

DOI: <https://doi.org/10.56712/latam.v6i1.3429>

Psychological and physical variables to predict quality of life in patients undergoing hematopoietic stem cell transplantation: cross-sectional research

Variables psicológicas y físicas para predecir calidad de vida en pacientes sometidos a trasplante hematopoyético de células progenitoras: estudio transversal

Liliana Rivera Fong

lmeylenf@hotmail.com

<https://orcid.org/0000-0003-4155-9954>

Instituto Nacional de Cancerología. Universidad Nacional Autónoma de México
Ciudad de México – México

Corina Benjet

cbenjet@gmail.com

<https://orcid.org/0000-0002-4569-6094>

Instituto Nacional de Psiquiatría
Ciudad de México – México

Rebeca Robles García

reberobles@hotmail.com

<https://orcid.org/0000-0001-5958-7393>

Instituto Nacional de Psiquiatría
Ciudad de México – México

José Luis Aguilar Ponce

joluagpo@gmail.com

<https://orcid.org/0000-0002-9960-8547>

Instituto Nacional de Cancerología
Ciudad de México – México

Brenda Lizeth Acosta Maldonado

brenda_ao@hotmail.com

<https://orcid.org/0000-0003-4692-0710>

Instituto Nacional de Cancerología
Ciudad de México – México

Angélica Riveros Rosas

vercige52@gmail.com

<https://orcid.org/0000-0002-4030-3407>

Universidad Nacional Autónoma de México
Ciudad de México – México

Artículo recibido: 28 de enero de 2025. Aceptado para publicación: 10 de febrero de 2025.
Conflictos de Interés: Ninguno que declarar.

Abstract

The aim of this study was to identify psychological and physical correlates of Quality of Life (QOL) in patients undergoing hematopoietic stem cell transplantation (HSCT). A total of 146 adult patients participated, of which 67.12% receiving an autologous HSCT and 32.87% an allogeneic HSCT. The sample included 63.01% male patients with a mean age of 40.24 years (s.d.=14.03). This was a cross-sectional design in which QoL was assessed using the Functionality Assessment of Cancer Therapy


– Bone Marrow Transplant (FACT-BMT). Independent variables included physical symptoms, emotional distress, coping, and problem-solving style. Multiple regression analyses were performed for each QoL sub-scale with variables that showed correlation. The analysis showed the global QoL mean was 83.33 (s.d.=13.47) on a scale from 0 to 108. Descriptive analyses of the QoL subscales showed greater negative impact on functional well-being. In contrast, physical well-being was the least affected subscale. Of the eight regression models (one for each QoL sub-scale) between 24.4% and 71.6% of the total variance was explained. Models included eight independent variables, the most strongly associated were fatigue, depression, and anxious preoccupation. In conclusion we identified medical and psychological correlates of patients' QoL. While this design cannot establish causal relations, establishing these correlates is relevant for clinical practice to identify patients with higher risk for compromised QoL and to guide the development of clinical interventions to promote protective QoL factors.

Keywords: quality of life, functionality, hemato-oncology, wellbeing, Mexico

Resumen

El objetivo de este estudio fue identificar si variables médicas y psicológicas tienen correlación con la calidad de vida (CV) en pacientes sometidos a trasplante hematopoyético de células progenitoras (TCPH). Se incluyeron 146 pacientes adultos, de los cuales, el 67.12% recibió un TCPG autólogo y el 32.87% alogénico. El 63.01% de los participantes fueron hombres y la muestra tuvo una media de edad de 40.24 años (d.e.=14.03). Se trató de un estudio transversal donde se evaluó CV con el Functionality Assessment of Cancer Therapy – Bone Marrow Transplant (FACT-BMT). Como variables independientes se incluyeron síntomas físicos, distress emocional y estilos de afrontamiento y de solución de problemas. Se llevó a cabo un análisis de regresión múltiple para cada subescala de CV con las variables que mostraron correlación. Los análisis mostraron que la CV promedio fue de 83.33 (d. e.=13.47) en una escala de 0 a 108. Los análisis descriptivos de las escalas de CV mostraron mayor impacto negativo en bienestar funcional; mientras que bienestar físico fue la escala menos afectada según el reporte de los pacientes. Se realizaron ocho modelos de regresión (uno para cada subescala), los cuales mostraron entre el 24.4% y 71.6% del total de varianza explicada. Los modelos incluyeron ocho variables independientes, de las cuales fatiga, depresión y preocupación ansiosa fueron las que mostraron las asociaciones más fuertes. En conclusión, se identificaron importantes correlaciones de CV con variables médicas y psicológicas; las cuales deben ser abordadas ya que, si bien el diseño no permite establecer relaciones causales, son hallazgos relevantes para la práctica clínica al permitir la identificación de posibles pacientes con mayor riesgo de compromiso o impacto negativo en la CV. Estos hallazgos pueden servir como guía para el desarrollo de intervenciones clínicas enfocadas en la promoción de estas variables con el fin de prevenir el impacto en la calidad de vida.

Palabras clave: calidad de vida, funcionalidad, hemato-oncología, bienestar, México

Todo el contenido de LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades, publicado en este sitio está disponibles bajo Licencia Creative Commons. 

Cómo citar: Rivera Fong, L., Benjet, C., Robles García, R., Aguilar Ponce, J. L., Acosta Maldonado, B. L., & Riveros Rosas, A. (2025). Psychological and physical variables to predict quality of life in patients undergoing hematopoietic stem cell transplantation: cross-sectional research. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades* 6 (1), 1478 – 1495.
<https://doi.org/10.56712/latam.v6i1.3429>

INTRODUCTION

The aim of Hematopoietic Stem Cell Transplantation (HSCT) is to cure or control the primary illness of hemato-oncological patients and improve long-term quality of life (QoL) comparable to that of the general population. However, as much as three years after an HSCT, patients report lower QoL than the general population (Sutherland, Fyles, Adams, et al., 1997). Cross-sectional research has indicated that 50% of these patients experience physical negative effects. Additionally, 40% reported emotional impact and 42% mentioned social consequences before undergoing HSCT (Pillay, Lee, Katona, et al., 2014a). Moreover, the negative impact upon QoL persists or even increases in approximately 46% of patients after the procedure (Beeken, Eiser, & Dalley, 2011), thus, achieving acceptable QoL standards is not an easy task.

