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Observational Study

Factors affecting anxiety, depression, and self-care ability in patients who have undergone liver transplantation

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Abstract

BACKGROUND

Depression, anxiety, and altered self-care ability are among the most important factors affecting the quality of life of liver transplant recipients. Depending on the severity of the underlying liver disease, signs and symptoms of anxiety and depression may become more pronounced.

AIM

To evaluate the factors affecting depression, anxiety and self-care abilities of liver transplant recipients.

METHODS

Recipients who are ≥ 18 years and who underwent liver transplantation at Inonu University Liver Transplantation Institute were included in this descriptive and cross-sectional study. Sample size analysis showed that the minimum number of recipients should be 301 (confidence level = 95%, confidence interval = 2.5, population = 1382). Three hundred and twenty recipients were interviewed and 316 recipients that have answered the questionnaires accurately were analyzed. The dependent variables were the Beck Depression Scale, State-Trait Anxiety Scale (Form I and II), and Self-Care Agency Scale. The independent variables of the study were sociodemographic characteristics, biliary complications, hepatocellular carcinoma, recommending liver transplantation to other patients, and the interval of out-patient clinic visits.

RESULTS

revised according to the STROBE Statement-checklist of items.

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Self-care ability scores were lower ($P = 0.002$) and anxiety scores were higher ($P = 0.004$) in recipients with biliary complications. On the other hand, in recipients with hepatocellular carcinoma, self-care scores were lower ($P = 0.006$) while depression ($P = 0.003$) and anxiety scores ($P = 0.009$) were higher. Liver transplantation recipients with a monthly income < 3000 Turkish liras had higher depression ($P < 0.001$) and anxiety ($P = 0.003$) scores. The recipients who stated that they would not recommend liver transplantation to others had lower self-care scores ($P = 0.002$), higher depression ($P < 0.001$), higher state anxiety ($P = 0.02$), and trait anxiety ($P < 0.001$) scores.

CONCLUSION

Presence of biliary complications and hepatocellular carcinoma, low income level, and an obligation for monthly visits to the outpatient clinic are factors that are found to affect self-care capability, depression, and anxiety.

Key Words: Liver transplantation; Biliary complications; Hepatocellular carcinoma; Socioeconomic status; Depression; Anxiety; Self-care capabilities

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Core Tip: Depression, anxiety, and deficiency in self-care ability are among the most important factors affecting the quality of life of liver transplant recipients. This descriptive, cross-sectional questionnaire-based study shows that presence of biliary complications and hepatocellular carcinoma, low monthly income level, and monthly visits to the outpatient clinic are factors that affect self-care capability, depression, and anxiety.

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INTRODUCTION

Since the first successful liver transplantation (LT) performed by Starzl *et al* [1] in 1967, LT has become the gold standard treatment modality for end stage liver failure and acute liver failure. In recent years, advancements in immunosuppressive medication, management of postoperative complications, and surgical technique have resulted in extended survival periods for transplant recipients [2,3]. The expectations in quality of life (QOL) of the LT recipients became more prominent with the increased survival rates of the recipients.

The parameters, signs, and symptoms related to QOL, such as the preoperative depression, anxiety, or need for support of a relative, can be exacerbated or can initially be seen in the postoperative period depending on the severity of preoperative psychosocial problems, operative trauma of a major operation, such as LT, long duration of hospitalization in either intensive care unit or in patient-wards, adverse effects of immunosuppressive agents (diabetes mellitus, osteoporosis, infection risk, hypertension, renal failure *etc.*), development of postoperative biliary complications that require interventions, the fear of recurrence of the underlying disease, such as hepatocellular carcinoma (HCC), the fear of the risk of acute or chronic organ rejection, loss of occupation that result in economic losses, and the need for regular postoperative follow-up [4-13]. The major factors affecting the QOL related with health are presence of preoperative co-morbidities (diabetes, hypertension, pulmonary disease), advanced age, female gender, occupation, low socioeconomic status, and financial burden [14-16]. Therefore, all these data suggest that strict surveillance of the transplant recipients in the preoperative and postoperative period in terms of psychosocial status and treatment of any psychosocial problems with psychotherapy and medication may increase the physical and mental QOL and may have a positive

impact on the life expectancy of the individuals[7,8].

Depression, anxiety, and the ability of self-care seem to be the most important parameters in the recipients in the postoperative period. Furthermore, some recipients may develop anxiety and depression depending on the risk factors mentioned above that may have an impact on the postoperative mental and physical QOL of the individual. In the present study on patients who received a LT, the anxiety was evaluated by State-Trait Anxiety Scale (STAI; Form I and II), depression was evaluated using the Beck Depression Scale (BDS), and the self-care was evaluated using the Self-Care Agency Scale (SCAS). All these scoring systems and scales were individually used in previous studies involving solid organ transplantation[17-19]. However, we have not encountered any study involving all three scales used together to evaluate a population of recipients. The aim of the present study is to analyze the relationship between sociodemographic characteristics, presence of biliary complications, presence of HCC, preference of recommendation of LT to others, and frequency of out-patient clinic control and some post-transplant QOL indicators (depression, anxiety, self-care ability).

