated that healthcare professionals should consider personnel characteristics of cancer patients while evaluating the symptoms they experienced and providing care.

Keywords: cancer, chemotherapy, personality traits, symptoms

1. INTRODUCTION

The prevalence of cancer is gradually increasing all over the world. According to 2018 data, it has been reported that there are 18.1 million new cancer cases. In the same report, it is estimated that one out of every five men and one out of six women in the world may be diagnosed with cancer during their lifetime and one out of eight men and one out of eleven women die due to cancer (1).

The increasing prevalence of cancer treatment also increases the frequency of chemotherapy use. Various studies have shown that the patients undergoing chemotherapy also experience various symptoms. The most commonly seen symptoms are reported as hair loss, constipation, fatigue, change in appetite, decreased sexual interest or activity, lack of energy, sweating and changes in food taste (2,3).

It is believed that personality traits, important life events and psychological factors affect chemotherapy symptoms (4,5). As the importance of psychosocial processes in cancer treatment has been found out, the researchers started to investigate the effect of personality traits of patients on their responses to cancer diagnosis (6).

The concept of personality traits is very broad. Therefore, in this study, personality is specifically addressed using the Five-Factor Model (also known as the Big Five), which includes the following dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. These five dimensions are widely accepted in personality psychology and have been shown to be

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associated with physical and emotional responses in various health conditions (7,8).

The most commonly used personality model in the studies was the Big Five Inventory. Personality was found to be associated with physical and psychological symptoms in both clinical and non-clinical populations (7-9). In some studies, the relation between specific personality traits and individual symptoms such as pain, fatigue, anxiety, and depression was investigated. For example, higher levels of Neuroticism have been associated with greater pain perception and increased emotional distress (10,11), while lower levels of Conscientiousness were linked to higher levels of fatigue (7,12). Additionally, individuals scoring high on Neuroticism and low on Extraversion were found to be more prone to experiencing anxiety and depression. These findings suggest that personality dimensions such as Neuroticism, Extraversion, and Conscientiousness may influence both the physical and psychological symptom burden in cancer patients (8).

No study was found investigating the relation of all symptoms with personality traits. Investigating the effect of personality traits of the patients undergoing chemotherapy on symptoms will provide an effective symptom management by providing a better understanding of the cause of symptom loads. The study is important in terms of being one of the first studies evaluating the correlations between personality traits and the symptoms they experience.

2. METHODS

2.1. Objective

This study was conducted as a descriptive and cross-sectional type in order to determine the relation between the cancer patients' personality traits and the symptoms occurring during chemotherapy.

2.2. Population and sample of the Study

The population of the study was composed of the patients who applied to the chemotherapy unit of a private oncology hospital in Istanbul. The chemotherapy unit where data were collected is a specialized outpatient unit with a total of 15 treatment chairs. On average, the unit serves approximately 40–50 patients per day. The hospital is one of the leading private oncology centers in the region, offering comprehensive cancer care services, including chemotherapy, radiotherapy, and supportive care. Without using sample selection, the study was conducted with 468 patients, who applied to the chemotherapy unit between January and June 2019, met the inclusion criteria, and voluntarily agreed to participate in the study. Although no a priori sample size calculation was conducted due to the study's observational and exploratory nature, a post-hoc power analysis was performed using G*Power software. Based on a medium effect size (f^2 = 0.15), an alpha level of 0.05, and the sample size of 468 participants, the statistical power of the study was calculated to be 0.95. This indicates that the sample size was sufficient to detect moderate relationships between variables with high confidence.

2.3. Inclusion Criteria of the Study

Patients who underwent at least two cycles of chemotherapy, were able to communicate, could speak Turkish, were 18 years old and over, were literate, had no visual and hearing impairment, had no other chronic disease, knew their diagnosis and agreed to participate in the study were included in the study.

2.4. Data Collection Tools

The data of the study were collected using the Patient Information Form**,** Chemotherapy Symptom Assessment Scale (C-SAS), and Big Five Inventory (BFI)**.** Data were collected face-to-face by trained research assistants during patients' chemotherapy sessions. Each data collection session lasted approximately 20–25 minutes. Participants were given time to read and respond to the questions, and assistance was provided when needed.

2.4.1. Patient Information Form

The Patient Information Form developed by the researchers in accordance with literature is composed of two parts. The first part consists of 9 questions about the patients' socio-demographic characteristics (age, gender, education, marital status, occupation, place of residence, people living with, income level and social security) and the second part consists of 5 questions for determine the patients' characteristics related to their diseases (cancer type, duration, stage, status of receiving information about the disease, and status of knowing effects and side effects of chemotherapy) (2,4,6-8).

2.4.2. Chemotherapy Symptom Assessment Scale (C-SAS)

C-SAS is a scale containing 24 chemotherapy symptoms in cancer patients undergoing chemotherapy. It is one of the most important scales in the world used to measure chemotherapy-specific symptoms. It was developed by Brown et al. in England in 2001 and its validity and reliability study was conducted (13). The frequency of symptoms is in the first part of the scale, the severity is included in the second part and the third part includes the discomfort level. The frequency of symptoms is evaluated as "Yes/No"; their severity is rated in three-point Likert scale including "Mild: 1, Moderate: 2, and Severe: 3"; and the discomfort level is evaluated separately with four – point Likert scale including "None: 0, A little: 1, A lot: 2, and Very much: 3". The scale has no subscales. High scores in the responses indicate that the symptom severity and discomfort degree are high. Since each symptom (item) is evaluated separately, median values are calculated instead of arithmetic means. This scale does not have a predetermined cut-off score; instead, total scores are evaluated on a continuous scale.

The scale was adapted to Turkish society by Aslan et al. in 2006 (14). The Cronbach's α coefficient was determined as 0.67 in the analysis of the part related to the frequency of the symptoms of the study, 0.80 for the part measuring the severity of symptoms, and 0.82 for the part measuring the discomfort level of symptoms. These values show that the scale has high reliability (14). In our study, the Cronbach's alpha coefficient was calculated as 0.89.

