World Cancer Research Journal

WCRJ 2023; 10: e2672
DOI: 10.32113/wcrj_20239_2672

INVESTIGATION OF HEALTHY LIFESTYLE BEHAVIORS AND QUALITY OF LIFE IN INDIVIDUALS UNDERGOING HEMATOPOIETIC STEM CELL TRANSPLANTATION

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ABSTRACT – *Objective:* This descriptive cross-sectional study aimed to investigate healthy lifestyle behaviors and quality of life in individuals who had undergone hematopoietic stem cell transplantation (HSCT) within the past six months and before.

Patients and Methods: The population of the study consisted of adults, who underwent hematopoietic stem cell transplantation in six months and before, in a university hospital. The sample consisted of 76 cases who were selected via convivence sampling. The data were collected using a Patient Information Form, the Healthy Lifestyle Behaviors Scale–II (HLBS-II), and the SF-36 Quality of Life Scale (SF-36).

Results: The mean scores of the HLBS-II and SF-36 Physical and Mental Components were 134.34 ± 19.81, 49.54 ± 23.27, and 52.95 ± 21.31, respectively. A statistically significant difference was detected in the HLBS-II total score in terms of educational background and the status of receiving radiotherapy treatment ($p<0.05$). A score of the SF-36 Physical Component showed a statistically significant difference in terms of working status, status of receiving radiotherapy treatment, developing complications, and re-hospitalization after discharge ($p<0.05$). A score of SF-36 Mental Component showed a statistically significant difference in terms of the working status and the status of getting regularly vaccinated after hematopoietic stem cell transplantation ($p<0.05$). There were weak correlations between the total score of HLBS-II and a score of the SF-36 Physical Component ($r=0.273$ $p<0.017$).

Conclusions: Consequently, it was concluded that the patients had a moderate level of healthy lifestyle behaviors and poor quality of life in the six months and later after hematopoietic stem cell transplantation.

KEYWORDS: Stem cell transplantation, Hematopoietic, Quality of life, Health promotion, Transplantation nursing.

INTRODUCTION

Hematopoietic stem cell transplantation (HSCT) is the process of collecting stem cells from the patient himself or herself or a healthy donor through bone marrow, peripheral blood or umbilical cord blood and transplanting them into the patient via intravenous infusion. The main purpose of this treatment method is to destroy malignant tumor cells induced by the disease via infusion of healthy hematopoietic stem cells or to replace dysfunctional cells with functional ones in various hematological diseases[1].

HSCT has increased recovery and survival rates for individuals with malignant blood diseases. Nevertheless, due to the treatment methods used during and after HSCT, the risk of developing a late infection, non-infectious complications, and secondary cancer increased in these individuals[2]. Therefore, it is crucially important for survivors after HSCT to adopt healthy lifestyle behaviours[3,4]. Healthy lifestyle behaviors are defined as a lifestyle that helps individuals control all their behaviors to improve their health and to choose behaviors appropriate for their health status while organizing their daily activities[4,5] . Healthy lifestyle behaviors are practiced behaviors by individuals for disease prevention and early diagnosis, maintenance of health, and improve quality of life[5]. In other words, they refer to the individuals' ability to control the factors affecting their health[6]. Healthy lifestyle behaviors are associated with the development of chronic diseases and have an important role in the prevention and management of chronic diseases[4,6,7]. When the individuals maintaining unhealthy lifestyle behaviors were compared with those who practice four or more healthy behaviors, who practice healthy behaviors the overall risk of death was found to be lower.[8] However, there is insufficient information about the healthy lifestyle behaviors of individuals undergoing hematopoietic stem cell transplantation[4,9].

HSCT has a long-term and profound impact on adult recipients. Although most of them continue their work, school, or home activities and their quality of physical, psychological, and social life tends to enhance in the subsequent years[10,11], they have weaker physical, psychological, and social functioning when compared to healthy individuals[12,13]. It takes a long time for these individuals to return to their previous daily lives. During this period, individuals need to follow certain rules to maintain their health and protect themselves from disease. But these rules can also be a significant source of stress for them[1]. They may also experience major short-term[14] and long-term complications[15] affecting their quality of life and physical and psychological well-being. The quality of life of the individuals with HSCT is affected in physical dimensions such as pain, fatigue, sleep, sexual function, and movement and psychological dimensions such as emotional stress, depression, post-traumatic stress disorder, and neurocognitive disorders as well as social and environmental dimensions[9,14].