MATERIALS AND METHODS

Type, duration, and location of the study

The preset study is descriptive, cross-sectional questionnaire-based study on patients transplanted between March 2002 and December 2018 at Inonu University Liver Transplant Institute. The recipients that are compliant with regular out-patient follow-up were selected for evaluation in the study, and face-to-face interview technique was applied to all these recipients. This study was reviewed and approved by the Inonu University institutional review board for non-interventional studies (3/27/2019).

Study population and sample size

The study population included 1382 recipients who met the above-mentioned criteria. The sample size was calculated (from the website <https://www.surveysystem.com/sscalc.htm>) using the confidence level of 95% and patient population ($n = 1382$) and the calculation showed that minimum of 301 individuals were required for evaluation in the present study. We interviewed 320 recipients in the present study considering the proportion of the recipients with missing data. Of those, the 316 recipients who answered the questionnaire forms accurately were included in the present study.

Inclusion and exclusion criteria

LT recipients who were discharged that were equal to or greater than 18 years old, who can communicate verbally, and understand and answer the questions were included in the present study. At the time of this study, LT was not performed for patients with intellectual disability in our liver transplant institute. Foreigners who lacked sufficient Turkish to answer the questions and recipients younger than 18 years were excluded from the study.

Parameters and scales used in the study

Demographic and clinical characteristics form: Age, gender, marital status, blood type, residency (city center, town, or village), monthly income [≤ 1000 Turkish liras (TL), 1000-3000 TL, ≥ 3000 TL], underlying liver disease (hepatitis B, hepatitis C, HCC *etc.*), type of LT (living donor LT, deceased donor LT), smoking status, alcohol consumption, type of immunosuppressive agent that is being used (tacrolimus, everolimus, cyclosporin, mycophenolate mofetil, corticosteroids, *etc.*), presence of postoperative biliary complications, co-morbidities (cardiac, pulmonary, metabolic *etc.*), and the frequency of the out-patient visits [monthly or once in every 3 mo (quarterly)] were all evaluated for the present study.

BDS: BDS is designed to evaluate how the individual feels about one-self that was defined by Beck *et al*[20] for the first time in 1961. Hisli[21] evaluated the validity and reliability of the Turkish version in 1989 (Cronbach's alpha = 0.80). BDS includes 21 articles that are scored between 0 and 3 points. The scores obtained from BDS range between 0 and 63 points and it evaluates the presence and the severity of depression in individuals. The severity of depression according to the scores of the individuals are minimal depression (0-9 points), mild depression (10-16 points), moderate depression (17-29 points), and severe depression (30-63 points)[22].

STAI: STAI was first defined by Spielberger *et al*[23] in 1970 to define the reaction of individuals with newly-developed or pre-existent anxiety. The validity and reliability of the scale was performed by Oner and LeCompte in 1983[24]. The Cronbach's alpha reliability coefficient for instantaneous and continuous anxiety scores calculated were 0.96 and 0.83, respectively[24]. The scale includes STAI Form-I (State) and STAI Form-II (Trait) parts. The first part of the form evaluates the recent anxiety status of the individual and the later part of the form evaluates the general anxiety status of the patient. The answers to the first part of the form are as follows: not at all (= 1), somewhat (= 2), moderately so (= 3), and very much so (= 4). The answers to the second part of the form are as follows: almost never (= 1), sometime (= 2), often (= 3), and almost always (= 4). In the STAI-I scale questions 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 are graded inversely (1 = 4 points, 2 = 3 points, 3 = 2 points, and 4 = 1 points). The other questions are graded directly (1 = 1 points, 2 = 2 points, 3 = 3 points, 4 = 4 points). In a similar fashion, in the STAI-II scale, 21, 26, 27, 30, 36, and 39th questions are graded inversely as explained before. At the end of evaluation, the anxiety is classified as high if the points are high; and is considered as low if the points are low. The total points from the instantaneous and the continuous parts is also helpful for the diagnosis of anxiety. If the total points are ≥ 35 points, this indicates the presence of anxiety and if the total points are < 35 , this suggests that there is no anxiety in the patients[24,25].

