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Chemotherapy-induced peripheral neuropathy according to biopsychosocial model: A descriptive cross-sectional correlational study

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Abstract The present study aimed to assess the biological health, perceived well-being and social well-being of cancer patients with CIPN within the scope of the biopsychosocial model. This study was conducted in oncology clinics and outpatient clinics of a research hospital. The sample comprised 109 patients who met the following inclusion criteria: age ≥ 18 years, completed at least three cycles of taxane and platinum chemotherapy treatment, showed peripheral neuropathy symptoms, could communicate in Turkish and provided consent to participate in the study. For data collection, Patient Information Form, Chemotherapy-induced Peripheral Neuropathy Scale (EQRTC QLQ CIPN20), Perceived Well-being Scale and Social Well-being Scale were used. The EQRTC QLQ CIPN20 score was higher in those with high school and higher education than in those with primary school education and below. Perceived well-being was higher with the increase in age, in males, patients receiving only chemotherapy but no immunotherapy, patients without additional stressors, unemployed patients, patients receiving care support from their spouses at home and patients living with their spouses. The social well-being level was higher in those with higher age and number of treatments, those without stem cell transplantation, those without additional stressors, those with primary school education and below and those living alone.

Keywords: Chemotherapy, Cancer, Peripheral neuropathy, Biopsychosocial model

1. Introduction

Peripheral neuropathy is one of the long-term complications of chemotherapy used for cancer treatment (Çetinkaya and Şahin, 2020). It is a condition that occurs secondary to various pathologies; it develops with the impairment of peripheral nerve cells and fibers and affects spinal nerve roots, ganglia and cranial nerves, as well as autonomic nerves (Hammi and Yeung, 2022). Patients who develop chemotherapy-induced peripheral neuropathy (CIPN) exhibit difficulty in performing activities of daily living such as wearing clothes, cleaning, cooking and climbing stairs; disruption in sleep patterns and impaired functionality in the home and work environment (Speck et al., 2012). Patients' role functions are impaired and their physical, psychological and social well-being is negatively affected (Tofthagen, 2010). The incidence of CIPN in cancer patients receiving chemotherapy is 19-85% (Zajaczkowska et al., 2019). The chemotherapeutic agents that cause a high incidence of CIPN are mostly platinum-based agents (frequently oxaliplatin and cisplatin), taxanes (paclitaxel and docetaxel), vinca alkaloids (vincristine and vinblastine), epothilones (ixabepilone), proteasome inhibitors (bortezomib) and immunomodulators (thalidomide) (Staborova and Vetter, 2017).

Symptoms of CIPN include sensory, motor and autonomic symptoms and the frequency of sensory symptoms is higher among all the symptoms. Large nerve fibers are affected more than small nerve fibers during the occurrence of sensory symptoms (Park et al., 2013). Sensory symptoms have a ''glove-sock'' distribution at the distal end of the extremities (Kaley and Deangelis, 2009). These symptoms are classified as positive sensory symptoms and negative sensory symptoms. Positive sensory symptoms include paresthesia (painless abnormal sensation), dysesthesia (painful sensation), hyperalgesia (excessive sensation of painful stimuli), allodynia (feeling of non-painful thermal and mechanical stimuli as painful) and burning pain (Maihöfner et al., 2021). The frequency of positive sensory symptoms is higher than that of negative sensory symptoms. Itching and Lhermitte's phenomenon (feeling of sudden electric shock) are also observed in patients (Windebank and Grisold, 2008). Negative sensory symptoms include hypoalgesia/hypoesthesia (decreased pain sensation against stimuli), vibration and decreased proprioceptive sensations (Maihöfner et al., 2021). Motor symptoms are characterized by decreased limb strength, impaired fine motor functions (such as buttoning buttons and grasping small objects) and abnormal gait (Kachrani et al., 2020). Proximal leg weakness, foot drop and muscle cramps are also observed in patients (Wasilewski and Mohile, 2021). Autonomic symptoms develop as paresis in the gastric region, constipation and postural hypotension (Schuler and Heller, 2017). Patients

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may also develop orthostasis, impairment in sexual functions and changes in heart rhythm (Wasilewski and Mohile, 2021). Autonomic symptoms in which internal organs are affected are found more rarely than sensory and motor symptoms (Kachrani et al., 2020).