A healthy lifestyle behaviour is beneficial to improve the quality of life in individuals with chronic diseases. Studies conducted on individuals with various chronic diseases such as multiple sclerosis [16], stroke [17], coronary heart disease [18], diabetes and obesity [19] have shown a positive impact of a healthy lifestyle on the quality of life. Similar finding has emerged from studies examining the relationship between healthy lifestyle behaviours and quality of life in cancer survivors. Healthy lifestyles have been reported to positively affect the quality of life in survivors of thyroid [20], cervix [21], breast, skin and prostate [22], colorectal [23], and different types of cancer [24]. However, there is insufficient information on the long-term quality of life and healthy lifestyle behaviours of people undergoing HSCT [4,25]. This study aims to investigate the healthy lifestyle behaviours and quality of life of individuals undergoing HSCT this study aims to investigate the healthy lifestyle behaviours and quality of life of individuals undergoing HSCT.

PATIENTS AND METHODS

Purpose of the Study

This cross-sectional descriptive study was conducted to examine healthy lifestyle behaviors and quality of life among individuals who undergoing HSCT between 1993 and 2019.

1. Do healthy lifestyle behaviors of the individuals vary according to their socio-demographic and disease-related characteristics?
2. Does the quality of life of the individuals vary according to their socio-demographic and disease-related characteristics?
3. Is there any correlation between healthy lifestyle behaviors and quality of life?

Sample of the Study

HSCT was initiated in 1993 at the center where the current research was conducted. During the period from 1993 to 2019, approximately 1000 patients underwent HSCT at this center. To achieve a statistical power of 80% at a significance level (α) of 0.05, a minimum of 68 cases were required for inclusion in the study. Formal sample calculations were not conducted, as the objective was to include all individuals who had undergone HSCT between 1993 and 2019.

However, as of March 2020, the number of patients visiting the outpatient clinic significantly declined due to the COVID-19 pandemic. Consequently, the study was concluded with the participation of 76 individuals who visited the clinic and consented to participate via telephone. The study included individuals aged 18 years or older, proficient in Turkish, literate, and willing to participate.

Data Collection Tools

The data were collected using a Patient Information Form, the Healthy Lifestyle Behaviors Scale –II (HLBS-II), and the SF-36 Quality of Life Scale (SF-36).

Patient Information Form

The form has 36 questions about the socio-demographic and disease-related characteristics of the participants.

HLBS-II

The Healthy Lifestyle Behaviors Scale was developed in 1987 to assess health-promoting behaviors. The scale consists of six subscales (Health Responsibility, Physical Activity, Nutrition, Spiritual Development, Interpersonal Relationships, and Stress Management) and 52 items. The items are rated on a 4-point Likert scale as never (1), sometimes (2), frequently (3), and regularly (4). The lowest and highest scores of the scale are 52 and 208 points, respectively. Higher scores indicate that the respondents display healthy lifestyle behaviors at a good level. Turkish validity and reliability study of the scale was conducted by Bahar et al in 2008[5] . They reported that Cronbach's alpha was 0.92 for the overall scale and varied between 0.64-0.80 for its subscales. In the present study, it was found that Cronbach's alpha was 0.913 for the overall scale and varied between 0.644-0.857 for its subscales.

SF-36

The scale, developed in 1989, is one of the most widely used scales. The scale assesses positive and negative aspects of health status. It includes 36 questions under two components (physical (PC) and mental (MC)) and eight subscales (physical functioning (PF) (10 items), role physical (RP) (4 items), role emotional (RE) (3 items), social functioning (SF) (2 items), mental health (MH) (5 items), vitality (V) (4 items), bodily pain (BP) (2 items), and general health (GH) (5 items). The total score varies between 0 and 100 points. SF-36 is rated with positive scoring. As the score of each component increases, health-related quality of life is enhanced. In 1995, Pınar conducted the Turkish adaptation, validity, and reliability study of SF-36 and found that the internal consistency coefficient of the scale was 0.92[25]. In this study, Cronbach's alpha value ranged between 0.54-0.92 for its subscales and was at a good level.