SCAS: SCAS was first developed in 1979 by Kearney and Fleischer[26] to evaluate the self-care ability of individuals. The validation of the Turkish version in healthy subjects was performed by Nahcivan[27] in 1993 (Cronbach's alpha = 0.89). All 35 questions in the questionnaire are designed in a five-point Likert scale: It does not define me at all (= 0), it does not define me entirely (= 1), I have no idea (= 2), it defines me a little (= 3), and it defines me completely (= 4). In the questionnaire, the question 6, 9, 13, 19, 22, 26, and 31 are graded inversely (0 = 4 points, 1 = 3 points, 2 = 2 points, 3 = 1 points, 4 = 1 points). The other questions are graded directly (0 = 1 points, 1 = 1 points, 2 = 2 points, 3 = 3 points, 4 = 4 points). Maximum points obtained from the scale can be 140, and higher scores indicate higher self-care ability.

Statistical analysis

All statistical analyses are performed by Statistical Software Package for Social Sciences (SPSS v. 25). The Kolmogorov-Smirnov test was used to evaluate the normality of distribution of the variables. Some of the variables did not distribute normally and, therefore, all the continuous variables were expressed as median and interquartile range (IQR = Q3-Q1). Qualitative variables were expressed as the number of affected individuals (*n*) and percentage (%). Two-independent groups were compared using the Mann-Whitney *U* test, Pearson Chi-Square test, and Chi-Square test with Yates correction. For three-independent group comparisons, the Chi-Square test was used for qualitative variables and the Kruskal-Wallis test was used for continuous variables. For parameters that showed significant differences in the Kruskal-Wallis test, these parameters were further evaluated with Kruskal-Wallis One-way ANOVA (*k* sample) to determine the source of difference among the multiple groups. The correlation between the discrete variables was evaluated using Spearman's Rho correlation analysis. The correlation between the qualitative and quantitative variables were evaluated using the Point Double-Series Correlation Coefficient. Partial correlation analysis was performed to evaluate the individual contribution of variables to the correlation. The Correlation coefficient (*r*) was classified according to the power of the correlation; as defined before: very weak (*r* = 0.00-0.25), weak (*r* = 0.00-0.25), moderate (*r* = 0.50-0.69), high (*r* = 0.70-0.89), and very high (*r* = 0.90-1.00). Any *P* value less than 0.05 was considered as being statistically significant.

RESULTS

A total 316 patient with an age ranging from 18 to 76 years (median = 50, IQR = 58-36) were included in the present study. There were 189 (59.8%) male and 127 (40.2%) female patients included in the study. The demographic and sociocultural characteristics, clinical characteristics related with LT, and data regarding self-care ability, depression and anxiety status of the recipients are summarized in Tables 1-3.

Table 1 Sociodemographic characteristics of the study group

Parameters	n	%
Gender		
Female	127	40.2
Male	189	59.8
Age (yr)		
Median	50	
IQR	58-36	
BMI (kg/m ²)		
Median	25	
IQR	28-22	
Marital status		
Married	245	77.5
Unmarried	58	18.4
Divorced	13	4.1
Residency		
City Center	175	55.4
Town	106	33.5
Village	35	11.1
Levels of education		
Unschool	48	15.2
Primary school	156	49.4
Secondary school	23	7.3
High school	61	19.3
Bachelor's degree or more	28	8.9
Career		
Housewife	90	28.5
Employed	27	8.6
Retired	78	24.7
Tradesman	40	12.7
Unemployed	81	25.6
Monthly income (Turkish liras)		
≤ 1000	18	5.7
1000-3000	260	82.3
≥ 3000	38	12.0
Chronic disease (except liver disease)		
Yes	113	35.8
No	203	64.2
Smoking (pre-LT)		
Yes	127	40.2
No	189	59.8
Smoking (post-LT)		
Yes	12	3.8

No	304	96.2
Alcohol use (pre-LT)		
Yes	37	11.7
No	279	88.3
Alcohol use (post-LT)		
Yes	7	2.2
No	309	97.8

BMI: Body mass index; IQR (Q3-Q1): Inter-quartile range.

Evaluation of the patients according to the presence of biliary complications

The recipients were classified into two groups according to presence ($n = 200$) and absence ($n = 116$) of biliary complications. Body mass index ($P = 0.038$), type of liver graft ($P < 0.001$), SCAS ($P = 0.002$), and STAI-I ($P = 0.004$) were significantly different among the groups. In recipients with biliary complications SCAS scores were found to be low and STAI-I scores were high. The median BDS scores did not significantly change. However, when the BDS scores were classified, there was a significant difference among the recipients with and without biliary complications ($P = 0.04$). The moderate to severe depression rate was higher in recipients with biliary complications. Total STAI scores were classified according to the anxiety of the recipients and the severity of anxiety was higher in recipients with biliary complications (57.5%, $P = 0.009$). There was no statistically significant difference in other variables according to the presence of biliary complications (Table 4).