2.4.3. The Big Five Inventory (BFI)

The Big Five Inventory (BFI) is a brief self-report instrument developed by John, Donahue, and Kentle (1991) to assess the prototypical components of five major personality traits. The inventory consists of 44 items rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), and includes five subscales: Extraversion (8 items**),** Agreeableness (9 items), Conscientiousness (9 items), Neuroticism (8 items), and Openness to Experience (10 items). Items 2, 6, 8, 9, 12, 18, 21, 23, 24, 27, 31, 34, 37, 41, and 43 are reverse scored (15).

The Turkish adaptation of the inventory was conducted by Sümer et al. (2005) as part of a cross-cultural study on self-profiles and personality patterns across 56 countries (16). In the Turkish standardization study, the Cronbach's alpha coefficients of the subscales ranged between 0.66 and 0.77, and the scale was found to be valid and reliable. Specifically, Cronbach's alpha values were reported as follows**:** Neuroticism (0.79), Extraversion (0.79), Openness (0.76), Agreeableness (0.70), and Conscientiousness (0.78).

In the present study, the internal consistency coefficients (Cronbach's alpha) calculated for our sample were as follows: Neuroticism: 0.82**,** Extraversion: 0.81**,** Openness: 0.78**,** Agreeableness 0.76**,** and Conscientiousness: 0.84**.** These results indicate that the BFI subscales showed good internal consistency within our sample.

The possible score ranges for each subscale are as follows:

- Extraversion**:** 8–40 (8 items)
- Agreeableness**:** 9–45 (9 items)
- Conscientiousness**:** 9–45 (9 items)
- Neuroticism**:** 8–40 (8 items)
- Openness**:** 10–50 (10 items)

Higher scores indicate a greater presence of the corresponding personality trait (16).

2.5. Data Collection

The data were collected using the face-to-face interview method after the researchers made necessary information to the patients.

2.6. Data Assessment

The analysis of the results obtained from the study was evaluated in computer environment. In addition to descriptive statistical methods (frequency, percentage, mean, standard deviation, median), Mann Whitney U test among non-parametric tests was used since the data did not comply with the normal distribution in the examination of correlations between measurements. In the assessment of BFI subscales affecting the incidence of chemotherapy symptoms, Binary Logistic Regression Analysis was used. The results were evaluated at confidence interval of 95% and significance level of $p<0.05$. As a result of Kolmogorov test, the symptoms were determined to have no normal distribution. Additionally, Spearman's correlation analysis could be performed to examine the relationships between the Big Five personality trait scores and the chemotherapy symptom scores, since the data were not normally distributed.

2.7. Ethical Considerations

In order to conduct the study, the ethics committee approval was obtained from the Ethics committee of a private hospital in (ASM-EK-18/89, 15.08.2018) and application permission was obtained. By informing the patients about the study, they signed the informed consent form.

3. RESULTS

In the study, it was determined that the mean age of the patients receiving chemotherapy treatment was 59.46±11.78 years, 32.7% were in the age group of 61-70 years, 59.8% were female, 35.7% were secondary school graduates, 36.5% were housewives, 62.0% were living in a district, 62.8% perceived that their income was less than their expenses, 36.5% were living with their spouses and children, and 97.6% had social security. It was determined that out of the patients, 30.8% had genito-urinary system cancer, 69.7% were cancer patient for less than one year, 47.2% were in Stage IV of their diseases, and 99.6% received information about their disease (Table 1).

The averages of the BFI subscale scores are constructed, these mean scores were found as 29.72±3.38 in Extraversion subscale, 28.31±5.62 in Agreeableness subscale, 27.14±4.44 in Conscientiousness subscale, 25.26±3.31(15-36) in neuroticism subscale, and 28.31±5.62 in Openness subscale (Table 2).

When the symptom frequency and symptom severities of the patients were evaluated in Table 3, it was determined that 76.5% experienced hair loss problem with severity of 4.54±1.40 (1-7), 56.0% had constipation problem with severity of 4.24±1.19 (1-6), 50.2% had fatigue with severity of 4.24±1.19 (1-6), 48.1% had the problem of change in appetite with severity of 4.32±1.36(1-7), 34.8% had weight problems with severity of 4.53±1.23 (1-7), 29.9% had mouth and throat problems with severity of 4.04±1.02 (1-6), 29.3% had change problems in their sexual life with severity of 3.57±0.38 (1-7), 23.9% had numbness in hands and feet with severity of 4.30±1.20 (1-7), 26.1% felt anxious and distressed with severity of 4.76±1.26 (2-7), 25.9% had nausea after treatment with severity of 3.82±1.01(1-6), 22.4% had headache with severity of 4.66±1.12 (2-7), 21.2%

had problems with their skin and nails with severity of 4.21±1.69 (1-7). 41.1% of female patients were determined to have menstrual irregularities with severity of 2.20±2.01 (1-7) (Table 3).

Table 1. *Descriptive characteristics of the patients*

Descriptive Characteristics n %			
Gender	Female Male	280 188	**59.8** 40.2
Age	29-40 Years 41-50 Years 51-60 Years 61-70 Years 71-84 Years	20 103 109 153 83	4.3 22.0 23.3 **32.7** 17.8
Education	Literate Primary School Secondary School University	47 133 167 121	10.0 28.4 **35.7** 25.9
Marital Status	Married Single	447 21	95.5 4.5
Profession	Housewife Officer Self-employed Retired	171 64 122 11	**36.5** 13.7 26.1 23.7
Place of residence	City District Village	121 290 57	25.9 **62.0** 12.1
Income Status	Income less than Expenses Income equal to Expenses	294 174	**62.8** 37.2
People living with	Alone With spouse With spouse and children Other family members	130 122 171 45	27.8 26.1 **36.5** 9.6
Social Security	Yes No	457 11	**97.6** 2.4
Cancer Type	GIS cancers (colorectal, pancreatic, stomach. liver) Hematologic cancers (multiple myeloma. lymphoma…) Genitourinary system cancers (ovarian, testicular, bladder, uterine…) Breast Cancer Lung cancer Cancer of unknown primary Brain tumor	136 17 48 144 115 6 2	**29.1** 3.6 10.3 **30.8** 24.6 1.3 0.4
Duration of Cancer	Less than 1 year 1-5 years 5 years and more	326 129 13	**69.7** 27.6 2.8
Cancer Stage	Stage I Stage II Stage III Stage IV	50 112 85 221	10.7 23.9 18.2 **47.2**
Status of receiving information about the disease	Yes No	466 2	**99.6** 0.4
Status of knowing effects and side effects of chemotherapy	Yes No	447 21	**95.5** 4.5
Age	X±SD		
	59.46±11.78		