Data Collection

Data were collected by calling up the patients who previously underwent HSCT at the center, where the study was conducted, and agreed to participate in the survey via telephone, and by conducting face-to-face interviews with those, who came to the clinic for controlling.

Statistical Analysis

Statistical analyses were conducted using NCSS (Number Cruncher Statistical System) 2007 software. Descriptive statistics, including mean, standard deviation, median, frequency, percentage, minimum, and maximum, were employed to assess the data. The normal distribution of quantitative data was assessed using the Shapiro-Wilk test and graphical analyses. While the independent samples *t*-test was used to compare normally distributed quantitative variables between two groups, Mann-Whitney U-test was

used to compare non-normally distributed quantitative variables between two groups. Kruskal-Wallis test and Dunn-Bonferroni test were used to compare non-normally distributed quantitative variables between more than two groups. Spearman's correlation analysis was used to evaluate the correlations between quantitative variables. Statistical significance was accepted as $p<0.05$.

Ethical Considerations

Approval from the Ethics Committee and permission from the chief physician of the related hospital were obtained. Permission was obtained from the authors who conducted the Turkish validity and reliability studies of SF-36 and HLBS-II. Written informed consent from all the participants was obtained. The procedures used in this study were carried out by the principles of the Declaration of Helsinki.

RESULTS

The results of the study indicated that the mean age of the patients was 42.99±13.72 years, 67.1% were female, 5.3% were smokers, 3.9% were drinking alcohol, and 17.6% had a chronic disease other than cancer (Table 1).

When the diagnoses of the diseases causing HSCT were analyzed, it was found that 25.3% of the participants had multiple myeloma, 10.7% had Hodgkin's lymphoma, and 18.7% had acute myeloid leukaemia. A total of 61.8% of the patients were diagnosed 6 months -5 years ago, 23.7% were diagnosed 6-10 years ago, and 14.5% were diagnosed 10 or more years ago (Table 1). All the patients underwent chemotherapy, 27.6% received radiotherapy treatment, 56.6% received immunosuppressive drug treatment, 44.7% underwent autologous stem cell transplantation, 51.3% underwent allogeneic stem cell transplantation, and 40.8% developed complications after the transplantation, 34.2% were re-hospitalized after discharge, 97.4% continued regular health checks after the transplantation, 57.9% got regularly vaccinated after the transplantation, 93% did regularly oral care, and 48.7% did regularly skin care (Table 1).

The participants' HLBS-II total mean score was 134.34 ± 19.81 and their total mean scores were 22.72 ± 4.52, 15.80 ± 5.35, 22.79 ± 4.06, 27.18 ± 4.44, 25.13 ± 4.51 and 20.71 ± 3.90 for Health Responsibility, Physical Activity, Nutrition, Spiritual Development, Interpersonal Relationships, and Stress Management subscales, respectively. HLBS-II total score showed a statistically significant difference in terms of gender (z= -2.956 p= 0.004), educational background (Kw-X^2 = 13.588 p=0.004), and status of receiving radiotherapy treatment (z= -2.669, p= 0.003). HLBS-II scores were significantly higher in males (139.8 ± 19.39) than their female (126.84 ± 18.1), in those having a bachelor's degree (148.75 ± 19.81) than those having a high school degree (126.24 ± 15.68), secondary school degree (130.83 ± 20.75), primary school degree and less (130.33 ± 16.93) and in those not receiving radiotherapy (137.95 ± 20.53) than those who did (124.9 ± 14.3) (p< 0.05) (Table 2).

There was no statistically significant difference between the HLBS-II total mean scores of the participants in terms of age groups, marital status, income level, employment status, having a chronic disease, duration of diagnosis, type of transplantation, number of transplants, receiving immunosuppressive therapy, development of complications after transplantation, re-hospitalization after discharge, getting regularly vaccinated after stem cell, and doing regularly oral care and skin care (p> 0.05) (Table 3).

The participants' mean scores were 56.12 ± 28.17, 34.21 ± 39.12, 56.58 ± 26.71, 51.64 ± 23.34, 49.54 ± 22.23, 57.24 ± 28.23, 39.03 ± 39.40, and 64.84 ± 17.51 for PF, RP, BP, GH, V, SF, RE, and MH subscales of SF-36, respectively. Their PC scores ranged between 7.50 and 96.25 with a mean score of 49.54 ± 23.27 and their MC scores ranged between 7 and 95.88 with a mean score of 52.95 ± 21.31 (Table 2).