Regarding long-term impact, a study has compared patients' QoL previous to HSCT with patients' QoL at different times after the procedure. These results indicate that after three years, patients do not improve their physical QoL but show small improvements in emotional QoL ($x=56$ vs. $x=64$), social ($x=55$ vs. $x=60$), and spiritual QoL ($x=72$ vs. $x=75$) (Wong, Francisco, Togawa et al., 2010). Another study has indicated that at ten years after an HSCT, survivors have lower QoL levels than a general population group. Specifically, survivors have lower levels of mental components ($p=0.01$), including emotional role, social function, mental health and vitality; as well as lower levels in the physical component ($p = 0.02$), which include physical function, role physical, bodily pain and general health (Syrjala, Langer, Adrams, et al., 2005).

Given the importance of QoL above and beyond a medical cure, significant efforts have sought to identify the factors that contribute to or are associated with QoL. Previous studies have reported negative associations between QoL and anxious or depressive symptomatology (Pillay, Lee, Katona, et al., 2014b) and helplessness/hopelessness coping style (Pillay et al., 2014b). On the other hand, higher QoL levels have been associated with a fighting spirit coping style (Pillay et al., 2014b), better self-efficacy (Hochhausen, Altmaier, McQuellon, et al., 2007), optimism (Hochhausen et al., 2007), and higher social support (Hochhausen et al., 2007). In another study, QoL related to the HSCT was predicted through severity of depression ($\beta = -0.497, t=-0.039, p < 0.001$) or anxiety ($\beta = -0.365, t = -4.430, p < 0.001$); each one with an independent model (Janicsák, Masszi, Reményi, et al., 2013).

A longitudinal study followed HSCT patients for seven years and found a direct effect that indicated that an increase in physical symptoms by 1 SD was significantly associated with a decrease in physical HRQOL by 0.98 SD and an increase in depressive symptoms by 0.94 SD ($b = 0.94$). In addition, an increase in depressive symptoms by 1 SD was significantly associated with a decrease in mental HRQOL by 0.26 SD ($b=-0.26$) and increase in depressive symptoms by 0.86 SD ($b=0.86$), and, greater depressive symptoms were significantly associated with poorer mental HRQOL ($b=-0.72$) (Kenzik, Huang, Rizzo et al., 2015). Furthermore, physical symptoms ($b = -0.23$), depressive symptoms ($b = -0.85$), and avoidant coping style ($b = 0.13$) directly influenced mental QoL. Simultaneously, the latter two variables acted as mediators of optimism and physical symptoms in predictive models of mental QoL (CFI = 0.94, RMSEA = 0.03) (Kenzik, et al., 2015).

These aforementioned studies have been conducted in HSCT patients in mostly the US or European high-income countries. Given QoL is highly influenced by cultural aspects (World Health Organization, 1997), sociodemographic and cultural differences may limit the external validity of such studies in diverse cultures and lower-income settings, like Mexico. Thus, this study aims to identify what set of psychological variables (anxiety, depression, distress, mental adjustment to cancer, or problem-solving strategy) and side effects of treatment are associated with QoL among Mexican patients undergoing HSTC.

METHODOLOGY

Sample and Procedures

The present cross-sectional study involved 146 patients in different phases of an autologous or allogeneic HSCT, all of them treated in a public hospital in Mexico City. See Table 1 for characteristics of the patients. The sample size was calculated based on the total number of patients seen in the hospital in the last 15 years (302 patients). A 5% margin of error and a 90% confidence interval were considered.

A psychologist reviewed medical records and identified patients who met the inclusion criteria (hemato-oncological patients aged 18 years or older who received or were about to receive HSCT). Potential participants were recruited in the Bone Marrow Transplantation Unit (BMTU) or before their medical consultation. The psychologist introduced herself, explained the study's objective, and explained how the patient would participate. Patients who agreed to participate signed informed consent and responded to the self-administered instruments. The Research and Ethics Committees of the hospital approved the protocol. Upon obtaining consent, the psychologist reviewed patients' clinical information based on an ad hoc questionnaire developed for this study, including diagnoses, clinical response, and type of transplant.

Table 1

Socio-demographic characteristics of patients

	f (%)	Transplant type	f (%)
Gender	86 (58.9)	Autologous	98 (67.12)
	60 (41.1)	Allogeneic	48 (32.87)
Age			
		Evaluation time	f (%)
Mean	40.24	Candidate to HSCT	42 (28.76)
Standar Deviation	14.03	Hospitalized to HSCT	38 (26.03)
Range	18 – 68	Follow up	66 (45.21)
Marital status			
		Cancer diagnosis	f (%)
Single	54 (37.0)	Acute Leukemia	32 (21.92)
Married	54 (37.0)	Non-Hodgkin Lymphoma	48 (32.88)
Common-law union	13 (8.9)	Hodgkin Lymphoma	16 (10.95)
Divorced	16 (11.0)	Multiple Myeloma	36 (24.66)
Separated	9 (6.2)	Myelodysplastic Syndrome	1 (0.68)

Measures

The study included five instruments. We measured the independent variable (QoL) with the Spanish version of the Functionality Assessment of Cancer Therapy – Bone Marrow Transplantation (FACT – BMT) that was previously adapted for the Mexican population (Rivera-Fong, Benjet, Robles, et al., 2020). This adapted instrument had adequate adjustment with its original structure and internal consistency (Cronbach's Alpha = 0.900). The FACT-BMT includes 50 items grouped into five domains: (a) Physical well-being (PWB), (b) Functional well-being (FWB), (c) Emotional well-being (EWB), (d) Social and family well-being (SWB) and, (e) Bone Marrow Transplantation scale (BMT).