The psychology of patients who develop CIPN is negatively affected; they have difficulty in performing their daily activities and exhibit impairment of functionality and their family, friend, and work relationships are negatively affected (Tofthagen, 2010). Because a holistic evaluation of patients with CIPN is needed the biopsychosocial model (Babalola et al., 2017), which supports the provision of care according to individual needs by considering the psychological and social environment of individuals is preferred. The biopsychosocial model has three sub-dimensions that affect each other bidirectionally: biological dimension, psychological dimension, and social dimension (Karunamuni et al., 2021).

The biological dimension of the biopsychosocial model includes factors affecting physical health such as age; gender; physical health status; comorbid diseases; metabolic, neurochemical and hereditary characteristics; immune system response; stress response; lifestyle and drug effect (The Open University, 2020). The biological dimension also addresses impairments in sensory, motor and autonomic function. Patients whose upper extremities are affected have difficulty in tasks requiring manual dexterity, such as writing, buttoning buttons and sewing. Patients whose lower extremities are affected have difficulty in moving and walking and difficulty in driving. These issues experienced by patients show that biological health is negatively affected by CIPN (Tofthagen, 2010). The psychological dimension of the biopsychosocial model is related to the individual's emotions, thoughts, perceptions of stress, perceptions of self and identity, attitudes, behaviors and defense mechanisms that affect mental health (Lehman et al., 2017). The psychological dimension includes the perceived well-being levels of patients with CIPN. Perceived well-being is defined as the individual's perception that he/she finds himself/herself healthy or unhealthy (Memnun, 2006). According to previous studies, depressive symptoms, anxiety and sleep problems develop in patients with CIPN (Tofthagen et al., 2013); these problems negatively affect total perceived well-being in patients (Kaşıkçı, 2023).

The social dimension of the biopsychosocial model includes the individual's relationships with family, school, peers and work environment and communication skills and the effects of these relationships on the individual's health (Lehman et al., 2017). The social dimension includes the social well-being levels of patients with CIPN. According to Keyes' definition, the concept of social well-being is the evaluation of the environment and conditions in which a person lives. The concept of social well-being includes values such as social interaction, social acceptance among other people, social adaptation to society and contribution to society (Keyes, 1998). Studies have reported that the social dimension of life such as work, hobbies and housework is affected in patients with CIPN (Tofthagen, 2010).

A literature review revealed that the biopsychosocial model has been used to assess patients with different chronic diseases; however, to date, it has not been used in the evaluate CIPN. The present study was conducted considering that a holistic examination of CIPN within the scope of the biopsychosocial model will fill the gap in the literature and contribute to the management of CIPN symptoms. The study shows how the biological health, perceived well-being, and social well-being of participants with peripheral neuropathy compare with their descriptive characteristics related to biopsychosocial factors.

2. Materials and Methods

This study was conducted using a descriptive cross-sectional correlational research design. This article is derived from a thesis with the same title. The study was conducted in oncology clinics and outpatient clinics of a research hospital between September 22, 2021 and March 24, 2023. The sample size of the study was calculated to be 109 by G*Power analysis. The study included individuals who were aged 18 years or older, had completed at least three cycles of chemotherapy with taxane and platinum group agents, showed symptoms of peripheral neuropathy, could communicate in Turkish and provided consent to participate in the study. Individuals with a diagnosis of diabetes, history of alcoholism, B12/folate deficiency, autoimmune diseases, peripheral vascular diseases such as vasculitis or previous ischemic attacks and psychiatric disorders, those who did not provide their consent to participate and those with communication barriers were excluded. Data collection tools were applied by the researcher to individuals who met the inclusion criteria by using the face-to-face interview technique. It was structured and reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for reporting descriptive research.

2.1. Data collection

Patient Information Form

Based on literature review, a ''Patient Information Form'' was created to collect the demographic information of the patients with 30 items. Five expert opinions were obtained using the Lawshe technique and the content validity of the patient information form was determined.