When SF-36 total mean scores of the participants were examined according to their socio-demographic and disease-related characteristics, a statistically significant difference was found in their PF total mean scores in terms of employment status (z= -2.563, p= 0.010), receiving radiotherapy treatment (z= 2.178, p= 0.033), developing complications after the transplantation (z = 2.202, p= 0.031), and being re-hospitalized after discharge (z= -2.251, p= 0.027). PF total mean score was significantly higher in employed ones (61.99 ± 18.81) than unemployed ones (46.08 ± 23.47), in those who underwent radiotherapy (54.25 ± 20.19) than those who did not (53.16 ± 22.99), in those who did not develop complications after the transplantation (54.42 ± 20.76) than those who did (42.70 ± 25.48), and in those who were not re-hospitalized after discharge (53.88 ± 23.06) than those who were (41.49 ± 22.16) (Table 3).

Table 1. Distribution of socio-demographic and disease-related characteristics.

Characteristics		n (%)
Age (Mean±Ss/Median (min-max) 42.99±13.72 / (19-71)	19-30	15 (19.7)
	31-40	19 (25.0)
	41-50	19 (25.0)
	51-60	23 (30.3)
	61 and over	9 (11.8)
Gender	Female	51 (67.1)
	Male	25 (32.9)
Marital status	Married	51 (67.1)
	Single	25 (32.9)
Educational status	Primary school and ↓	27 (35.5)
	Secondary school	12 (15.8)
	High School	17 (22.4)
	Associate degree and ↑	20 (26.3)
Level of income	Moderate and lower	58 (76.4)
	Good	18 (23.7)
Employment status	Employed	17 (22.4)
	Unemployed	59 (77.6)
Having a chronic disease	Yes	13 (17.6)
	No	63 (82.9)
Duration of Diagnosis	6 months-5 years	47 (61.8)
	6-10 years	18 (23.7)
	10 years ↑	11 (14.5)
Diseases causing HSCT	Multiple myeloma.	19 (25.3)
	Hodgkin's lymphoma	8 (10.7)
	Acute myeloid leukemia	14 (18.7)
	Acute lenfoid leukemia	8 (10.7)
	Aplastik anemia	7 (9.3)
	Others	20 (25.3)
Type of transplantation	Autologous	34 (44.7)
	Allogeneic	39 (51.3)
	Autologous and Allogeneic	3 (3.9)
Number of transplantations	One	68 (89.5)
	Two	8 (10.5)
Radiotherapy treatment	Yes	21 (27.63)
	No	55 (72.36)
Immunosuppressive treatment	Yes	43 (56.57)
	No	34 (43.42)
Development of complications after transplantation	Yes	31 (40.78)
	No	45 (59.21)
Re-hospitalized after discharge	Yes	26 (34.21)
	No	50 (65.78)
Preservation of fertility before transplantation	Had	57 (75.0)
	Did not have	19 (25.0)
Getting regularly vaccinated	Yes	44 (57.89)
	No	8 (10.52)
	Has not yet started	24 (31.57)
Oral care	Yes	71(93.42)
	No	5 (2.63)
Skin Care	Yes	37 (48.68)
	No	39 (51.31)
Alcohol	No	73 (96.1)
	Yes	3 (3.9)
Smoked	No	72 (94.7)
	Yes	4 (5.3)

Table 2. Distribution of the Scores of SF-36 Quality of Life Scale and Healthy Lifestyle Behaviors Scale-II (N=76).

		No. of Items	Mean ± Sd	Median (Mix-Max)
Healthy Lifestyle Behaviors scale-II	Health responsibility	9	22.72 ± 4.52	22 (15-36)
	Physical activity	8	15.80 ± 5.35	15.5 (8-30)
	Nutrition	9	22.79 ± 4.06	22 (13-36)
	Spiritual development	9	27.18 ± 4.44	28 (16-35)
	Interpersonal relations	9	25.13 ± 4.51	25 (16-34)
	Stress management	8	20.71 ± 3.90	21 (12-30)
	Total Score	52	134.34 ± 19.81	132 (100-190)
SF-36	Physical Functioning	10	56.12 ± 28.17	55 (0-100)
	Role Physical	4	34.21 ± 39.12	25 (0-100)
	Bodily Pain	2	56.58 ± 26.71	60 (0-90)
	General Health	5	51.64 ± 23.34	50 (0-100)
	Vitality	4	49.54 ± 22.23	50 (0-100)
	Social Runctioning	2	57.24 ± 28.23	62.5 (0-100)
	Role Emotional	3	39.03 ± 39.40	33.3 (0-100)
	Mental Health	5	64.84 ± 17.51	68 (12-96)
	Physical Component		49.54 ± 23.27	48 (7.50-96.25)
	Mental Component		52.95 ± 21.31	50.71 (7-95.88)