Regarding the independent variables, all instruments were validated for the Mexican population; and authors selected instruments that prioritize objective symptoms evaluation. Anxiety and depression were evaluated with the 12-item Hospital Anxiety and Depression Scale (HADS). In a prior study with Mexican oncological patients, this scale explained 48% of the variance and had good internal consistency ($\alpha = 0.86$) (Galindo, Benjet, Juárez, et al., 2015).

We evaluated overall distress with the Distress Thermometer (DT), this instrument has two parts: the first one includes a single item thermometer-shaped visual analog scale self-rated from 0 to 10, which has shown 93% sensitivity and 76% specificity in Mexican cancer patients (Almanza, Rosario, & Pérez, 2008). The second part of the DT contains items to evaluate spiritual/religious concerns and practical, family, physical, and emotional problems; all items refer to problems or symptoms associated with cancer or its treatment; including HSCT's most frequent side effects in immediate (i.e. nausea or vomiting, sores in the mouth, fatigue, and diarrhea) and long-term (i.e. cataracts, sexual side effects, thyroid problems, and lung or bone damage (Almanza et al., 2008).

We evaluated patients' problem-solving resources with the Social Problem Solving Instrument (SPSI). The Mexican adaptation of the SPSI is composed of 25 items grouped into four social problems solution styles: (a) rational, (b) avoidance, (c) impulsive – carelessness, and (d) negative orientation (14). It has shown adequate internal consistency ($\alpha = 0.86$) and explained 50.22% of the variance.

Finally, we measured adjustment to cancer with the Mental Adjustment to Cancer instrument (MAC). The MAC includes 22 items that measures five domains: (a) fighting spirit, (b) anxious preoccupation, (c) helplessness / hopelessness, (d) positive attitude, and (e) cognitive avoidance. In Mexican patients, it explains 53% of total variance with an internal consistency of $\alpha = 0.78$ (Galindo, 2019).

Data analysis

First, we performed a descriptive analysis of all the dependent and independent variables in which we computed the mean, median, mode, and dispersion measurements (standard deviation and range) in all scales. Then, as a preliminary analysis to determine which variables to include in the final models, we ran correlations among all subscale variables using Pearson's r coefficient. Variables that showed statistical significance ($p < 0.05$) and a minimum magnitude of association of >0.40 with each subscale of QoL were included in the subsequent analysis. Furthermore, to confirm the variables' association with QoL, we created two groups using the extreme quartiles of quality of life scores and compared all variables using independent samples Student t tests.

Finally, for each QoL subscale, we identified variables that met correlation and comparison criteria (relevant correlation >0.40) and performed multiple regression analyses. The predictive analysis included each variable's significance and total variance.

RESULTS

Table 2 shows patients' scores in quality of life and all the independent variables. Functional well-being was the most affected area of QoL. In contrast, physical well-being was the least affected.

Table 2

Quality of life evaluation with the FACT-BMT instrument in patients undergoing to Hematopoietic Stem Cell Transplantation

	Evaluation topic	Instrument's range	Participants' range	Mean (s.d.)	Median (interquartile range)
FACT - BMT	FACT-G	0 - 108	43 - 106	83.88 (13.47)	85 (76 - 94)
	PWB	0 - 28	5 - 28	22.93 (4.62)	24 (21 - 26)
	SWB	0 - 28	8 - 28	21.45 (4.55)	22 (18 - 25)
	EWB	0 - 24	6 - 24	19.42 (3.54)	20 (17 - 22)
	FWB	0 - 28	6 - 28	20.08 (5.37)	20 (16 - 24)
	BMTS	0 - 40	13 - 40	28.24 (5.87)	28 (24 - 33)
	TOI	0 - 96	28 - 95	71.25 (13.77)	73 (64 - 81)
	FACT-BMT	0 - 148	57 - 145	112.12 (18.24)	113 (101 - 125)
HADS	Anxiety	0 - 18	0 - 14	2.71 (2.6)	2 (1 - 4)
	Depression	0 - 18	0 - 9	2.01 (2.4)	1 (0 - 3)
	Total	0 - 32	0 - 22	4.72 (4.3)	4 (2 - 7)
Distress thermometer	Distress Thermometer	0 - 10	0 - 10	2.60 (2.7)	2 (0 - 4)
	Diary problems	0 - 5	0 - 5	1.24 (1.2)	1 (0 - 2)
	Family problems	0 - 2	0 - 2	0.22 (0.5)	0 (0 - 0)
	Emotional problems	0 - 7	0 - 7	1.80 (1.6)	1.5 (0 - 3)
	Physical problems	0 - 21	0 - 13	4.30 (3.7)	3 (1 - 7)
Mental adjustment to cancer	Fighting spirit	0 - 100	58.33 - 100	86.13 (11.3)	87.5 (78.1 - 95.8)
	Anxious preoccupation	0 - 100	25 - 90	45.55 (15.4)	40 (35 - 55)
	Helplessness/Hopelessness	0 - 100	25 - 100	38.46 (15.5)	35 (25 - 45)
	Positive Attitude	0 - 100	25 - 100	86.47 (16.0)	91 (75 - 100)
	Cognitive Avoidance	0 - 100	33.33 - 100	71.97 (15.5)	75 (58.3 - 83.3)
Problem solving	Rational solution	0 - 100	20 - 100	67.53 (18.3)	67.69 (55 - 81.5)
	Negative orientation	0 - 100	20 - 93.33	38.90 (17.9)	33.33 (26.7 - 46.7)
	Avoidance style	0 - 100	20 - 83.33	32.81 (13.3)	30 (23.3 - 36.7)
	Impulsive - carelessness	0 - 100	20 - 93.33	37.90 (15.4)	33.33 (26.7 - 46.7)
Symptomatology	Fatigue	0 - 100	0 - 100	23.14 (22.3)	22.22 (0 - 33.3)
	Sickness	0 - 100	0 - 100	6.85 (16.0)	0 (0 - 0)
	Pain	0 - 100	0 - 100	15.07 (22.1)	0 (0 - 33.3)
	Dyspnea	0 - 100	0 - 100	6.39 (17.21)	0 (0 - 0)