Evaluation of the patients according to the presence of HCC

The recipients were classified according to presence ($n = 32$) or absence ($n = 284$) of HCC (Table 5). SCAS ($P = 0.006$), BDS ($P = 0.003$), and STAI-II scores ($P = 0.009$) were significantly different among recipients with and without HCC. While mild and moderate depressive symptoms were more pronounced in recipients with HCC, minimal depressive symptoms were higher in recipients without HCC. Other variables showed no difference according to presence or absence of HCC (Table 5).

Evaluation of the patients according to monthly income

The recipients were grouped in to three groups according to their monthly income (TL): ≤ 1000 ($n = 18$), 1000-3000 ($n = 260$), and ≥ 3000 ($n = 38$) (Table 6). There were significant differences in gender ($P < 0.001$), place or residence ($P = 0.002$), BDS scores ($P < 0.001$), and STAI-II scores ($P = 0.003$) among groups. In recipients with monthly income ≥ 3000 TL, the depressive symptoms were minimal; while, in recipients with low income, higher rates of mild and moderate depressive symptoms were observed. Other parameters did not show difference according to income of the recipients (Table 6).

Evaluation of the patients according to their inclination towards recommendation of LT to others

The recipients were grouped according to their preference of recommending ($n = 285$) or not recommending ($n = 31$) LT to others. The groups showed statistically significant difference in terms of SCAS ($P = 0.002$), BDS scores ($P < 0.001$), STAI-I ($P = 0.02$), and STAI-II scores ($P < 0.001$). In the group of recipients that do not recommend LT to others, about half of the individuals had moderate to severe depressive symptoms which was significantly higher than the recipients in the group that do recommend LT (48.5% vs 11.6%; $P < 0.001$). All STAI scores were stratified according to the anxiety of the recipients and the rate of anxiety was significantly higher in recipients in the group that do not recommend LT (100% vs 85.6%; $P = 0.021$). There was no significant difference in other variables according to inclination towards recommending or not recommending LT to others (Table 7).

Evaluation of the patients according to frequency of out-patient clinic visits

The data of the 264 LT recipients that come to out-patient clinic monthly were compared to 52 recipients who come to out-patient visits quarterly. Age ($P = 0.047$) and BDS scores ($P = 0.028$) showed significant difference among the groups. The

Table 2 Clinical characteristics of the study group associated with liver transplantation

Parameters	<i>n</i>	%
Underlying liver disease		
HBV	157	49.7
Cryptogenic	25	7.9
HCC	32	10.1
Wilson	15	4.7
HCV	19	6.0
Autoimmune	22	6.9
Others	46	14.5
Type of LT		
LDLT	291	92.1
DDLT	25	7.9
Biliary complications		
Presence	200	63.3
Absence	116	36.7
Antiviral agents use (HBV/HCV)		
Yes	196	62.0
No	120	38.0
Ursodeoxycholic use		
Yes	229	72.5
No	87	27.5
Tacrolimus use		
Yes	286	90.5
No	30	9.5
Everolimus use		
Yes	108	34.2
No	208	65.8
Corticosteroid use		
Yes	96	30.4
No	220	69.6
Mycophenolate mofetil use		
Yes	212	67.1
No	104	32.9
PPI Inhibitors use		
Yes	314	99.4
No	2	0.6
Inclination towards recommendation of LT to others		
I recommend	285	90.2
I do not recommend	31	9.8
Frequency of out-patient visits		
Monthly	264	83.5
Quarterly	52	16.5

DDLT: Deceased donor liver transplantation; HBV: Hepatitis B virus; HCC: Hepatocellular carcinoma; HCV: Hepatitis C virus; LDLT: Living donor liver transplantation; LT: Liver transplantation.

Table 3 Evaluation of the Study group according to the scores obtained Self-Care Agency Scale, Beck Depression Scale and State-Trait Anxiety Scale

Parameters	Results
SCAS scores	
Median	95
IQR	108-86
BDS scores	
Median	9
IQR	14-5
STAI-I (state) scores	
Median	35
IQR	41-28
STAI-II (trait) scores	
Median	42
IQR	50-36
STAI-I (state) (categorized form)	
Presence anxiety (≥ 35 point)	164 (51.9)
Absence anxiety (< 35 point)	152 (48.1)
STAI-II (trait) (categorized form)	
Presence anxiety (≥ 35 point)	275 (87.0)
Absence anxiety (< 35 point)	41 (13.0)
BDS (categorized form)	
Minimal depression (0-9 point)	183 (57.9)
Mild depression (10-16 point)	85 (26.9)
Moderate depression (17-29 point)	45 (14.2)
Severe depression (30-63 point)	3 (0.9)

BDS: Beck Depression Scale; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale.

moderate depression rate of the recipients that come to monthly controls were significantly higher (16.7% *vs* 1.9%; $P = 0.004$). Other variables did not show significant difference according to the frequency of out-patient clinical visits (Table 8).