A statistically significant difference was determined between the SF-36 MC total mean scores of the participants in terms of employment status (z= -2.038, *p*= 0.042) and status of getting regularly vaccinated (Kw= 9.343, *p*= 0.009). MC total mean score was higher in employed ones (61.99 ± 18.81) than unemployed ones (46.08 ± 23.47) and in those who got regularly vaccinated (58.96 ± 19.34) than those who didn't get regularly vaccinated and did not start vaccination, yet (44.02 ± 16.12, 44.01 ± 21.99) (Table 3).

While there was a statistically significant weak correlation between the HLBS-II total mean score and the mean score of SF-36 PC (*r*= 0.273 *p*< 0.017), there was no significant correlation between HLBS-II total mean score and MC (*p*> 0.05). The coefficient of determination between HLBS-II and SF-36 PC was $R^2=(0.273)^2 = 0.074$. The result indicated that Healthy Lifestyle Behaviors accounted for only 7% of the change in PC; thus, the other variables accounted for 93% of the change in PC (Figure 1).

DISCUSSION

Healthy Lifestyle Behaviors of the Patients Undergoing HSCT

In this study, the healthy lifestyle behaviors of individuals undergoing HSCT were determined to be moderate. The healthy lifestyle behaviors of the participants were not at a better level when compared to the results obtained from the healthy groups [27-31]. However, it was determined that were at a better level when compared to individuals suffering from chronic diseases other than cancer[32-35]. Consequently, it can be asserted that the healthy lifestyle behaviors of individuals undergoing HSCT were not as good as healthy individuals but were at a better level than individuals with chronic disease.

Some studies reported that healthy lifestyle behaviors did not show a significant difference in terms of age[29,36], gender[36], marital status[33,36]; whereas, some others reported that those who were older than [35], were male[37,38], had good economic status [37], were married[38], were employed, and had a high educational level[30] had better healthy lifestyle behaviors. In the present study, it was observed that healthy lifestyle behaviors of the participants did not vary significantly based on age, marital status, income level, or employment status. However, individuals who were male and possessed a higher level of education demonstrated better healthy lifestyle behaviors.

Adaptation to healthy lifestyle behaviors is very important in the emergence and management of chronic diseases. In this study, it was found that individuals with chronic diseases had significantly better health responsibility and nutritional status than those without chronic diseases[39], while another study revealed no difference in patients with chronic diseases[40]. In the present study, it was observed that healthy lifestyle behaviors did not differ according to the status of having a chronic disease other than cancer.

Table 1. Distribution of Sf-36 Quality of Life Scale Scores and Healthy Lifestyle Behaviors Scale-II According to Socio-demographic and Disease-Related Characteristics (N=76).