	Insomnia	0 – 100	0 – 100	18.95 (25.9)	0 (0 – 33.3)
	Loss of appetite	0 – 100	0 – 100	10.73 (19.9)	0 (0 – 33.3)
	Constipation	0 – 100	0 – 100	11.64 (21.7)	0 (0 – 33.3)
	Diarrhea	0 – 100	0 – 100	8.45 (18.7)	0 (0 - 0)
	Financial problems	0 – 100	0 – 100	48.17 (34.8)	33.33 (33.3 – 66.7)

Note: FACT-G = Functional Assessment of Cancer Therapy – General; PWB = Physical Wellbeing, SWB = Social Wellbeing; EWB = Emotional Wellbeing, FWB = Functional Wellbeing; BMTS = Bone Marrow Transplantation Scale; TOI = Trial Outcome Index; FACT-BMT = Functional Assessment of Cancer Therapy - Bone Marrow Transplantation. HADS: Hospital Anxiety and Depression Scale.

Table 3 shows the correlations among the independent variables and QoL. Global QoL had a relevant negative correlation with depression, distress, emotional problems, physical problems, anxious preoccupations, negative orientation, fatigue, and pain.

Table 3

Correlations among Quality of Life and independent variables

		PWB	SWB	EWB	FWB	BMTS	TOI	FACT-G	FACT.BMT
HADS	Anxiety	-0.273**	-0.183*	-0.478**£	-0.254**	-0.321**	-0.382**	-0.386**	-0.386**
	Depression	-0.285**	-0.425**£	-0.490**£	-0.504**¥	-0.46**£	-0.486**£	-0.571**¥	-0.568**¥
	Total	-0.321**	-0.343**	-0.557**¥	-0.429**£	-0.44**£	-0.464**£	0.543**¥	-0.544**¥
TD	Distress thermometer	-0.286**	-0.354**	-0.417**£	-0.321**	-0.245**	-0.325**	-0.455**£	-0.415**£
	Diary problems	-0.198*	-0.191*	-0.266	-0.327**	-0.265**	-0.307**	-0.333**	-0.331**
	Family problems	-0.125	-0.336**	-0.086	-0.085	-0.103	-0.119	-0.213**	-0.190*
	Emotional problems	-0.377**	-0.309**	-0.620**¥	-0.353**	-0.43**£	-0.446**£	-0.537**¥	-0.534**¥
	Physical problems	-0.681**¥	-0.281**	-0.341**	-0.428**£	-0.44**£	-0.583	-0.589**¥	-0.576**¥
MAC	Fighting spirit	0.125	0.406**£	0.187*	0.396**	0.279**	0.315**	0.387**	0.375**
	Anxious preoccupations	-0.217**	-0.337**	-0.574**¥	-0.290**	-0.43**£	-0.370**	-0.455**£	-0.455**£
	Helplessness / Hopelessness	-0.128	-0.376**	-0.337**	-0.319**	-0.342**	-0.313**	-0.387**	-0.396**
	Positive attitude	-0.047	0.261**	0.148	0.148	0.093	0.081	0.170	0.155
	Cognitive avoid	0.306**	0.250**	0.149	0.377**	0.381**	0.412**£	0.379**	0.402**£
SPS	Rational solution	0.120	0.350**	0.183*	0.261**	0.247**	0.247**	0.312**	0.310**
	Negative orientation	-0.401**£	-0.115	-0.528**¥	-0.295**	-0.378**	-0.411**£	-0.433**£	-0.441**£
	Avoidance style	-0.177*	-0.147	-0.465**£	-0.162	-0.230**	-0.220**	-0.297**	-0.293**

	Impulsive – carelessness	-0.206*	0.013	-0.225**	-0.091	-0.145	-0.166*	-0.162	-0.166*
EORTC	Fatigue	-0.780**¥	-0.232**	-0.363**	-0.534**¥	-0.62**¥	-0.731**¥	-0.654**¥	-0.681**¥
	Sickness	-0.422**£	0.052	-0.126	-0.137	-0.210*	-0.284**	-0.215**	-0.226**
	Pain	-0.669**¥	-0.104	-0.262**	-0.336**	-0.370**	-0.513**¥	-0.467**£	-0.464**£
	Dyspnea	-0.353**	0.000	-0.138	-0.282**	-0.279**	-0.347**	-0.270**	-0.298**
	Insomnia	-0.332**	-0.088	-0.244**	-0.328**	-0.226**	-0.336**	-0.339**	-0.323**
	Loss of appetite	-0.359**	-0.112	-0.321**	-0.234**	-0.293**	-0.336**	-0.339**	-0.344**
	Constipation	-0.134	-0.027	-0.280**	-0.054	-0.123	-0.119	-0.150	-0.151
	Diarrhea	-0.424**£	-0.044	-0.068	-0.060	-0.104	-0.210*	-0.202*	-0.183*
	Financial problems	-0.367**	-0.156	-0.388**	-0.281**	-0.332**	-0.374**	-0.393*	-0.397**

Note: *p < 0.05; ** p < 0.01; £moderate correlation; ¥high correlation. PWB=Physical Wellbeing; SWB=Social Wellbeing; EWB=Emotional Wellbeing; FWB=Functional Wellbeing; BMTS=Bone Marrow Transplantation Scale; TOI=Outcomes Index; FACT-G=Functional Assessment of Cancer Therapy – General; FACT-BMT=Functional Assessment of Cancer Therapy – Bone Marrow Transplant. TD=Distress Thermometer; MAC=Mental Adjustment of Cancer; SPS=Social Problem Solving; EORTC=Quality of Life.