EQRTC QLQ CIPN20

This scale was used to evaluate CIPN. It was developed by Postma et al. in 2005. Turkish validity and reliability study of this scale was conducted by Önsüz in 2015. Cronbach's alpha reliability coefficient of the scale was 0.87. The scale has three

sub-dimensions with a total of 20 items: sensory, motor and autonomic. Each question in the scale is scored between 0 and 4 (1= none, 2= somewhat, 3= quite, 4= very much) and the maximum score that can be obtained from the scale is 80. A high score on the scale indicates that a high level of symptoms and abnormalities (Önsüz, 2015).

Perceived Well-being Scale

This scale was developed in 1997 by Adams et al. Turkish validity and reliability study of this scale was conducted by Memnun in 2006. The scale has 36 items and is scored across emotional, physical, spiritual, intellectual, social and psychological sub-dimensions. Each dimension has six items. The lowest score that can be obtained from the scale is 36 and the highest score is 216; a score lower than 144 indicates a low level of perceived well-being (Memnun, 2006).

Social Well-being Scale

The scale was developed in 1998 by Keyes and the Turkish validity and reliability study of the scale was conducted by Akın et al. in 2013. This one-dimensional scale comprises 15 items. A high score on this scale indicates a high level of social well-being (Akın et al., 2013).

2.2. Data analysis

Statistical analysis of the data was performed using the IBM SPSS Statistics 23.0 program. The suitability of the scale data to normal distriution was tested with skewness and kurtosis values. Because the skewness and kurtosis values were between -1.5 and +1.5, the scale data were considered to be suitable for normal distribution; hence parametric tests were used. Mean and standard deviation, percentages and minimum and maximum values were used to analyze the socio-demographic data. Descriptive statistics of categorical variables were expressed as frequency distribution (number and percentage). Pearson's correlation test, independent sample t-test and ANOVA were used to determine the relationship between the data. A statistical expert in data analysis was consulted for validation.

3. Results

The mean age of the patients was 51.36±11.89 years (minimum: 24, maximum: 82) and 63.2% of the patients were females. A total of 36.7% patients had breast cancer (n=40), 25.7% patients had gastrointestinal cancer (n=28) and 14.7% patients had lung cancer (n=16) (Table 1). Other cancer diagnoses in the sample were gynecologic cancers (n=12), testicular cancer (n=4), head and neck cancers (n=4), Hodgkin lymphoma (n=2), Ewing sarcoma (n=1), primary peritoneal cancer (n=1), and malignant melanoma (n=1). All patients received chemotherapy. The mean number of treatment cycles received was 6.87±4.68 (minimum: 3, maximum: 27). Ten percent of the patients received medication to prevent CIPN (Neruda, Lyrica, Neurontin, and Gabaset).

An analysis of the descriptive psychological characteristics of the patients revealed that 77% of the patients thought that their support resources were sufficient to cope with the disease. Stressors other than the disease were present in 51.3% of the patients (Table 1). An analysis of the descriptive social characteristics of the patients showed that 78% of the patients were married, 50.4% had high school or higher education, 79% were unemployed, 25.7% lived with their spouses, 16.5% had no caretaker at home and 33% received care support from their spouses (Table 1).

No significant correlation was observed between the biological characteristics of the patients and EQRTC QLQ CIPN20 ($p > 0.05$). The total perceived well-being level was significantly higher in older patients ($r= 0.319$; $p < 0.01$), males ($t= –2.187$; $p = 0.031$) and those who did not receive immunotherapy ($t= –2.871$; $p = 0.038$) (Table 2). The level of social well-being was significantly higher in patients with advanced age ($r= 0.260$; $p < 0.01$), those with more chemotherapy cycles ($r= 0.194$; $p = 0.043$) and those without stem cell transplantation ($t= –3.415$; $p = 0.042$) (Table 2).

No significant relationship was observed between the psychological characteristics of the patients and EQRTC QLQ CIPN20 ($p > 0.05$); the total perceived well-being level ($t= –2.803$; $p < 0.01$) and the social well-being level ($t= –2.372$; $p = 0.02$) were significantly higher in patients without stressors other than the disease (Table 2).