		n	HLBS-II		Physical component Mean±SD median/(mn-max)		Mental component Mean±SD/median/(min-max)	
			134.34±19.81 /132 (100-190)		49.54±23.27/48 (7.50-96.25)		52.95±21.31/50.71 (7-95.88)	
Age	19-30	15	136.73±18.48	4.612	54.25±25.21	3.211	53.24±23.40	0.531
	31-40	19	138.32±16.16	[b]0.330	52.11±22.80	[b]0.523	53.54±19.72	0.970
	41-50	19	128.26±20.07		48.68±22.17		51.33±21.51	
	51-60	23	132.86±26.84		49.64±25.38		55.81±22.53	
	61 and over	9	137.11±16.37		37.92±20.79		50.22±23.08	
Gender:	Female	32	126.84±18.1	-2.956	44.22±20.98	-1.748	49.30±20.65	-1.194
	Male	44	139.8±19.39	***[c]0.004***	53.58±24.44	[c]0.085	55.11±21.19	[c]0.236
Marital status	Married	51	133.75±19.59	-0.373	49.26±22.94	-0.198	52.56±22.03	-0.063
	Single	25	135.56±20.61	[c]0.710	50.40±24.68	[c]0.844	52.88±19.25	[c]0.950
Education	Primary school and under	27	130.33±16.93	13.588	44.81±23.34	2.302	49.42±20.75	2.014
	Secondary school	12	130.83±20.75	***[b]0.004***	48.65±22.4	[b]0.512	48.62±22.41	[b]0.569
	High School	17	126.24±15.68		55±24.83		57.69±21.55	
	Associate degree and over	20	148.75±19.81		52.19±23.11		55.20±20.48	
Level of income	Moderate and lower	58	134.1±20.41	-0.187	49.03±23.69	-0.544	52.47±21.14	-0.006
	High	18	135.11±18.26	[c]0.852	51.60±22.84	[a]0.586	53.29±21.25	[a]0.995
Employment status	Employed	17	134.65±16.89	0.072	61.99±18.81	***-2.563***	61.87±18.99	***-2.038***
	Unemployed	59	134.25±20.71	[c]0.943	46.08±23.47	***[a]0.010****	50.01±21.00	***[a]0.042****
Chronic disease	Yes	13	130.69±22.59	-0.683	46.44±21.72	[a]0.746	46.03±24.35	[a]0.288
	No	63	135.1±19.3	[a]0.495	50.29±23.80	-0.324	54.03±20.21	-1.062
Duration of transplantation	Less then 5 years	47	134.87±19.71	0.603	46.65 ±24.42	2.284	49.84±21.99	4.679
	6-10 years	18	132.28±18.96	[b]0.740	56.74±21.63	[b]0.319	61.10±18.75	[b]0.096
	10 Years and more	11	135.45±23.13		50.80±20.55		55.21±17.03	
Radiotherapy treatment	Yes	55	124.9±14.3	-2.669	53.16±22.99	***2.178***	40.42±22.30	1.066
	No	21	137.95±20.53	***[c]0.003****	54.25±20.19	***[c]0.033****	48.51±23.06	[c]0.290
Immunotherapy treatment	Yes	33	135.35±20.97	0.503	49.20±23.89	-0.141	49.97±23.24	0.610
	No	43	133.03±18.42	[c]0.616	54.40±23.75	[c]0.888	51.33±18.85	[c]0.544
Complications after transplantation	Yes	31	130.84±20.17	-1.285	42.70±25.48	***2.202***	48.67±22.63	1.384
	No	45	136.76±19.41	[c]0.203	54.42±20.76	***[c]0.031****	55.42±19.63	[c]0.171
Re-hospitalization after discharge	Yes	26	134.85±18.82	-0.049	41.49±22.16	***-2.251***	49.21±20.71	-1.032
	No	50	134.08±20.49	[c]0.961	53.88±23.06	***[c]0.027****	54.46±21.17	[c]0.305
Getting regularly vaccinated after stem cell	Yes	44	134.77±18.88	0.288	55.43±22.62	5.957	58.96±19.34	***9.343***
	No	8	134.75±19.74	[b]0.866	38.75±15.40	[b]0.051	44.02±16.12	***[b]0.009****
	Has not yet started	24	133.42±22.21		42.66±24.41		44.01±21.99	
Oral care	Yes	71	135.1±20.18	-1.352	49.65±22.97	-0.031	52.52±20.02	-0.251
	No	5	123.6±8.68	[a]0.176	49.50±31.68	[a]0.975	54.67±35.64	[a]0.801
Skin care	Yes	37	136.3±21.36	0.836	47.80±21.54	-1.360	48.13±20.04	-0.664
	No	39	132.49±18.3	[a]0.406	51.38±25.14	[c]0.178	56.97±21.28	[c]0.509

[a]Mann Whitney U Test, [b]Kruskal Wallis Test, [c]Student *t*-Test *p<0.05, **p<0.01.