Subsequently, regression analyses were performed with independent variables that showed correlations >0.40 and each subscale of QoL by prioritizing parsimonious models. We tested a model for physical well-being, including fatigue ($b = -0.493, p < 0.001$) (FIV = 2.09), physical problems ($b = -0.219, p < 0.001$) (FIV = 1.83), pain ($b = -0.171, p = 0.006$) (FIV = 1.91), diarrhea ($b = -0.178, p < 0.001$) (FIV = 1.19). Nausea ($p = 0.321$) and negative orientation ($p = 0.251$) lost significance. After eliminating them, the model was statistically significant ($F = 92.35; p < 0.001$), and it explained 71% of the variance. For social well-being, a multiple regression analysis, including depression ($b = -0.321, p < 0.001$) (FIV = 1.15) and fighting spirit mental adjustment to cancer ($b = -0.291, p < 0.001$) (FIV = 1.15), showed a statistically significant impact ($F = 24.44; p < 0.001$), which explained 24.4% of the variance. Fighting spirit includes items such “I am determined to face everything” or “I focus on the good things I have”

In the case of emotional well-being, we tested a model with seven variables that showed relevant correlations but lost significance as predictors; anxiety ($p = 0.937$), depression ($p = 0.204$), distress ($p = 0.856$), negative orientation problem-solving style ($p = 0.152$) and avoidant/ carelessness orientation problem-solving style ($p = 0.421$). A new, statistically significant model ($F=63.80; p < 0.001$) explained 46.4% of variance; this model included number of emotional problems ($b = -0.441, p < 0.001$) (FIV = 1.37) and an anxious preoccupation mental adjustment to cancer ($b = -0.346, p < 0.001$) (FIV = 1.37), such as “My health problems prevent me from planning for the future” or “I don’t know what I have to do” or “I’m worried that I experience a cancer relapse or the cancer will get worse”.

For functional well-being, the initial analysis included depression, fatigue, and the number of physical symptoms. However, physical symptoms did not show statistical significance ($p = 0.315$), so it was removed. After this adjustment, the new model explained 41.3% of the variance and showed statistical significance ($F=52.03; p < 0.001$) with depression ($b = -0.384, p < 0.001$) (FIV = 1.09) and fatigue ($b = -0.426, p < 0.001$) (FIV = 1.09).

For the bone marrow transplant subscale, a model with five variables was tested. The number of emotional problems ($p = 0.543$) and the number of physical issues ($p = 0.671$) were not significant. After removing these variables, a model that proved to be statistically significant ($F = 28.06; p < 0.001$) resulted and explained 48.8% of the variance by depression ($b = -0.228, p < 0.001$) (FIV = 1.27), anxious preoccupations ($b = -0.210, p = 0.002$) (FIV = 1.25), and fatigue ($b = -0.496, p < 0.001$) (FIV = 1.11).

The FACT-BMT instrument includes a sub-scale named Trial Outcome Index (TOI); this index is the summed score of the physical well-being scale and the functionality well-being score; thus, TOI has been considered the most appropriate single patient-reported indicator by some clinical research. For this index we tested a model with seven variables. Still, the number of emotional problems ($p = 0.536$), negative orientation of social problem-solution style ($p = 0.894$), and pain ($p = 0.706$) were not significant; so they were removed. After this adjustment, we obtained a model that explained 66.1% of the variance ($F = 71.74; p < 0.001$); the model includes depression ($b = -0.245, p < 0.001$) (FIV = 1.16), number of physical problems ($b = -0.172, p = 0.006$) (FIV = 1.65), fatigue ($b = -0.505, p < 0.001$) (FIV = 1.69), cognitive avoidance ($b = -0.199, p < 0.001$) (FIV = 1.10) which contains items such “I don’t really think I have cancer” or “I try to keep living like I always have”.

As for the global quality of life scale (FACT-G) a model with eight variables was tested, however the distress thermometer score ($p = 0.209$), number of emotional problems ($p = 0.837$), negative orientation problem-solving style ($p = 0.557$), and pain level ($p = 0.856$) lost significance as predictors. A statistically significant model was obtained ($F = 62.76; p < 0.001$), which explains 63% of the variance through depression ($b = -0.327, p < 0.001$) (FIV = 1.29), number of physical problems ($b = -0.204, p = 0.002$) (FIV = 1.65), anxious preoccupation ($b = -0.163, p = 0.005$) (FIV = 1.26), and fatigue ($b = -0.396, p < 0.001$) (FIV = 1.63).