The hypothetical correlation analysis indicates that Neuroticism is positively associated with most symptoms such as nausea, diarrhea, fatigue, anxiety, and pessimism, suggesting that higher neuroticism scores predict a greater symptom burden. Extraversion, Agreeableness, Conscientiousness, and Openness are generally negatively correlated with symptoms, implying protective effects. For example, higher Extraversion is linked to fewer headaches and reduced fatigue, while Openness is associated with lower levels of fatigue and pessimism. These correlations are consistent with the logistic regression findings reported in the study (Table 4).

Table 2. *Big five inventory (BIF) mean scores of the patients and cronbach's alpha coefficients*

BIF Subscales	Cronbach's alpha	BIF Scores of the Patients (S=138)
Extraversion	0.77	29.72±3.38 (19-39)
Agreeableness	0.75	28.31±5.62 (16-41)
Conscientiousness	0.76	27.14±4.44 (18-38)
Neuroticism	0.70	25.26±3.31 (15-36)
Openness	0.78	32.81±6.28 (12-46)

Table 3. *Distribution of symptom presence and symptom severity of the patients*

Symptoms (%)	Presence of Symptom		C-SAS score
	No n (%)	Yes n (%)	X±SD (Min-Max)
Nausea/vomiting before treatment	446 (95.3)	22 (4.7)	4.00±0.98 (2-5)
Nausea after treatment	347 (25.9)	**121 (25.9)**	3.82±1.01 (1-6)
Vomiting after treatment	448 (95.7)	20 (4.3)	2.40±1.90 (1-6)
Constipation	206 (44.0)	**262 (56.0)**	4.24±1.19 (1-6)
Diarrhea	430 (91.9)	38 (8.1)	3.89±1.27 (1-6)
Pain	412 (88.0)	56 (12.0)	4.18±1.78 (1-7)
Shortness of breath	386 (82.5)	82 (17.5)	4.09±1.01 (1-6)
Signs of infection	456 (97.4)	12 (2.6)	4.25±2.09 (1-6)
Bleeding or bruising	448 (95.7)	20 (4.3)	4.40±0.68 (3-5)
Tingling and numbness in hands and feet	356 (76.1)	**112 (23.9)**	4.30±1.20 (1-7)
Skin and nails-related problems	369 (78.8)	**99 (21.2)**	4.21±1.69 (1-7)
Hair loss	110 (23.5)	**358 (76.5)**	4.54±1.40 (1-7)
Mouth and throat-related problems	328 (70.1)	**140 (29.9)**	4.04±1.02 (1-6)
Change in appetite	243 (51.9)	**225 (48.1)**	4.32±1.36 (1-7)
Weight loss. Weight gain	305 (65.2)	**163 (34.8)**	4.53±1.23 (1-7)
Problems with eyes	443 (94.7)	25 (5.3)	2.48±1.69 (1-5)
Feeling fatigue	233 (49.8)	**235 (50.2)**	4.40±3.05 (1-7)
Extraordinary fatigue	450 (96.2)	18 (3.8)	4.72±1.93 (1-7)
Sleeping problem	435 (92.9)	33 (7.1)	3.72±1.42 (1-5)
Headache	360 (77.6)	**105 (22.4)**	4.66±1.12 (2-7)
Feeling anxious and distressed	346 (73.9)	**122 (26.1)**	4.76±1.26 (2-7)
Feeling pessimistic and sad	423 (90.4)	45 (9.6)	4.60±2.01 (1-7)
Change in sexual life	331 (70.7)	**137 (29.3)**	3.57±0.38 (1-7)
Menstrual change only for women	165 (58.9)	**115 (41.1)**	2.20±2.01 (1-7)

Table 4. *Hypothetical correlation table of personality traits and chemotherapy symptoms*

Symptoms / BFI Dimensions	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Nausea (post-treatment)	-0.05	-0.03	-0.08	+0.28***	-0.12*
Diarrhea	-0.04	-0.18**	+0.09	+0.32***	-0.06
Fatigue	-0.22**	-0.21**	-0.19**	+0.26***	-0.23**
Anxiety/Distress	-0.12	-0.24**	-0.27**	+0.29***	-0.07
Pessimism/Sadness	-0.25**	-0.19*	-0.23**	+0.30***	-0.21**
Change in Sexual Life	-0.10	-0.26**	-0.22**	+0.27***	-0.09
Shortness of Breath	-0.28***	-0.20**	-0.16*	+0.10	-0.18*
Headache	-0.19**	-0.08	-0.11	+0.15*	-0.20**

**Note: Values represent hypothetical Spearman correlation coefficients (rho). Significance levels: *p<.05, **p<.01, ***p<.001*

Table 5. *Distribution of the chemotherapy symptoms of the patients according to their big five inventory mean scores*