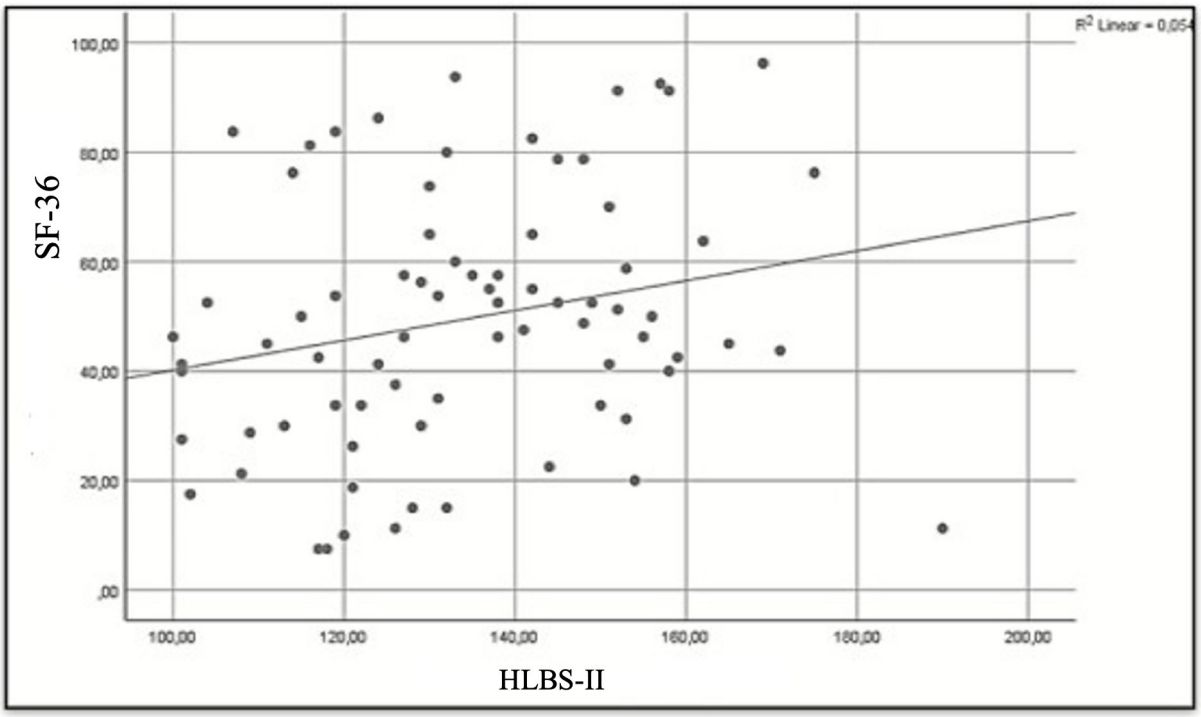

Figure 1. Correlation between the Healthy Lifestyle Behaviors Scale II and SF-36 Physical Component.

Quality of Life in the Patients Undergoing HSCT

It is important to monitor changes in the quality of life of HSCT survivors to provide optimal care physically, mentally, and socially[1,41,42]. In this study, the three most affected areas of the participants after hematopoietic stem cell transplantation were RP (34.21 ± 39.12), RE (39.03 ± 39.40), and V (49.54 ± 22.23). The least affected areas were MH (64.84 ± 17.51), SF (57.24 ± 28.23), PF (56.12 ± 28.17) and BP (56.58 ± 26.71). When the current research results are compared with the normative values of Turkey[43] it was determined that the quality of life of individuals undergoing hematopoietic stem cell transplantation was quite poor, and vitality was the lowest area similar to the Turkish population.

In the early period after allogeneic and autologous HSCT, all areas of quality of life are lower than the norm values of the population in the early period, return to baseline values before one year with ongoing improvement and showed a long-term deterioration compared to non-cancer groups[44]. When the results of the present study were compared with the normative values in Turkey[43], it was found that the quality of life of the individuals with HSCT was quite low and vitality took place among the lowest areas as similar to the Turkish population.

About the populations of the studies, quality of life is affected by age, gender, marital status, education level, income level, and health status of the individual[45]. A study reported that the education level, income level, employment status, and marital status before transplantation were related to PF but not with clinical outcome[41]. In the present study, no significant difference was found in the quality of life in terms of age, gender, marital status, education level, income level, and chronic disease status.

Working life affects the quality of life. A study conducted on patients with leukemia reported that working was associated with a good quality of life[46]. In the current study, it was observed that the quality of life of employees was physically and mentally better, which is compatible with the literature.