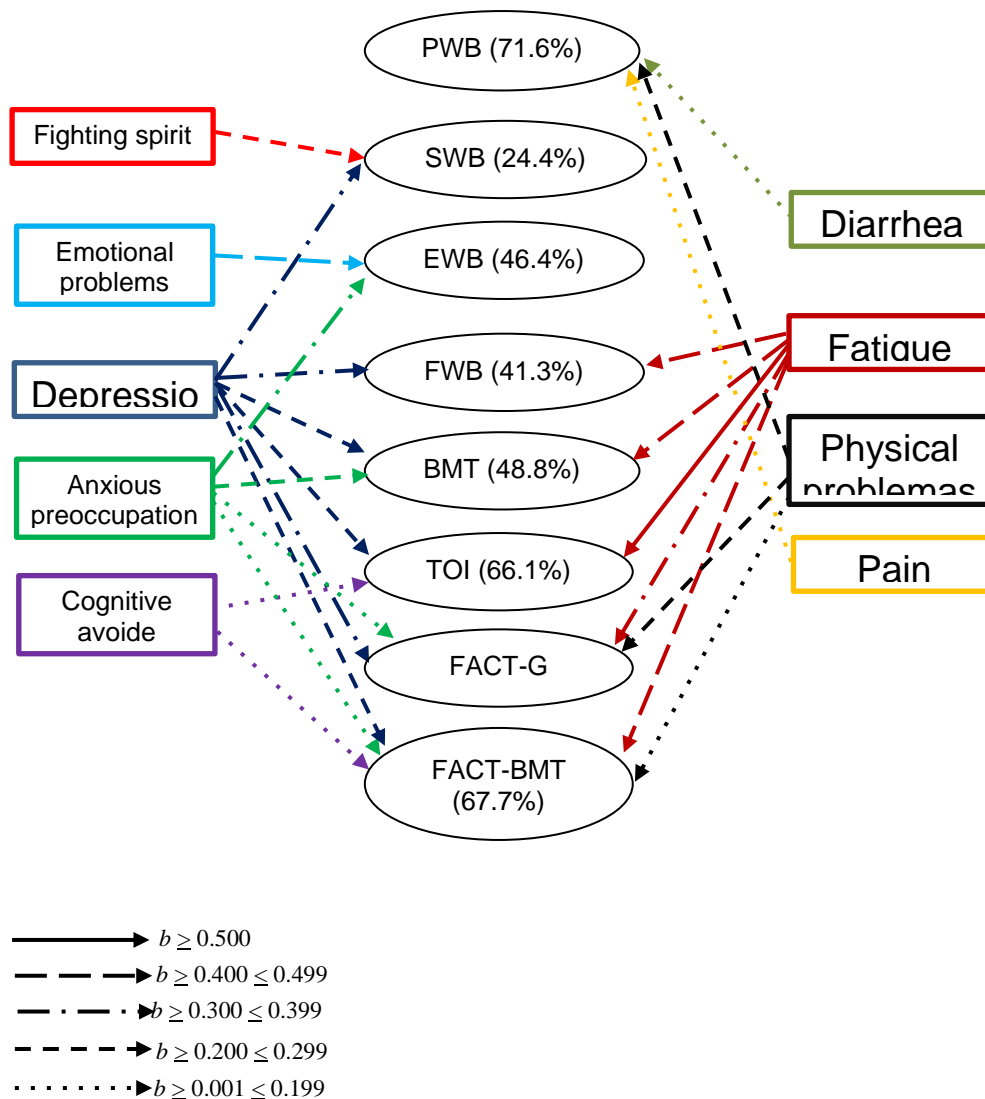
Finally, for the total scale of QoL (FACT-BMT) we performed an initial multiple regression analysis with nine variables, but DT score ($p = 0.727$), number of emotional problems ($p = 0.988$), negative orientation problem-solving style ($p = 0.696$), and pain ($p = 0.759$) lost predictive significance. Upon removing these variables, a model explained 67.7% of the variance and was statistically significant ($F = 61.84$; $p < 0.001$). The predictive model includes depression ($b = -0.291$, $p < 0.001$) (FIV = 1.32), physical problems ($b = -0.172$, $p = 0.005$) (FIV = 1.66), anxious preoccupation ($b = -0.167$, $p = 0.002$) (FIV = 1.27), fatigue ($b = -0.407$, $p < 0.001$) (FIV = 1.13), and cognitive avoidance ($b = -0.167$, $p = 0.002$) (FIV = 1.27).

Figure 1 shows the integration of models obtained by multiple regression analyses, the explained variances of each factor and the psychological and medical variables that proved significant impact for each model.

Figure 1

Physical and psychological variables to predict quality of life and its factors

Note: PWB=Physical Wellbeing; SWB=Social Wellbeing; EWB=Emotional Wellbeing; FWB=Functional Wellbeing; BMTS=Bone Marrow Transplantation Scale; TOI=Outcomes Index (PWB+FWB+10 items of



BMT); FACT-G=Functional Assessment of Cancer Therapy – General (PWB+FWB+SWB+EWB); FACT-BMT=Functional Assessment of Cancer Therapy – Bone Marrow Transplant (FACT-G + 10 items BMT).

DISCUSSION

This study's objective was to evaluate a set of psychological and medical correlates of quality of life in Mexican patients undergoing an HSCT. Results indicated that Global QoL were correlated with psychological and physical variables that include depression, anxious preoccupations, cognitive avoidance, physical problems, and fatigue.

However, specific areas showed correlations with different variables. An interesting result is that Physical QoL only correlated with physical side effects associated with treatment or illness. On the other hand, social and emotional QoL only showed correlations with emotional symptoms or coping style, but functional QoL showed correlation with physical and psychological variables.

Similar results were identified in previous studies that identified various degrees of association and prediction of physical quality of life by (a) the presence and intensity of physical symptoms such as fatigue (Boland, Eiser, Ezaydi, et al., 2012; Gielissen, Schattenberg, Verhagen, et al., 2007), pain perceived (Boland, et al., 2012), physical symptoms (Kenzik et al., 2015); (b) variables related to treatment and disease such as the intensity of treatment received (Wingard, Huang, Sobocinski, et al., 2010), the experience of severity of the HSCT (18), the development of graft-versus host disease (GVHD) (Wingard et al., 2010; Rosenberg, Syrjala, Martin, et al., 2015); the requirement of more than four medications (Rosenberg et al., 2015) and ; (c) variables on the patient's global health status as general health (Wingard et al., 2010), the presence and number of comorbidities (Wingard et al., 2010), low Karnofsky evaluation (Wingard et al., 2010), physical limitations (Kenzik et al., 2015), and functional status (Rosenberg et al., 2015). On the other hand, this study did not find predictive power of physical symptoms with variables identified in previous studies, such as anxiety (Goetzmann, Klaghofer, Wagner-Huber, et al., 2007; Wingard et al., 2010), depression (Pillay et al., 2014b; Goetzmann et al., 2007) or fighting spirit as a mental adjustment to cancer (Pillay et al., 2014b).

In this sense, symptoms like fatigue and pain should be routinely evaluated because fatigue has shown prevalence greater than 60% up to 6 months after a transplant (Costanzo, Knight, Coe et al., 2020); and pain increase between 47% and 71% after a HSCT in contrast with prevalence before the procedure (Galvin, Paice, & Mehta, 2015). Additionally, these symptoms have been associated with physical and emotional QoL, but we only identified correlation with physical QoL.

The variables that demonstrated predictive power for emotional QoL included emotional problems and anxious preoccupations with mental adjustment to cancer. Both variables have been previously identified in similar studies with other groups of variables such as social limitations (Kenzik et al., 2015), impairments in global mental health (Vickberg, DuHamel, Smith et al., 2001), and the presence of anxiety personality traits (Wingard et al., 2010) as precursors of greater effects on the emotional area. On the other hand, the present study did not identify that depressive symptoms (Kenzik, et al., 2015; Loberiza Jr, Rizzo, Bredeson et al., 2002), avoidant problem-solving style (Kenzik et al., 2015) could predict QoL like previous studies. However, all patients should be evaluated by a mental health professional because a patient's mental health before a transplant could be correlated with mental health after the procedure.