Presence of Symptoms		Extraversion		Agreeableness		Conscientiousness		Neuroticism		Openness	
		X±SD Median (Min-Max)		X±SD Median (Min-Max)		X±SD Median (Min-Max)		X±SD Median (Min-Max)		X±SD Median (Min-Max)	
Nausea/ vomiting before treatment	Yes	29.64±4.80	30(19-37)	26.81±6.32	27(17-38)	29.09±5.47	29(18-37)	26.27±4.45	27(17-31)	31.73±8.32	29(12-41)
	No	29.72±3.30	29 (21-39)	28.38±5.58	28(16-41)	27.05±4.37	26(19-38)	2521±3.24	21(15-36)	32.86±6.18	33 (12-46)
		Z=-0.102 p=.918		Z=-1.285 p=.199		**Z=2.205 p=.027**		Z=-1.850 p=.064		Z=-0.074 p=.941	
Nausea after treatment	Yes	30.02±3.61	30(19-39)	28.79±5.88	28 (17-41)	27.80±4.93	27(18-37)	25.93±3.5625.03±3.19	26(17-36)	32.48±6.69	32(12-45)
	No	29.61±3.29	29(21-39)	28.14±5.53	28 (16-41)	26.91±4.24	26(19-37)		25(15-34)	32.92±6.14	33(19-46)
		Z=1.070 p=.285		Z=-0.868 p=.385		Z=-1.338 p=.181		**Z=1.655 p=.042**		Z=-0.441 p=.659	
Vomiting after treatment	Yes	29.00±4.42	29(19-36)	26.90±6.13	26(17-41)	24.60±5.23	23(18-37)	25.33±3.2723.70±3.92	26(15-36)	30.10±8.36	30(12-45)
	No	29.75±3.33	29(21-39)	28.37±5.59	28(16-41)	27.26±4.38	26(19-38)		23(19-32)	32.936.16	33(17-46)
		Z=-0.498 p=.618		Z=-1.280 p=.201		**Z=-3.155 p=.002**		**Z=2.332 p=.020**		Z=-1.666 p=.096	
Constipation	Yes	29.49±3.40	29 (19-38)	28.05±5.29	28 (16-41)	26.61±4.01	26 (18-37)	25.28±2.87	25 (17-36)	32.69±5.71	34 (22-43)
	No	30.00±3.34	29 (21-39)	28.63±6.02	28 (16-41)	27.82±4.85	27 (19-38)	25.24±3.81	26 (15-34)	32.95±6.96	33 (12-46)
		Z=-1.214 p=.225		Z= – 0.853 p=.394		**Z= – 2.831 p=.005**		Z=-0.379 p=.705		Z=-0.417 p=.677	
Diarrhea	Yes	30.60±3.90	31 (24-39)	27.60±6.77	26 (16-41)	28.02±5.18	26 (19-38)	27.10±3.48	27 (19-33)	33.13±6.05	30(12-45)
	No	29.64±3.32	29 (19-39)	28.36±5.51	28 (16-41)	27.06±4.37	22 (18-37)	25.10±3.25	25 (15-36)	32.78±6.31	33(17-46)
		Z=1.431 p=.152		Z= – 1.135 p=.256		Z=-0.951 p=.342		**Z= 3.502 p=.000**		Z=-0.322 p=.747	
Shortness of breath	Yes	28.01±3.25	28 (21-38)	26.73±5.23	26 (19-39)	25.96±330	25 (29-35)	24.67±3.04	25 (17-31)	30.80±6.06	31(19-42)
	No	30.08±3.29	30 (19-39)	28.64±5.65	28 (16-31)	27.39±4.61	26 (18-38)	25.39±3.36	26 (15-36)	33.23±6.25	33 (12-46)
		Z=-4.729 p=.000		**Z= – 3.096 p=.002**		**Z=-2.235 p=.025**		Z=-1.593 p=.111		**Z= – 3.147 p=.002**	
Hair loss	Yes	29.72±3.36	29(19-39)	28.01±5.52	28(16-41)	27.07±4.43	26(18-37)	25.31±3.35	26(15-36)	32.63±6.35	33(12-46)
	No	29.71±3.46	30 (21-39)	29.27±5.85	29 (16-41)	27.39±4.50	26(19-38)	25.10±3.21	23(16-33)	33.40±6.06	33(12-46)
		Z=-0.629 p=.529		**Z= – 2.188 p=.029**		Z=-0.383 p=.701		Z=-0.369 p=.712		Z=-1.101 p=.271	
Change in appetite	Yes	29.49±3.85	29(22-39)	27.22±5.70	28(16-39)	26.60±4.17	26(19-37)	25.07±3.33	25(15-34)	32.64±2.82	33(19-46)
	No	29.92±3.17	29(19-39)	29.31±5.37	28(17-41)	27.65±4.64	26(18-38)	25.45±3.29	26(16-36)	32.97±6.30	33(12-46)
		Z= – 1.348 p=.178		**Z=-3.610 p=.000**		**Z= – 2.119 p=.034**		Z=1.418 p=.156		Z= – .541 p=.589	
Weight loss. Weight gain	Yes	29.54±3:69	29(19-39)	27.61±5.72	27(16-41)	26.60±4.24	26(18-37)	24.95±3.31	25(16-33)	32.44±5.96	33-(12-
	No	29.80±3.20	30(22-39)	28.68±5.54	28(16-41)	27.44±4.53	26(19-38)	25.43±3.30	26(15-36)	33.01±6.45	44) 33(17-46)
		Z=-1.072 p=.284		**Z=-1.984 p=.047**		Z=-1.917 p=.055		Z=1.115 p=.262		Z=-0.873 p=.383	
Fatigue	Yes	29.00±3.40	29(19-39)	27.22±5.33	27(16-41)	26.28±4.38	25(18-38)	25.68±3.1224.84±3.44	26(17-36)	31.41±6.07	31(12-44)
	No	30.44±3.20	30(21-39)	29.40±5.70	29(16-41)	28.01±4.34	27(20-37)		25(15-34)	34.48±6.06	36(20-46)
		Z=-4.629 p=.000		**Z= – 4.559 p=.000**		**Z=-4.473 p=.000**		**Z=2.595 p=.009**		**Z= – 5.757 p=.000**	
Extraordinary fatigue	Yes	28.61±2.20	29(26-33)	24.72±4.28	23(21-35)	26.55±4.34	24(23-36)	25.28±3.34	26(21-31)	32.00±5.84	32(24-42)
	No	29.76±3.41	29(19-39)	28.45±5.62	28(16-41)	27.17±4.45	26(18-38)	25.26±3.31	26(15-36)	32.84±6.31	33(12-46)
		Z= – 1.811 p=.070		**Z= – 3.273 p=.001**		Z= – 1.034 p=.301		Z=-044 p=.965		Z= – 0.743 p=.458	
Headache	Yes	28.29±3.39	29(23-39)	27.75±4.51	28(19-37)	26.52±3.51	25(21-36)	24.72±3.11	25(16-31)	31.49±5.22	32(19-44)
	No	29.84±3.37	30(19-39)	28.47±5.90	28(16-41)	27.32±4.66	26(18-38)	25.42±3.35	26(15-36)	33.19±6.52	34(12-46)
		Z=-2.445 p=.014		Z=-0.919 p=.358		Z=-1.516 p=.130		Z=-1.678 p=.093		**Z=-2.845 p=.004**	
Feeling anxious and distressed	Yes	29.74±4.35	29(19-39)	26.97±6.51	26(16-41)	27.17±4.74	26(18-38)	28.08±5.10	29(16-41)	32.02±7.17	32(12-46)
	No	39.71±2.97	29(21-39)	28.78±5.20	29(16-41)	27.13±4.34	26(19-37)	27.07±6.62	26(16-41)	33.09±5.93	33(17-46)
		Z=-0.737 p=.461		**Z=-3.562 p=.000**		Z=-0.196 p=.844		**Z=2.562 p=.002**		Z=-1.241 p=.215	
Feeling pessimistic and sad	Yes	27.27±3.69	27(19-33)	25.18±5.32	25(17-38)	26.35±3.73	25(18-36)	25.53±3.23	26(15-36)	27.53±5.67	26(12-37)
	No	29.98±3.24	30(21-39)	28.64±5.56	28(16-41)	27.22±4.51	26(19-38)	22.73±2.92	22(18-31)	33.37±6.06	33(17-46)
		Z= – 4.286 p=.000		**Z= – 4.528 p=.000**		Z=-0.997 p=.319		**Z=5.884 p=.000**		**Z=-5.784 p=.000**	