An analysis of the relationship between the social characteristics of the patients and the EQRTC QLQ CIPN20 showed that the scale score of patients with high school education and above was higher than those with primary school education and below ($F= 3.738$; $p = 0.027$). The total perceived well-being level was significantly higher in patients who were unemployed ($t= 2.022$; $p = 0.05$), those who lived with their spouses ($F= 4.425$; $p < 0.01$), and those who received care support from their spouses at home ($F= 3.612$; $p = 0.016$). The social well-being level was significantly higher in patients with primary school education or less ($F= 4.487$; $p = 0.01$) and those living alone ($F= 3.268$; $p = 0.024$) (Table 2).

Table 1 Biopsychosocial Factor Characteristics of the Study Patients (n=109).

		N	%
Biological Factors		Mean± Standard deviation	
Age	Min: 24, Max:82	51.36±11.89	
Gender	Female	69	63.2
	Male	40	36.8
Cancer diagnosis time (Min: 1, Max:9)		2.42±1.56	
Type of cancer	Breast cancer	40	36.7
	Gastrointestinal cancers	28	25.7
	Lung cancer	16	14.7
Receiving radiotherapy in addition to chemotherapy	Yes	41	37.7
	No	68	62.3
Receiving surgery in addition to chemotherapy	Yes	55	50.4
	No	54	49.6
Immunotherapy in addition to chemotherapy	Yes	3	2.8
	No	106	97.2
Stem cell transplant in addition to chemotherapy	Yes	3	2.8
	No	106	97.2
Number of cures (Min: 3, Max:27)		6.87±4.68	
Psychological Factors			
The state of thinking that support resources are sufficient in coping with the disease	Yes	84	77
	No	25	23
Presence of stressors other than illness	Yes	56	51.3
	No	53	48.7
Stress sources* (n=56)	Family stress	37	34
	Economic stress	26	23.9
	Social environment stress	16	14.7
	School stress	11	10
	Work stress	9	8.2
Social Factors			
Marital status	Married	85	78
	Single	24	22
Educational status	Primary school and below	45	41.3
	Middle school	9	8.3
	High school and above	55	50.4
Working status	Not working	86	79
	Working	23	21
People living with	No One	8	7.3
	Partner	28	25.7
	Child	10	9.2
	Extended family	63	57.8
Is there anyone at home who can care for you?	No One	18	16.5
	Partner	36	33
	Child	14	12.9
	Extended family	41	37.6

*Participants gave more than one answer

A negative, weakly significant relationship was observed between the physical sub-dimension of the Perceived Well-being Scale and the sensory (r= –0.242; p = 0.011), motor (r= –0.354; p < 0.01) and autonomic (r= –0.304; p < 0.01) dimensions of the EQRTC QLQ CIPN20 (Table 3). A negative, weakly significant relationship was also observed between the social sub-dimension of the Perceived Well-being Scale and the autonomic sub-dimension of the EQRTC QLQ CIPN20 (r= –0.199; p = 0.038) (Table 3).

Table 2 Comparison of Patients' Biopsychosocial Factor Characteristics and Scale Outcomes.