The results of correlation statistics between the scales

SCAS and BDS showed a significant but weak and negative correlation ($P < 0.001$; $r = -0.340$). There was also a significant but weak and negative correlation between SCAS and STAI-I scales ($P < 0.001$; $r = -0.473$) and SCAS and STAI-II scales ($P < 0.001$; $r = -0.391$). There was a significant but weak positive correlation between BDS and STAI-I scores ($P < 0.001$; $r = +0.498$) and between BDS and STAI-II scores ($P < 0.001$; $r = +0.455$). There was a significant, moderate, and positive correlation between STAI-I and STAI-II scores ($P < 0.001$; $r = +0.539$). The impact of presence of biliary complications, HCC, and the frequency of out-patient clinic visits on correlations observed between STAI-I, STAI-II, BDS, and SCAS scores were further analyzed using partial correlation analyses techniques which showed that the correlation between different scales were independent from the factors that were investigated.

Table 4 Comparison of various characteristics of the study group according to presence of postoperative biliary complications

Parameters	Biliary complications (+) (n = 200)	Biliary complications (-) (n = 116)	P value
Age (yr)			0.126
Median	48	53	
IQR	56-36	60-40	
Gender (%)			0.533
Female	83 (41.5)	44 (37.9)	
Male	117 (58.5)	72 (62.1)	
BMI (kg/m ²)			0.038
Median	26	25	
IQR	28-22	27-22	
Type of LT			< 0.001
LDLT	194 (97)	97 (83.6)	
DDLT	6 (3)	19 (16.4)	
SCAS scores			0.002
Median	94	98	
IQR	108-82	107-89	
BDS scores			0.375
Median	9	9	
IQR	15-5	12-7	
STAI-I (state) scores			0.004
Median	37	32	
IQR	43-29	41-27	
STAI-II (trait) scores			0.454
Median	42	42	
IQR	50-36	54-37	
BDS (categorized form)			0.040
Minimal depression	114 (57)	69 (59.5)	
Mild depression	52 (26)	33 (28.4)	
Moderate depression	34 (17)	11 (9.5)	
Severe depression	0(0)	3 (2.6)	
STAI-I (state)			0.009
Presence anxiety	115(57.5)	49(42.2)	
Absence anxiety	85(42.5)	67(57.8)	
STAI-II (trait)			1.000
Presence anxiety	174 (87.0)	101 (87.1)	
Absence anxiety	26 (13.0)	15 (12.9)	

BDS: Beck Depression Scale; BMI: Body mass index; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale.

DISCUSSION

With the advances in surgical techniques, perioperative patient management, the treatment of postoperative complications with minimally invasive methods, and the development of targeted immunosuppressive treatment protocols with fewer side effects, significant reductions in mortality and morbidity rates have been achieved in

Table 5 Comparison of various characteristics of the study group according to presence of hepatocellular carcinoma

Parameters	HCC (+) (n = 32)	HCC (-) (n = 284)	P value
Age (yr)			0.195
Median	52	50	
IQR	59-44	58-36	
BMI (kg/m ²)			0.063
Median	26	25	
IQR	29-23	28-22	
Gender (%)			1.000
Female	13 (40.6)	114 (40.1)	
Male	19 (59.4)	170 (59.9)	
Biliary complications			0.147
Presence	16 (50)	184 (64.8)	
Absence	16 (50)	100 (35.2)	
SCAS scores			0.006
Median	92	96	
IQR	95-68	108-86	
BDS scores			0.003
Median	13	9	
IQR	17-8	13-5	
STAI-I (state) scores			0.856
Median	34	35	
IQR	50-26	41-28	
STAI-II (trait) scores			0.009
Median	45	42	
IQR	56-39	50-36	
BDS (categorized form)			0.004
Minimal depression	10 (31.3)	173 (60.9)	
Mild depression	12 (37.5)	73 (25.7)	
Moderate depression	10 (31.3)	35 (12.3)	
Severe depression	0 (0)	3 (0.9)	
STAI-I (state) (categorized form)			0.968
Presence anxiety	16 (50)	148 (52.1)	
Absence anxiety	16 (50)	136 (47.9)	
STAI-II (trait) (categorized form)			0.402
Presence anxiety	30 (93.8)	245 (86.3)	
Absence anxiety	2 (6.2)	39 (13.7)	

BDS: Beck Depression Scale; BMI: Body mass index; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale.

patients who received LT during the last quarter century[8]. The 1- and 5-years survival rates of the patients following LT were 85%-86% and 68%-74%, respectively [28]. On the other hand, together with the long-term survival rates obtained, the QOL of the recipients started to become one of the major concerns for both the physicians and the relatives of the recipients[8].