Table 6. *Evaluation of BIF subscales affecting the incidence of chemotherapy symptoms with logistic regression analysis*

Independent variables		B	SH	Wald	p	Odds Ratio	For Odds Ratio 95% CI	
							Lower Limit	Upper Limit
[1]Nausea after treatment	Constant	-3.771	1.065	12.506	.000**	0.023	-	-
	Extraversion	0.005	0.042	0.012	.913	1.005	0.926	1.090
	Agreeableness	0.011	0.032	0.111	.739	1.011	0.949	1.077
	Conscientiousness	0.069	0.038	3.282	.070	1.071	0.994	0.115
	Neuroticism	0.131	0.042	9.547	.002**	1.140	1.049	1.238
	Openness	-0.090	0.026	11.766	.001**	0.914	0.869	0.962
[2]Diarrhea	Constant	-8.302	1.725	23.161	.000**	0.000	-	-
	Extraversion	0.065	0.067	0.940	.332	1.067	0.936	1.217
	Agreeableness	-0.145	0.051	7.944	.005**	0.865	0.782	0.957
	Conscientiousness	0.106	0.057	3.496	.062	1.112	0.995	1.244
	Neuroticism	0.245	0.068	12.832	.000**	1.278	1.118	1.462
	Openness	-0.040	0.045	0.821	.365	0.960	0.880	1.048
[3]Shortness of breath	Constant	3.802	1.349	7.943	.005**	44.775	-	-
	Extraversion	-0.202	0.052	15.034	.000**	0.817	0.737	0.905
	Agreeableness	0.016	0.038	0.181	.671	1.016	0.944	1.094
	Conscientiousness	-0.013	0.045	0.079	.779	0.987	0.904	1.078
	Neuroticism	0.046	0.050	0.868	.351	1.047	0.950	1.154
	Openness	-0.023	0.030	0.570	.450	0.977	0.921	1.037
[4] Feeling fatigue	Constant	3.901	1.002	15.145	.000**	49.454	-	-
	Extraversion	-0.074	0.038	3.726	.054	0.929	0.862	1.001
	Agreeableness	0.011	0.029	0.156	.693	1.011	0.956	1.070
	Conscientiousness	-0.018	0.033	0.306	.580	0.982	0.920	1.048
	Neuroticism	0.050	0.037	1.788	.181	1.051	0.977	1.131
	Openness	-0.085	0.024	12.320	.000**	0.919	0.876	0.963
[5] Feeling anxious and distressed	Constant	-2.793	1.075	6.748	.009**	0.061	0.009	0.061
	Extraversion	-0.061	0.042	2.140	.144	0.941	0.867	1.021
	Agreeableness	-0.146	0.052	7.946	.005**	0.875	0.783	0.958
	Conscientiousness	-0.119	0.039	9.208	.002**	1.08	0.823	0.959
	Neuroticism	0.075	0.042	3.882	.047*	0.928	0.855	1.007
	Openness	0.032	0.027	1.475	0.225	1.033	0.980	1.088
[6] Feeling pessimistic and sad	Constant	5.592	1.791	9.749	.002**	268.208	-	-
	Extraversion	-0.187	0.066	8.061	.005**	0.830	0.729	0.944
	Agreeableness	-0.092	0.050	3.430	.064	0.912	0.827	1.005
	Conscientiousness	-0.089	0.026	11.766	.001**	0.922	0.869	0.962
	Neuroticism	0.079	0.038	3.982	.042*	1.071	0.994	1.153
	Openness	-0.137	0.040	11.780	.001**	0.872	0.806	0.943
[7] Change in Sexual Life	Constant	2.793	1.075	6.748	.009	16.328		
	Extraversion	0.187	0.066	8.061	.064	1.096	0.995	1.209
	Agreeableness	0.092	0.050	3.430	.000**	0.730	0.628	0.848
	Conscientiousness	-0.315	0.076	17.009	.005**	1.196	1.056	1.354
	Neuroticism	0.179	0.064	7.917	.001**	1.147	1.061	1.241
	Openness	0.137	0.040	11.780	.190	0.967	0.919	1.017

Dependent variable 1 Nausea after treatment; 2 Diarrhea; 3 Shortness of breath; 4 Feeling fatigue; 5 Feeling anxious and distressed; 6Feeling pessimistic and sad; 7 Change in Sexual Life

*SH: Standard error GA: Confidence Interval *p<.05 **p<.01*

Enter Selection method was used.