Quality of life is adversely affected due to acute complications developing during HSCT and late complications developing after discharge. It was detected that the quality of life was affected in PC according to the status of receiving radiotherapy, development of complications, and re-hospitalization after discharge. In the present study, PC quality of life among those receiving radiotherapy, developing complications, and being re-hospitalized after discharge may be adversely affected due to acute and late complications. The initiation of the vaccination affected MC positively in the present study, which can be attributed to the fact that the patient's recovery starts and he/she feels good. Vaccination is started after patients are in complete remission and immunosuppressive drugs are discontinued.

Correlation between Quality of Life and Healthy Lifestyle Behaviors

The studies reported a moderately positive correlation between the quality of life and healthy lifestyle behaviors. A moderately significant correlation was reported in the patients with prostate cancer[33] and cardiac patients in physical and mental components[40]. In one study conducted with 742 people in the society, a low level of positive correlation was found between psychological health, social relationships, and healthy lifestyle behaviors [38]. In another study found that health promotion was directly and positively related with the PC (β = 0.466, $p < 0.001$) and MC latent variables (β = 0.623, $p < 0.001$). When the current study examined the relationship between quality of life and healthy lifestyle behaviors, only a weak positive and significant correlation was observed in PC; while healthy lifestyle behaviors increased, physical quality of life was better. However, healthy lifestyle behaviors accounted for only 7% of the change in the quality of life in PC. Thus, the other variables accounted for 93% of the change in the quality of life in PC. Further studies are needed in this regard.

Limitations of the Study

This study is subject to several limitations. Firstly, a significant constraint pertains to the sample size. The study had to contend with a restricted sample due to the challenges posed by data collection during the pandemic. Consequently, the extent to which the obtained results can be generalized is limited. Subsequent research endeavors should encompass more extensive and diverse sample cohorts. A second limitation of this research arises from the relatively small sample size, which hindered the examination of healthy lifestyle and quality of life separately concerning allogeneic and autologous HSCT types. It would be advantageous to explore the healthy lifestyle and quality of life of cases categorized by allogeneic and autologous HSCT types within more extensive sample groups.The third limitation of this study pertains to the inclusion of cases within the six-month to one-year post-transplantation timeframe in the sample. To gain insights into how healthy lifestyle and quality of life evolve in individuals one year or more after transplantation, longitudinal follow-up studies are imperative. Such studies can scrutinize the progression and sustainability of healthy lifestyle behaviors and quality of life over an extended period.

CONCLUSIONS

The study was conducted to examine the correlation between healthy lifestyle behaviors and quality of life in individuals undergoing HSCT revealed that their healthy lifestyle behaviors were at a moderate level, and those who had higher education levels and did not receive radiotherapy treatment had better healthy lifestyle behaviors.

The quality of life of individuals undergoing HSCT was not at a good level according to the norm values in Turkey, the physical quality of life of those who were unemployed, received radiotherapy, developed complications, and were re-hospitalized was poor, while the mental quality of life of those who were employed and got vaccinated was significantly better.

In light of these results, it is recommended to conduct studies to support healthy lifestyle behaviors and enhance the quality of life of individuals in the late period after HSCT and to evaluate healthy lifestyle behaviors and quality of life regularly. To improve healthy lifestyle behaviors and quality of life after HSCT, it is recommended to establish evaluation and follow-up systems with a multidisciplinary team including nurses.

Ethics approval:

The study has been conducted according to the declaration of Helsinki. The study protocol has been reviewed by the Medical Ethical Committee of the Halic University in Turkey (Turkey), (22/10/2020, Number: 125). The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest:

All authors declare that they have no conflict of interest.

Informed Consent:

Prior to their participation in the study, all participants were provided with information regarding the study's objectives and the confidentiality of their data. Subsequently, they provided informed consent to partake in the research.

Availability of data and material:

The datasets generated and/or analyzed during the present study can be obtained from the corresponding author upon a reasonable request.

Authors' Contributions:

This study represents a thesis conducted at the Graduate Institute of Haliç University. Both authors jointly contributed to the conceptualization and design of the study. Data collection was undertaken by Sevda Ozge Kurt. The analysis and interpretation of the data were collaborative efforts involving both authors. Both authors reviewed and approved the final version of the study, assumed responsibility for its content, and agreed to be accountable for the study's accuracy and comprehensiveness.

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