Table 6 Comparison of various characteristics of the study group according to monthly income

Parameters	≤ 1000 TL (n = 18)	1000-3000 TL (n = 260)	≥ 3000 TL (n = 38)	P value
Age (yr)				0.921
Median	44	51	50	
IQR	60-30	58-36	57-43	
Gender (%)				< 0.001
Female	13 (72.2)	107 (41.2)	7 (18.4)	
Male	5 (27.8)	153 (58.8)	31 (81.6)	
Residency (%)				0.002
City center	12 (66.7)	131 (50.4)	32 (84.2)	
Town	4 (22.2)	96 (36.9)	6 (15.8)	
Village	2 (11.1)	33 (12.7)	0 (0)	
SCAS scores				0.119
Median	94	94	97	
IQR	109-86	105-86	112-87	
BDS scores				< 0.001
Median	9	9	6	
IQR	16-5	15-6	9-3	
STAI-I (state) scores				0.106
Median	35	35	33	
IQR	46-26	42-28	41-25	
STAI-II (trait) scores				0.003
Median	48	42	39	
IQR	52-43	50-36	45-36	
BDS (categorized form)				0.004
Minimal depression	10 (55.6)	139 (53.5)	34 (89.5)	
Mild depression	4 (22.2)	78 (30)	3 (7.9)	
Moderate depression	4 (22.2)	40 (15.4)	1 (2.6)	
Severe depression	0 (0)	3 (1.2)	0 (0)	

BDS: Beck Depression Scale; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale; TL: Turkish liras.

According to the World Health Organization (WHO), healthy individual is not only free of disease or disability but also defined as a state of psychological and physical well-being[8-10]. From this WHO's perspective, technical and medical success following LT does not necessarily indicate health of the individual; the recipients should also be in the acceptable range of well-being in psychosocial terms as well. For this reason, physicians should also aim to mediate the factors that affect the psychosocial QOL of the individuals following the LT procedures. In the last two decades the studies regarding the QOL of the living donors and recipients after LT have increased tremendously[8,29-33].

Biliary complications are frequently encountered following LT and especially after living donor LT[34,35]. The treatment involves a combination of surgical therapy and endoscopic or interventional radiology assisted percutaneous stenting or catheter placement[36-39]. These complications result in prolonged hospitalization, repeated interventions, and frequent outpatient clinic visits. Therefore, the QOL of the recipients with biliary complications are expected to be lower than recipients without biliary complications[6,40-42]. We have seen that there are no studies analyzing the relationship between biliary complications and the QOL of the recipients. The majority of the published studies state that the biliary complications that develop can adversely

Table 7 Evaluation of the study group according to their inclination towards recommendation of liver transplantation to other patients

Parameters	I recommend (n = 285)	I do not recommend (n = 31)	P value
Age (yr)			0.519
Median	51	50	
IQR	58-36	62-40	
Gender (%)			1.000
Female	115 (40.4)	12 (38.7)	
Male	170 (59.6)	19 (61.3)	
Residency (%)			0.551
City center	155 (54.4)	20 (64.5)	
Town	98 (34.4)	8 (25.8)	
Village	32 (11.2)	3 (9.7)	
Biliary complications			0.660
Presence	182 (63.9)	18 (58.1)	
Absence	103 (36.1)	13 (41.9)	
SCAS scores			0.002
Median	95	74	
IQR	108-87	101-69	
BDS scores			< 0.001
Median	9	15	
IQR	13-5	29-9	
STAI-I (state) scores			0.020
Median	35	42	
IQR	41-28	51-27	
STAI-II (trait) scores			< 0.001
Median	42	49	
IQR	50-36	53-43	
BDS (categorized form)			< 0.001
Minimal depression	173 (60.7)	10 (32.3)	
Mild depression	79 (27.7)	6 (19.4)	
Moderate depression	33 (11.6)	12 (38.7)	
Severe depression	0 (0)	3 (9.8)	
STAI-I (state) (categorized form)			0.095
Presence anxiety	143 (50.2)	21 (67.7)	
Absence anxiety	142 (49.8)	10 (32.3)	
STAI-II (trait) (categorized form)			0.021
Presence anxiety	244 (85.6)	31 (100)	
Absence anxiety	41 (14.4)	0 (0.0)	

BDS: Beck Depression Scale; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale.

affect the QOL of the recipients[6,8,40]. In the present study, the self-care ability of the recipients with biliary complications was found to be low ($P = 0.002$) and the instantaneous anxiety index was found to be increased ($P = 0.004$). Furthermore, in recipients with biliary complications, 17% showed moderate depression and 57.5% showed signs

Table 8 Comparison of various characteristics of the study group according to frequency of out-patient clinic visits