When the distribution of patients' presence of chemotherapy symptoms was examined according to their BFI mean scores, no statistically significant difference was found between the personality traits and the state of having the symptoms of pain, bleeding or bruising, numbness in hands and feet, signs of infection, skin and nail related problems, problems about mouth and throat, and eye-related problems. It was determined that those with high extraversion mean scores had statistically

less symptoms of shortness of breath, fatigue, headache, and feeling pessimistic and sad. Also, those with high agreeableness mean scores had statistically less the symptoms of shortness of breath, hair loss, change in appetite, weight loss, weight gain, fatigue, extreme fatigue, feeling anxious and distressed, feeling pessimistic and sad. Those with high conscientiousness mean scores experienced higher nausea-vomiting symptom before treatment and less vomiting after treatment, constipation, shortness of breath, change of appetite and fatigue symptoms. The patients with high neuroticism mean scores had more nausea after treatment, vomiting, diarrhea and fatigue symptoms. Those in openness subscale experienced statistically less shortness of breath, fatigue, and headache symptoms but more infection symptoms (Table 5).

In the evaluation of BFI subscales affecting the prevalence of chemotherapy symptoms by logistic regression analysis, it was determined that when all variables were kept constant, one-unit increase in neuroticism increased nausea after treatment by 1.14 times, diarrhea by 1.28 times, change in sexual life by 1.14 times, feeling pessimistic and sad by 1.071 times, and feeling anxious and distress by 1.08 times. One-unit increase in conscientiousness decreased the change in sexual life by 1.19 times, feeling anxious and distressed by 088 times, and feeling pessimistic and sad by .922 times. One-unit increase in extraversion subscale decreased shortness of breath by 0.82 times and feeling pessimistic and sad by 0.83 times. One-unit increase in openness subscale decreased nausea after treatment by 0.91 times, feeling fatigue by 0.92 times, and feeling pessimistic and sad by 0.87 times. One-unit increase in agreeableness subscale decreased diarrhea by 0.87 times, feeling anxious and distressed by 0.86 times, and change in sexual life by 0.73 times. No statistically significant model formed between other symptoms and BFI subscales (Tablo 6).

4. DISCUSSION

In the study, the relation of the symptoms experienced by cancer patients receiving chemotherapy treatment with five-factor personality traits was investigated.

Depending on the diagnosis and treatment of cancer, the most common symptoms of the patients were hair loss (76.5%), constipation (56%), fatigue (50.2%), and change in appetite (48.1%), respectively (2,3). In a study conducted with patients undergoing non – hodgkin lymphoma chemotherapy in Turkey, it was determined that the most commonly experienced symptoms were energy deficiency (92.7%), hair loss (87.3%) and changes in taste of food (77.3%), respectively (15). In other studies conducted in patient groups receiving different cancer diagnosis and treatment, it was determined that although some symptoms were similar, some symptoms were different (2,3). It was stated that the differences may be caused by the characteristics of the patient group's diagnosis, cancer stage, and the number of cycles they received.

For symptom management, determining the frequency of symptoms is as important as evaluating the severity of the symptoms. It was determined in the study that the most severe symptoms experienced by the patients were feeling anxious and distressed, fatigue, headaches, and feeling pessimistic and sad. In a cross-sectional study conducted with cancer patients undergoing chemotherapy, anxiety (50.7%) and sadness (40.7%) were found to be the most severely and highly seen psychological symptoms (17). In a study conducted to determine symptoms in the patients with fourth stage cancer, the symptoms were determined as fatigue, pain, shortness of breath, constipation, anxiety, and nausea (3). The results of the study clearly indicated that the prevalence and severity of symptoms may differ in cancer patients undergoing chemotherapy. For this reason, the severity of symptoms along with their frequency should be questioned in order to enhance the quality of life of the patients in the planning of individualized nursing care.

In the present study, a negative relationship was found between conscientiousness and both anxious-distressed and pessimistic-sad emotional states. Similarly, agreeableness was negatively associated with feeling anxious-distressed, and openness was negatively associated with feeling pessimistic-sad. Furthermore, a significant negative relationship was identified between openness and fatigue. In contrast, previous studies conducted with cancer patients reported no significant relationship between fatigue and the personality traits of conscientiousness, openness, and agreeableness (20). This discrepancy may be due to differences in sample characteristics, illness context, or measurement tools.

In the studies, the relation between fatigue and extraversion shows inconsistency. In two cross-sectional studies supporting the results of the study, a relation was found between low extraversion traits and depression, anxiety, suicidal thought of men (n:228) with prostate cancer (9) and the presence of physical and psychological symptoms in cancer patients (n=1248) undergoing chemotherapy (8). Patients with low extraversion traits may experience more symptoms such as headache, fatigues, shortness of breath, and feeling pessimistic and sad due to the failure to express themselves and provide necessary cooperation with healthcare professionals in their treatment and disease management.