Furthermore, it is possible to predict social QoL by depressive symptoms and fighting spirit style of mental adjustment to cancer; both were previously identified (Pillay et al., 2014b). However, no predictive function was found with other reported variables such as social functioning (Vickberg et al., 2001), fatigue (Gielissen et al., 2007), and anxiety (Wingard et al., 2010).

According to the descriptive analysis of this study it is important to note that each QoL subscale median is above the midpoint of each subscale; in contrast the medians shown in the scales to evaluate psychological symptoms or physical problems are below the midpoint of each subscale. A possible explanation is that patients who received an HSCT in Mexico are carefully evaluated to ensure patients have the personal resources, social support, and sociodemographic conditions to handle a transplant. This evaluation may have excluded patients with risk factors to develop complications or severe medical conditions; for example, the mean of level education in the sample is higher than the general population, all patients have social support, and patients did not pay for the procedure or hospitalization.

In addition, it is important to underline that the two more common mental adjustments to cancer coping styles used in this sample were fighting spirit and positive attitude. These coping styles were associated with better functionality and higher QoL in other studies (Pillay et al., 2014a; Pillay et al., 2014b; Hochhausen et al., 2007). Given that most of these patients used these coping styles it was not possible to evaluate the effect of other coping styles.

Finally, an international study suggests that Latin-American patients have lower QoL in contrast with the Caucasian American population; this study identified cultural variables which could impact QoL like familism (needs and objectives of the family are placed over the needs of the individual), simpatía (a preference towards pleasant and non-confrontational social interactions that could facilitate patients to obey medical indications in order to avoid the displeasure of health professionals), and religiosity / spirituality (given Hispanics often consider religion as a source of support during health adversities) (Yanez, McGinty, Buitrago et al., 2016).

This study contributes additional insight into factors associated with QoL in patients undergoing an HSCT, literature that is considered weak or inconclusive and that until now has not included samples from Latin America (Braamse, Gerrits, van Meijel et al., 2012). Findings from the present study and previous evidence suggest that variables such as physical discomfort, anxiety, depression, and coping styles are important correlates of patients' quality of life undergoing HSCT. However, as a limitation, the cross-sectional design of this study precludes inferring directionality or causality. While determining correlates of QoL it is important to identify those patients that may be at high risk for poor QoL or for not regaining levels of QoL; future research to provide evidence for causality through longitudinal studies is important to determine whether modifying these variables will have an impact upon QoL.

While we present data from a population (Mexican) with little prior research in this area, a further limitation of this study, the limited sample size from one public hospital, precludes generalizing the findings to all Mexican patients treated with HSCT. We recommend developing both multicenter and longitudinal studies.

Finally, we focused on medical and psychological variables, but future research could include variables such as nutritional status and social support which have been associated with QoL in oncological patients.

CONCLUSION

Quality of life must be evaluated throughout the disease process because it is a dynamic and multicomponent construct, so it is necessary to identify conditions that can be treated in each phase of medical attention. The prompt intervention can reduce the overall impact of the disease and its treatment.

In this research, patients had a hemato-oncological disease and received complex medical treatment such as a HSCT; but the main area of impairment was the functionality or role fulfillment, not the

physical well-being. A possible explanation for this impact, could be that the average age of the patients is within the ranges of the productive life stage and their perception of inability to fulfill certain activities that impact their global life proposes.

In this sense, identifying correlates of QoL in different populations of patients with HSCT is an important first step to identifying individuals at risk for poor QoL or lack of improvement in QoL. Further research into causal mechanisms will allow for the development of specific psychological interventions to prevent or control variables found to deteriorate QoL or to increase factors found to improve the QoL of these patients and contribute to their interdisciplinary care.

REFERENCES

- Almanza J. J., Rosario I., & Pérez S. (2008). Traducción, adaptación y validación del termómetro de distress en una muestra de pacientes mexicanos con cancer. *Rev Sanid Milit Mex.*, 62(5), 209-217.
- Beeken R. J., Eiser C., & Dalley C. (2011). Health-related quality of life in haematopoietic stem cell transplant survivors: a qualitative study on the role of psychosocial variables and response shifts. *Qual Life Res*, 20(2), 153-160. doi: 10.1007/s11136-010-9737-y
- Boland E., Eiser C., Ezaydi Y., Greenfield D. M., Ahmedzai S. H., & Snowden J. A. (2012). Living with advanced but stable multiple myeloma: a study of the symptom burden and cumulative effects of disease and intensive (hematopoietic stem cell transplant-based) treatment on health-related quality of life. *J Pain Symptom Manage*, 46(5), 671-680. doi: 10.1016/j.jpainsymman.2012.11.003
- Braamse A. M. J., Gerrits M. M. J. G., van Meijel B., Visser O., van Oppen P., Boenink A. D., et al. (2012). Predictors of health-related quality of life in patients treated with auto- and allo-SCT for hematological malignancies. *Bone Marrow Transplantation*. 47(6):757-69. <https://doi.org/10.1038/bmt.2011.130>
- Costanzo E., Knight J. M., Coe C. L., Hematti P., & Juckett M. B. (2020). Prevalence and biobehavioral predictors of early and long-term fatigue following hematopoietic stem cell transplantation. *Biol Blood Marrow Transplant*, 26(3), S68. doi: 10.1016/j.bbmt.2019.12.237
- Galindo O. (2019). Escala de Afrontamiento al Cáncer en pacientes oncológicos en población Mexicana. *Psicooncología*, 16(1), 61-72
- Galindo O., Benjet C., Juárez F., Rojas E., Riveros-Rosas A., Aguilar J. L., et al. (2015). Propiedades psicométricas de la Escala Hospitalaria de Ansiedad y Depresión (HADS) en una población de pacientes oncológicos mexicanos. *Salud Mental*, 38(4), 253-258
- Galindo O, Rivera-Fong L., Lerma A., & Jiménez J. (2016). Propiedades psicométricas del Inventario de Solución de Problemas Revisado (SPSI-R) en población Mexicana. *Psicología y Salud*, 26(2), 263-271
- Galvin J. P., Paice J., & Mehta J. (2015). Pain following hematopoietic stem cell transplant: a prospective observational study. *Biol Blood Marrow Transplant*, 21(2), S249-S250. <https://doi.org/10.1016/j.bbmt.2014.11.392>
- Gielissen M. F. M., Schattenberg A. V. M, Verhagen C. A. H. H. V. M., Rinkes M. J., Bremmers M. E. J., & Bleijenberg G. (2007). Experience of severe fatigue in long-term survivors of stem cell transplantation. *Bone Marrow Transplant*, 39(10), 595-603. doi: 10.1038/sj.bmt.1705624
- Goetzmann L., Klaghofer R., Wagner-Huber R., Halter J., Boehler A., Muellhaupt B., et al. (2007). Psychosocial vulnerability predicts psychosocial outcome after an organ transplant: results of a prospective study with lung, liver, and bone-marrow patients. *J Psychosom Res.*, 62(1), 93-100. doi: 10.1016/j.jpsychores.2006.07.023
- Hochhausen N., Altmaier E. M., McQuellon R., Davies S. M., Papadopolous E., Carter S., et al. (2007). Social support, optimism, and self-efficacy predict physical and emotional well-being after bone marrow transplantation. *Psychosoc Oncol.*, 25(1), 87-101. doi: 10.1300/J077v25n01_05
- Janicsák H., Masszi T., Reményi P., Ungvari G. S., & Gazdag G. (2013). Quality of life and its socio-demographic and psychological determinants after bone marrow transplantation. *Eur J Haematol.*, 91(2), 135-140. doi: 10.1111/ejh.12.126