		Chemotherapy- induced Peripheral Neuropathy Scale			Perceived Well-being Scale			Social Well-Being Scale		
Biological Factors		M±SD	Test statistic	p value	M±SD	Test statistic	p value	M±SD	Test statistic	p value
Age*		-	-0.132	0.170	-	0,319	0,001	-	0.260	0.006
Gender**	Female	31.17±7.97	-0.389	0.699	145.06±19.68	-2.187	0.031	65.03±9.93	0.526	0.600
	Male	31.83±8.67			153.38±18.13			63.98±10.36		
Cancer diagnosis time *		-	0.146	0.131	-	0.021	0.829	-	-0.008	0.934
Receiving radiotherapy in addition to chemotherapy **	Yes	31.78±7.86	0.368	0.714	146.29±18.14	-0.755	0.452	65.05±9.59	0.333	0.740
	No	31.19±8.45			149.21±20.27			64.40±10.38		
Receiving surgery in addition to chemotherapy **	Yes	30.53±8.52	-1.140	0.257	148.24±19.39	0.068	0.946	65.78±10.43	1.197	0.234
	No	32.31±7.84			147.98±19.71			63.48±9.61		
Immunotherapy in addition to chemotherapy **	Yes	30.67±3.05	-0.396	0.720	139.00±4.58	-2.871	0.038	64.33±2.51	-0.181	0.865
	No	31.43±8.31			148.37±19.67			64.65±10.19		
Stem cell transplant in addition to chemotherapy **	Yes	30.67±3.05	0.908	0.456	141.33±24.78	-0.610	0.543	57.00±3.60	-3.415	0.042
	No	31.43±8.31			148.30±19.40			64.86±10.10		
Number of cures *		-	-0.071	0.461	-	0.002	0.985	-	0.194	0.043
Psychological Factors										
The state of thinking that support resources are sufficient in coping with the disease**	Yes	31.13±8.44	-0.702	0.486	148.32±19.90	0.217	0.829	64.79±9.24	0.230	0.819
	No	32.36±7.43			147.40±18.27			64.16±12.61		
Presence of stressors other than illness **	Yes	32.88±7.89	1.934	0.060	143.20±20.04	-2.803	0.006	62.46±9.69	-2.372	0.020
	No	29.87±8.31			153.30±17.57			66.94±10.00		
Social Factors										
Marital status **	Married	33.42±7.81	1.360	0.177	141.54±23.39	-1.633	0.112	65.04±10.22	0.218	0.829
	Single	30.85±8.26			149.96±17.93			64.53±10.06		
Educational status ***	Primary school and below	29.02±7.04	3.738	0.027	153.40±21.32	2.970	0.056	68.09±11.30	4.487	0.01
	Middle school	31.11±7.37			146±20.59			61.56±5.24		
	High school and above	33.42±8.79			144.13±16.86			62.33±8.77		
Working status**	Not working	31.31±8.40	-0.257	0.799	149.90±19.71	2.022	0.050	65.15±10.28	1.096	0.280
	Working	31.78±7.59			141.43±17.28			62.74±9.121		
People living with***	No One	30.63±4.65	0.868	0.460	132.13±27.96			71.63±12.52	3.268	0.024
	Partner	29.43±8.19			156.36±18.78	4.425	0.006	66.57±10.84		
	Child	31.45±7.48			152.91±16.71			67.73±11.39		
	Extended family	32.40±8.65			145.60±17.43			62.32±8.50		
Is there anyone at home who can care for you?***	No One	34.72±8.35	1.715	0.169	138.33±22.71			64.61±12.27	0.888	0.450
	Partner	30.56±8.53			154.33±18.70	3.612	0.016	64.67±10.32		
	Child	28.57±5.70			153.21±20.53			68.43±8.27		
	Extended family	31.68±8.23			145.20±16.28			63.34±9.30		

* Pearson correlation test, ** Independent sample test, *** ANOVA

Table 3 Comparison of Scale Outcomes between Sensory, Motor and Autonomic Functions.

		Chemotherapy- induced Peripheral Neuropathy Scale			
		Sensory	Motor	Autonomic	Total
Social Well-Being Scale Total Score	r*	-0.089	-0.122	0.008	-0.103
	p value	0.357	0.206	0.938	0.288
Perceived Well-being Scale					
Emotional	r*	-0.101	-0.123	0.077	-0.097
	p value	0.296	0.203	0.428	0.318
Spiritual	r*	-0.106	-0.154	-0.058	-0.137
	p value	0.273	0.109	0.550	0.155
Social	r*	-0.045	-0.067	-0.199	-0.089
	p value	0.644	0.492	0.038	0.358
Psychological	r*	0.045	-0.073	-0.004	-0.003
	p value	0.643	0.450	0.970	0.975
Intellectual	r*	0.004	-0.059	-0.056	-0.030
	p value	0.968	0.541	0.565	0.753
Physically	r*	-0.242	-0.354	-0.119	-0.304
	p value	0.011	0.000	0.219	0.001
Total score	r*	-0.049	-0.113	0.150	-0.049
	p value	0.613	0.241	0.119	0.611