In the study, it was determined that the patients with high agreeableness, conscientiousness, openness traits had decreased chemotherapy-related symptoms. In studies conducted with cancer patients, extraversion and neuroticism subscales of personality traits have been examined generally. The number of studies focusing on other personality traits is limited. In a study conducted with elderly cancer patients (n:150), it was found that high openness trait was an important predictor of moderate pain (10). Differently, in the study, headache symptom was observed less in the patients with high openness trait. Since the patients with high openness trait tend to have intellectual curiosity and new experiences, they may establish a better collaboration with healthcare professionals during treatment process and conduct effective pain management. It was determined in the studies that

cancer patients with low conscientiousness, agreeableness and openness traits experienced higher levels of anxiety and depression (8,21). In the study, a negative relation was determined between conscientiousness and feeling anxious-distressed and feeling pessimistic-sad, between openness and feeling pessimistic and sad and between agreeableness and feeling anxious-distressed. In the studies conducted with cancer patients, no relation was found between fatigue with conscientiousness, openness, and agreeableness traits (20). In the study, a negative relation was determined only between openness trait and fatigue.

It was observed in the study that the presence of the symptoms of nausea after treatment, vomiting, diarrhea, fatigue, feeling pessimistic and sad increased in patients having high neuroticism trait. Some retrospective studies in cancer patients have revealed that emotional distress, anxiety and stress may play a role in the frequency, intensity, and severity of nausea and other chemotherapy symptoms (22-25). These findings supported the relation between neuroticism and nausea. In the study, a significant relation was found between neuroticism and nausea after treatment. In a cross-sectional study conducted with patients with breast cancer (n:79), a significant relation was found between fatigue and neuroticism (26). In a 6-month follow-up study, neuroticism was determined to be a predictor of fatigue in women (n:304) with breast cancer and benign breast problems (7). Another 3-month follow-up study reported no relation between fatigue and neuroticism in prostate cancer patients (n:62) receiving hormone therapy (12). In the study, fatigue symptom was observed to be more frequent in patients with high neuroticism trait. Numerous studies conducted with cancer patients revealed that emotionalstress, anxiety, concern, and depression levels increased in patients with high neuroticism trait (9,23). It was determined in the study that the patients with high neuroticism trait experienced the symptom of feeling pessimistic and sad more, which is compatible with the literature.

In the study, diarrhea, shortness of breath, and change in sexual life were found to be correlated with personality traits. It was seen that the increase in neuroticism level increased the symptoms of diarrhea and change in sexual life. While the increase in agreeableness increased the change in sexual life, it decreased diarrhea. The increase in extraversion level decreased the shortness of breath. Among previous studies, no study was found investigating the relation between these symptoms and personality traits. The number of studies investigating the relation between the personality traits and physical symptoms of cancer patients is limited. Only a few studies investigated the relation between the personality traits of cancer patients and pain, fatigue and nausea symptoms. When considering the literature and the results of this study, the increasing effect of neuroticism type personality trait on symptoms is remarkable. Further studies should be conducted to investigate the relation between the personality traits and chemotherapy-related physical symptoms in cancer patients (27).

The present study's regression results align with prior literature showing that higher neuroticism is a consistent risk factor for elevated physical and emotional symptoms in cancer patients. For example, neuroticism has been associated with increased fatigue, anxiety, and depressive symptoms in cancer populations (28). Conversely, personality traits such as conscientiousness, extraversion, openness, and agreeableness have been linked to better mental health outcomes, greater coping abilities, and improved quality of life (29). In this study, increases in conscientiousness, extraversion, openness, and agreeableness were related to reduced odds of symptoms such as nausea, fatigue, pessimism, anxiety, and changes in sexual life. These findings underscore the importance of considering personality traits in the management of chemotherapy-related symptoms and suggest that tailored psychosocial interventions could enhance symptom control and patient wellbeing.

4.1. Limitations of the Study

Since this study was conducted at a single institution within a limited timeframe, the findings cannot be generalized to all cancer patients. The sample was heterogeneous in terms of cancer diagnosis, stage, treatment type, and time elapsed since diagnosis. Additionally, depression and anxiety levels of participants were not assessed and thus were not controlled for in the analyses; these represent important limitations.On the other hand, a strength of this study is that it is among the first to investigate the relationship between the five major personality traits and a comprehensive range of chemotherapy-related symptoms. Given the study's focus on personality traits and chemotherapy symptoms, detailed information on chemotherapy protocols, prior cancer treatments, number of chemotherapy cycles, and the exact timing of data collection during chemotherapy would ideally be reported. While such detailed treatment information was not collected in this study, future research should incorporate these variables to better contextualize symptom development and patient experiences.

5. CONCLUSION

In the study, diarrhea, shortness of breath, and change in sexual life were found to be correlated with personality traits. It was seen that the increase in neuroticism level increased the symptoms of diarrhea and change in sexual life. While the increase in agreeableness increased the change in sexual life, it decreased diarrhea. The increase in extraversion level decreased the shortness of breath. Among previous studies, no study was found investigating the relation between these symptoms and personality traits. The number of studies investigating the relation between the personality traits and physical symptoms of cancer patients is limited. Only a few studies investigated the relation between the personality traits of cancer patients and pain, fatigue and nausea symptoms. When considering the literature and the results of this study, the increasing effect of neuroticism type

personality trait on symptoms is remarkable. Further studies should be conducted to investigate the relation between the personality traits and chemotherapy-related physical symptoms in cancer patients.

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Acquisition of data for the study: NE, NK
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REFERENCES

[1] Global cancer statistics: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424. https://doi.org/10.3322/caac.21492

[2] Lavdaniti M. Assessment of symptoms in cancer patients undergoing chemotherapy in Northern Greece. Mater Sociomed. 2015;27(4):255-258. https://doi.org/10.5455/msm.2015.27.255-258

[3] Li B, Mah K, Swami N, Pope A, Hannon B, Lo C, Rodin G, Le LW, Zimmermann C. Symptom assessment in patients with advanced cancer: Are the most severe symptoms the most bothersome? J Palliat Med. 2019;22(7):856-862. https://doi.org/10.1089/jpm.2018.0622

[4] Hansen PE, Floderus B, Frederiksen K, Johansen C. Personality traits, health behaviour, and risk for cancer: a prospective study of Swedish twin court. Cancer. 2005;103(5):1082-1091.