Parameters	Monthly control (n = 264)	Quarterly control (n = 52)	P value
Age (yr)			0.047
Median	52	44	
IQR	58-38	56-29	
Gender (%)			1.000
Female	106 (40.2)	21 (40.4)	
Male	158 (59.8)	31 (56.9)	
Residency (%)			0.077
City center	150 (56.8)	25 (48.1)	
Town	82 (31.1)	24 (46.2)	
Village	32 (12.1)	3 (5.8)	
SCAS scores			0.664
Median	95	94	
IQR	108-86	108-87	
BDS scores			0.028
Median	9	9	
IQR	15-6	10-3	
STAI-I (state) scores			0.728
Median	35	38	
IQR	41-28	44-29	
STAI-II (trait) scores			0.519
Median	42	40	
IQR	50-36	50-36	
BDS (categorized form)			0.004
Minimal depression	147 (55.7)	36 (69.2)	
Mild depression	72 (27.3)	13 (25)	
Moderate depression	44 (16.7)	1 (1.9)	
Severe depression	1 (0.4)	2 (3.8)	
STAI-I (state) (categorized form)			0.360
Presence anxiety	134 (50.8)	30 (57.7)	
Absence anxiety	130 (49.2)	22 (42.3)	
STAI-II (trait) (categorized form)			0.506
Presence anxiety	228 (86.4)	47 (90.4)	
Absence anxiety	36 (13.6)	5 (9.6)	

BDS: Beck Depression Scale; IQR (Q3-Q1): Inter-quartile range; SCAS: Self-Care Agency Scale; STAI: State-Trait Anxiety Scale.

of instantaneous anxiety. In our opinion, this observation can be explained by prolonged hospitalization, pain and discomfort that is caused by percutaneous catheter placement, the fear of losing the transplanted organ, and the necessity of frequent outpatient clinic visits.

Another factor that has a major impact on the QOL is the presence of HCC diagnosis before the LT. Mabrouk *et al*[43] have stated that the QOL parameters in recipients transplanted for HCC were significantly worse than that of the recipients transplanted for other etiologies; the reason for this was correlated with anxiety related with the probability of a recurrence of the HCC in the post-LT period. On the

other hand, Castaldo *et al*[44] suggested that the diagnosis of HCC had a positive impact on the physical and mental components of QOL for the recipients. On the other hand, Heits *et al*[45] have found no relation between HCC and QOL parameters. In Europe and the United States, recipients with HCC receive additional points during the waiting list and recipients are transplanted in early disease stages, which results in a favorable prognosis compared to recipients without HCC. In the present study, in patients with HCC, the self-care ability was low ($P = 0.006$) while depression ($P = 0.003$) and continuous anxiety indices ($P = 0.009$) were higher than recipients without HCC. Furthermore, 31.3% of the patients with HCC had signs and symptoms of moderate depression. We agree with the Mabrouk *et al*[43] regarding this issue; however, we believe that the negative effect on the QOL parameters should be further investigated regarding the impact of HCC diagnosis and the cumulative effect of the various other factors on this outcome. The cadaveric organ donations in Turkey are significantly lower than that of the developed western countries, and, for this reason, the recipients with HCC have almost no chance for deceased donor LT and the majority need a living liver donation from a family member or a relative[46]. Therefore, the patients have to live with HCC for a period of time before the LT, with some patients requiring bridging procedures, such as chemoembolization, radioembolization, microwave or radiofrequency ablation, and surgical resection. This prolonged and hard waiting period may be the cause of the adverse effects observed on the QOL parameters in the post-LT period.

Other important factors that have an impact on the QOL of the recipients following LT is the income and the frequency of the required out-patient clinic visits of the recipients. The studies have shown that the recipients taking long journeys to come for an out-patient control visit had detrimental economical consequences and reduction in QOL of the recipients[47]. Furthermore, the prolonged hospitalization and frequent hospital visits delay the time to return to work, which reduce the household income. This will inevitably result in psychosocial problems in the recipients. Previous studies from our institute have shown that families of pediatric recipients with a low incomes experienced severe social and economic problems following the transplant procedure [48]. In the present study, we have shown that as the monthly income increased, the parameters related with depression ($P < 0.001$) and continuous anxiety indices ($P = 0.003$) decreased significantly. The symptoms related with moderate depression was observed in 22.2% of the patients with a monthly income lower than 1000 TL; on the other hand, patients with 1000-3000 TL and ≥ 3000 TL had moderate depression rate of 15.4% and 2.6%, respectively ($P = 0.004$). Similarly, the depression level of the recipients who were required to attend frequent visits to the out-patient clinic were significantly higher than recipients who only had to attend quarterly ($P = 0.028$). In other words, 22.2% of the patients that had to come to out-patient clinic monthly showed signs and symptoms of moderate depression ($P = 0.004$).