*Pearson correlation test

4. Discussion

In this study, no relationship was observed between the biological and psychological factor characteristics of the patients and CIPN symptoms (sensory, motor, and autonomic). Previous studies have shown that the development of these symptoms is associated with the duration of exposure to chemotherapeutic agents, the type of chemotherapeutic agent, the dose administered and the cumulative dose, but not with patient-related biological and psychological factors (Ibrahim and Ehrlich, 2020). A previous study reported that peripheral neuropathy developed significantly more in patients receiving chemotherapy with taxane and platinum group agents above the cumulative dose or 3 cycles or more (Cioroiu and Weimer, 2017). In this respect, CIPN symptoms are explained by physiopathological mechanisms such as axon damage (Hammi and Yeung, 2022), dorsal root ganglion damage (Park et al., 2013) and induction of apoptosis (Podratz et al, 2011), independent of the biopsychosocial characteristics of the patients. An analysis of the relationship with social factor characteristics showed that the presence of CIPN symptoms was higher in patients with high school education and above compared to those with primary school education and below. It is considered that people's awareness increases with the increase in the education level and hence, they can recognize the symptoms more easily.

In our study, the total perceived well-being level was higher in patients who were older, males and did not receive immunotherapy. A US-based study on patients with a history of cancer showed that the level of perception of health status was positively affected with age (Obeng-Kusi et al., 2022). It is thought that perceived well-being increases with increasing age in patients who develop CIPN; this is because of the increase in satisfaction with life by re-signifying life with increasing age (Yukay Yüksel et al., 2021). A study of 15,985 individuals using the Turkish Health Survey questionnaire revealed that the perceived well-being of men was higher (Uzden and Kurutkan, 2022). Men are thought to have higher perceived well-being due to the low burden related to their traditional gender roles (Ersoy and Ehtiyar, 2021). Patients receiving immunotherapy treatment may develop various side effects such as fatigue, skin rash, oral mucositis, diarrhea, hepatotoxicity and disruptions in the endocrine system (Çalıkuşu, 2019); this may require patients to cope with the side effects of immunotherapy in addition to chemotherapy-related side effects, which may decrease the total perceived well-being level. In our study, the total perceived well-being level of patients with no additional stressors other than the disease was significantly higher. A previous study reported that economic stress caused by treatment costs, which is one of the stressors other than the disease, led individuals to think of discontinuing the treatment and increased the anxiety and depression levels of the patients (Oncology Nursing Society, 2017). Additional stressors can force patients to cope with negative conditions and emotions and decrease the perception of total well-being.

In our present study, the total perceived well-being level was higher in patients who were unemployed, received care support from their spouse at home, and lived with their spouse. Because the working status and conditions of employed individuals can create an additional burden and stress source to the stress caused by the disease and treatment, it is thought that well-being perceptions are higher in unemployed patients due to the absence of work stress. A meta-analysis study reported that social support from the family enabled individuals to cope with stressors more easily and to have a higher perception of well-being (Yalçın, 2015). Meneguin et al. (2018) conducted a study on cancer patients receiving palliative care and found that patients who did not receive support from their family and spouse stated that their lives worsened (Meneguin et al., 2018). It is thought that individuals have a higher perception of well-being because they can cope with negative emotions

such as stress, more easily and recognize positive emotions more easily with the social support they receive from their environment.

In the present study, social well-being levels were higher in patients with advanced age, a higher number of chemotherapy cycles and those without stem cell transplantation. In a study on quality of life and social support in patients with lung cancer, no relationship was observed between patient age and the social sub-dimension of quality of life (Doğan, 2011). It is thought that the social well-being level increases with increasing age due to more interaction and harmony with the environment and the strengthening of support resources (Yukay Yüksel et al., 2021). Pekmezci et al. (2022) reported that the social well-being subscale score of patients with 4 or more chemotherapy cycles was higher (Pekmezci Purut et al., 2022). With the increase in the number of cycles, the social well-being level increases because cancer patients adapt to CIPN symptoms and develop coping skills with symptoms; this reflects positively on the interaction with the social environment. A study on the social well-being of patients who underwent stem cell transplantation noted that symptoms such as pain, insomnia and fatigue were experienced after transplantation and that social well-being was negatively affected because people developed an attitude of not sharing their feelings and thoughts about the disease (Bartley et al., 2014). A higher level of social well-being was achieved in patients who did not undergo stem cell transplantation in our study; this is because the interaction of patients with their environment was negatively affected in relation to symptoms such as fatigue, pain and insomnia observed after stem cell transplantation.