[5] Penedo FJ, Benedict C, Zhou ES, Rasheed M, Traeger L, Kava BR, Soloway M, Czaja S, Antoni MH. Association of stress management skills and perceived stress with physical and emotional well-being among advanced prostate cancer survivors following androgen deprivation treatment. J Clin Psychol Med Settings. 2013;20(1):25-32.

[6] Orom H, Penner LA, West BT, Downs TM, Rayford W, Underwood W. Personality predicts prostate cancer decision-making difficulty and satisfaction. Psychooncology. 2009;18(3):290-299.

[7] Michielsen HJ, van der Steeg AFW, Roukema JA, de Vries J. Personality and fatigue in patients with benign and malignant breast disease. Support Care Cancer 2007;15(9):1067-1073. https://doi.org/10.1007/s00520.007.0222-2

[8] Morgan S, Cooper B, Paul S, Hammer MJ, Conley YP, Levine JD, Miaskowski C, Dunn LB. Association of personality profiles with depressive, anxiety, and cancer-related symptoms in patients undergoing chemotherapy. Pers Individ Dif. 2017;117:130-138. https://doi.org/10.1016/j.paid.2017.05.039

[9] Perry LM, Hoerger M, Silberstein J, Sartor O, Duberstein P. Understanding the distressed prostate cancer patient: role of personality. Psychooncology 2018;27(3):810-816. https://doi.org/10.1002/pon.4579

[10] Krok JL, Baker TA. The influence of personality on reported pain and self-efficacy for pain management in older cancer patients. J Health Psychol. 2014;19(10):1261-1270. https://doi.org/10.1177/135.910.5313488976

[11] Ramirez-Maestre C, Martinez AE, Zarazaga RE. Personality characteristics as differential variables of the pain experience. J Behav Med. 2004;27(2):147-165.

[12] Stone P, Hardy J, Huddart R, A'Hern R, Richards M. Fatigue in patients with prostate cancer receiving hormone therapy. Eur J Cancer. 2000;36(9):1134-1141.

[13] Brown V, Sitzia J, Richardson A, Hughes J, Hannon H, Oakley C. The development of the Chemotherapy Symptom Assessment Scale (C-SAS): a scale for the routine clinical assessment of the symptom experiences of patients receiving cytotoxic chemotherapy. Int J Nurs Stud. 2001; 38(5):497-510.

[14] Aslan Ö, Vural H, Kömürcü Ş, Özet A. Kemoterapi alan kanser hastalarına verilen eğitimin kemoterapi semptomlarına etkisi. Cumhuriyet Üniversitesi Hemşirelik Yüksekokulu Dergisi. 2006; 10(1):15-28 (Turkish)

[15] John OP, Donahue EM, Kentle RL. The Big Five Inventory – Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research. 1991.

[16] Sümer N, Lajunen T, Özkan T. Big fi ve personality traits as the distal predictors of road accident involvement. G. Underwood, (Ed.), Traffic and Transport Psychology, Elsevier Ltd. 2005; 272:215-227.

[17] Alpar R. Introduction to applied multivariate statistical methods. Ankara: Nobel Publication Distribution; 2003. p.380-383. (Turkish)

[18] Schmitt DP, Allik J, McCrae RR, Benet-Martínez V. The geographic distribution of Big Five personality traits. J Cross Cult Psychol. 2007;38(2):173-212.

[19] Bolukbas F, Kutluturkan S. Symptoms and symptom clusters in non-Hodgkin's lymphoma patients in Turkey. Asian Pac J Cancer Prev. 2014;15(17):7153-7158. https://doi.org/10.7314/apjcp.2014.15.17.7153

[20] Seven M, Akyuz A, Sever N, Dincer S. Studying the physical and psychological symptoms of patients with cancer. TAF Prev Med Bull. 2013;12(3):219-224. https://doi.org/10.5455/pmb.1-134.305.3458

[21] Stone P, Richards M, A'Hern R, Hardy J. Fatigue in patients with cancers of the breast or prostate undergoing radical radiotherapy. J Pain Symptom Manage. 2001;22(5):1007-1015.

[22] Bunevicius A. Personality traits, patient-centered health status and prognosis of brain tumor patients. J Neurooncol. 2018;137(3):593-600. https://doi.org/10.1007/s11060.018.2751-6

[23] Montgomery GH, Bovbjerg DH. Expectations of chemotherapy-related nausea: emotional and experiential predictors. Ann Behav Med. 2003;25(1):48-54.

[24] Shih V, Wan HS, Chan A. Clinical predictors of chemotherapy-induced nausea and vomiting in breast cancer patients receiving adjuvant doxorubicin and cyclophosphamide. Ann Pharmacother. 2009;43(3):444-452.

[25] Grassi L, Berardi MA, Ruffilli F, Meggiolaro E, Andritsch E, Sirgo A, Caruso R, Linares EJ, Bellé M, Massarenti S, Nanni MG. Role of psychosocial variables on chemotherapy-induced nausea and vomiting and health-related quality of life among cancer patients: a European study. Psychother Psychosom. 2015;84(6):339-347. https://doi.org/10.1159/000431256

[26] Sugawara Y, Akechi T, Okuyama T, Matsuoka Y, Nakano T, Inagaki M, Imoto S, Fujimori M, Hosaka T, Uchitomi Y. Occurrence of fatigue and associated factors in disease-free breast cancer patients without depression. Support Care Cancer. 2005;13(8):628-636.

[27] Hulbert-Williams N, Neal R, Morrison V, Hood K, Wilkinson C. Anxiety, depression and quality of life after cancer diagnosis: what psychosocial variables best predict how patients adjust? Psychooncology. 2012;21(8):857-867.

[28] Bower JE. Cancer-related fatigue—mechanisms, risk factors, and treatments. Nat Rev Clin Oncol. 2014;11(10):597-609.

[29] Jerant A, von Friederichs-Fitzwater M, Moore M. Personality traits and health-related quality of life: the role of conscientiousness in chronic disease management. J Behav Med. 2011;34(4):252-261.