Kenzik K., Huang I-C., Rizzo J. D., Shenkman E., & Wingard J. (2015). Relationships among symptoms, psychosocial factors, and health-related quality of life in hematopoietic stem cell transplant survivors. *Support Care Cancer*, 23(3), 797-807. doi: 10.1007/s00520-014-2420-z

Loberiza Jr. F. R., Rizzo J. D., Bredeson C. N., Antin J. H., Horowitz M. M., Weeks J. C., & Lee S. J. (2002). Association of depressive syndrome and early deaths among patients after stem-cell transplantation for malignant diseases. *J Clin Oncol*. 20(8), 2118 – 2126. <https://doi.org/10.1200/JCO.2002.08.757>

Pillay B., Lee S. J., Katona L., Burney S., & Avery S. (2014a). Psychosocial factors associated with quality of life in allogeneic stem cell transplant patients prior to transplant. *Psychooncology*, 23(6), 642-649. doi: 10.1002/pon.3462

Pillay B, Lee S. J, Katona L., Burney S., & Avery S. (2014b). Psychosocial factors predicting survival after allogeneic stem cell transplant. *Support Care Cancer*, 22(9), 2547-2555. doi: 10.1007/s00520-014-2239-7

Rivera-Fong L., Benjet C., Robles R., Traeger L., Aguilar J. L., Valero L. M., et al. (2020). Patients' quality of life: Validation of the functional assessment of cancer therapy-bone marrow transplant (FACT-BMT) instrument for the Mexican population. *Palliative & supportive care*, 18(5), 557-568. doi: 10.1017/S1478951520000085

Rosenberg A., Syrjala K. L., Martin P. J., Flowers M. E., Carpenter P. A., Salit R. B., et al. (2015). Resilience, health, and quality of life among long-term survivors of hematopoietic cell transplantation. *Cancer*, 121, 4250–4257. doi: 10.1002/cncr.29651

Sutherland H. J., Fyles G. M., Adams G., Hao Y., Lipton J. H., Minden M. D., et al. (1997). Quality of life following bone marrow transplantation: a comparison of patient reports with population norms. *Bone Marrow Transplant*, 19(11), 1129-1136. doi: 10.1038/sj.bmt.1700806

Syrjala K. L., Langer S. L., Abrams J. R., Storer B. E., Martin P. J. (2005). Late effects of hematopoietic cell transplantation among 10-year adult survivors compared with case-matched controls. *J Clin Oncol.*, 23(27), 6596-6606. doi: 10/1200/JCO.2005.12.674


Vickberg S. M., DuHamel K. N., Smith M. Y., Manne S. L., Winkel G., Papadopolous E., et al. (2001). Global meaning and psychological adjustment among survivors of bone marrow transplant. *Psychooncology*, 10, 29–39. doi: 10.1002/1099-1611(200101/02)10: <29::aid-pon482 >3.0.co;2-y

Wingard J. R., Huang I. C., Sobocinski K. A., Andrykowki M. A., Cella D., Rizzo D., et al. (2010). Factors associated with self-reported physical and mental health after hematopoietic cell transplantation. *Biol Blood Marrow Transplant*, 16(12), 1682–1692. doi: 10.1016/j.bbmt.2010.05.017

Wong F. L., Francisco L., Togawa K., Bosworth A., Gonzales M., Hanby C., et al. (2010). Long-term recovery after hematopoietic cell transplantation: predictors of quality-of-life concerns. *Blood*, 115(12), 2508-2519. doi: 10.1182/blood-2009-06-225631

World Health Organization [internet]. Suiza: WHOQOL. (1997). Measuring Quality of Life (No. Programme on Mental Health). [cited 2022 Jan 2]. Available from: <http://www.who.in>

Yanez B., McGinty H. L., Buitrago D., Ramirez A. G., & Penedo F. J. (2016). Cancer outcomes in Hispanic/Latinos in the United States: an integrative review and conceptual model of determinants of health. *J Lat Psychol.*, 4(2), 114-129. doi: 10.1037/lat0000055

Todo el contenido de **LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades**, publicados en este sitio está disponibles bajo Licencia Creative Commons .

El presente artículo es producto del trabajo de tesis doctoral del primer autor bajo la tutoría del último.