In the present study, the social well-being level was significantly higher in patients without stressors other than the disease. Because additional stressors other than the disease may cause negative emotions in individuals and may even lead to negative behavioral symptoms in interpersonal communication (Özel and Bay Karabulut, 2018), the social well-being level was higher in patients without additional stressors in this study.

Our study also found that the social well-being level was high in patients with low educational levels (primary school education and below group) and those living alone. Kuralay et al. (2021) showed that the attitudes of patients toward cancer were negatively affected in those patients with a higher education level (Kuralay et al., 2021). A higher level of social well-being in patients with lower education levels may be related to the patient's perception of health and illness, their response to illness and treatment and adaptation to the process; morever this group of patients can focus their attention on the social environment more easily. A meta-analysis study showed that the level of social well-being increased with the increase in social relations and social support (Yalçın, 2015). However, although living with family members positively affects social well-being, the physical, social and economic burden of family members may negatively affect the social well-being of the patient. Individuals living alone also have higher levels of social well-being because they are away from the economic, social, physical and spiritual burdens arising from cancer (Karabuğa Yakar and Pınar, 2013), which are observed in family members who provide to care to the patient.

In the present study perceived physical well-being decreased as sensory, motor and autonomic symptoms of CIPN increased. Previous studies have also reported numbness and tingling in the hands and feet, muscle cramps, difficulty in walking, deterioration in gait pattern, loss of balance, falls, injuries and decreased physical functionality in patients with CIPN (Komatsu et al., 2019). Because all symptoms related to CIPN reduce the physical capacity and functionality of patients, it is thought that perceived physical well-being decreases.

Our study observed that perceived social well-being decreased as the autonomic symptoms of CIPN increased (orthostatic hypotension, blurred vision and erectile dysfunction). According to previous literature, patients who develop symptoms of peripheral neuropathy develop a disability and consequently have impairments in functionality and interaction with the environment (Uçman, 2021); moreover, they have difficulty in performing activities of daily living and their general well-being is therefore negatively affected (Sacid and Arikan, 2020). Hypotension and blurred vision negatively affect perceived social well-being by disturbing all types of functionality in daily life, particularly the fulfillment of walking function (Usta Yeşilbalkan and Üstündağ, 2019) and impotence caused by erectile dysfunction (Çolak and Vural, 2021).

5. Conclusions

A holistic evaluation of CIPN symptoms is required with respect to biological, psychological and social symptoms and supportive care interventions should be developed for these patients. The presence of depression, aggression and sleep problems should be evaluated within the scope of the psychological dimension of the biopsychosocial model. Based on this model, it should be ensured that the patients benefit from social services that will support them socially, economically and educationally and improve their interactions with their family members and the environment.

The major limitation of this study is that it was very difficult to find patients who experienced only the symptoms of peripheral neuropathy from chemotherapy. Since there are no similar studies in the literature, it is recommended to increase the number of studies examining chemotherapy-associated peripheral neuropathy with a larger sample size within the scope of the biopsychosocial model in order to confirm the research findings.

Acknowledgment

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Ethical considerations

The study was conducted after obtaining approval from the Hacettepe University Non-Interventional Clinical Research Ethics Committee (22.09.2021, Approval No. 16969557–1716) and institutional permission from Gülhane Training and Research Hospital Health Research and Application Center (Decision number: E.90739940). The study complied with all articles of the Declaration of Helsinki. Permission was obtained from the authors of the scoring scales to use the data collection tools. Informed consent was obtained from the individuals who agreed to participate in the study. Research data are stored on a password-protected computer that only the researcher can access.

Conflicts of interest

The authors declare that they have no conficts of interest.

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