Immunosuppressive drugs that are being used to prevent organ rejection also have a significant impact on the QOL of the recipients. Zaydfudim *et al*[49] have stated that high dose steroid use in recipients have reduced the physical and mental health of the recipients and caused majority of the anxiety related symptoms of the individuals. Lerut[50] stated that reduction or even discontinuation of steroids and other immunosuppressives would eliminate their adverse effects and would increase the QOL of the recipients. In the present study, we found no difference between the Beck's depression score, instantaneous or continuous anxiety indices, and self-care ability of the patients who did or did not use steroids. Braun *et al*[51] have suggested that recipients that are treated with cyclosporin had better QOL when compared to patients treated with tacrolimus. However, there are contradicting studies that show better QOL with tacrolimus treatment when compared to patients that are on cyclosporin treatment[52,53]. In the present study, the type of immunosuppressive (tacrolimus *vs* cyclosporin) did not have significant impact on the BDS, STAI-I, STAI-II, and SCAS scores of the recipients. Similarly, we found no difference in terms of the BDS, STAI-I, STAI-II, and SCAS among the patients who did or did not receive cyclosporin treatment. However, we found that the BDS scores of the recipients that are on tacrolimus therapy were significantly higher ($P = 0.018$) and the SCAS scores ($P = 0.001$) were significantly lower than the recipients that are not receiving tacrolimus therapy. In general, our results suggest that there is no impact of either cyclosporin or tacrolimus on the QOL parameters of the recipients. However, our results regarding the impact of tacrolimus on the self-care abilities of the recipients are original and need to be validated by prospective studies.

The decision to recommend LT to others and its relationship with the QOL parameters requires further analysis. Our review of current literature showed that there are no studies addressing this problem. In the present study, we have found that

the SCAS scores were lower ($P = 0.002$) and BDS ($P < 0.001$), STAI-I ($P = 0.020$), and STAI-II ($P < 0.001$) scores were higher in patients who stated that they would not to recommend LT to others. Furthermore, moderate depression rate and signs of prominent anxiety was present in 38.7% and 100% of the recipients who did not recommend LT to others, respectively. The recipients that did or did not recommend LT did not differ in terms of incidence of biliary complications ($P = 0.660$), presence of HCC ($P = 1.000$), and use of tacrolimus ($P = 0.056$) as immunosuppressive treatment. However, 36.1% of the recipients that did recommend LT and 16.1% of the recipients that did not recommend LT were using everolimus ($P = 0.042$). Patients that do or do not use everolimus did not significantly differ in terms of depression, anxiety, and self-care ability. Therefore, our results need validation and further analyses by studies that will be conducted in future.

CONCLUSION

Biliary complications cause depression, reduced self-care ability, and cause anxiety in patients after LT. This has a major impact on the QOL of the recipients. HCC reduces the QOL by increasing depression and anxiety and reducing self-care ability of the recipients. These recipients have HCC that exceed the acceptable limits in the preoperative period, and they receive multiple procedures to down-stage the tumors. This results in frustration and concerns of recurrence of the tumor in the postoperative period. The monthly income and frequent out-patient clinic visits have a significant impact on the QOL of the recipients. The recipients and their relatives cannot return to work until they recover fully after the LT procedure. Furthermore, frequent visits to the out-patient clinic further compromise return to work for the recipients which has a major impact on the income of the recipients. All recipients should be examined by psychiatry in the preoperative period and should receive medico-social therapy in necessary situations. Routine postoperative follow-up of the recipients with a psychologist and physiotherapists are very important for physical and mental QOL of the recipients. Transplant centers should also employ physiotherapists and psychologists that will work with specifically with recipients.

ARTICLE HIGHLIGHTS

Research background

Depression, anxiety, and status of self-care ability are among the most important factors affecting the quality of life of patients who have undergone liver transplantation. Depending on the severity of the underlying liver disease, signs and symptoms of anxiety and depression may become more pronounced.

Research motivation

Depression, anxiety, and deficiency in self-care ability are among the most important factors affecting the quality of life of liver transplant recipients. This descriptive, cross-sectional questionnaire-based study shows that presence of biliary complications and hepatocellular carcinoma, low monthly income level, and monthly visits to the outpatient clinic are factors that are found to affect self-care capability, depression, and anxiety.

Research objectives

The main objective of this study is to analyze the relationship between sociodemographic characteristics, presence of biliary complications, presence of hepatocellular carcinoma, preference of recommendation of liver transplantation to others, and frequency of out-patient clinic control, and some post-transplant quality of life indicators (depression, anxiety, self-care ability).

Research methods

This study is descriptive, cross-sectional questionnaire-based study on patients transplanted between 2002 and 2018 at our Liver Transplant Institute. The recipients who were discharged that were equal to or greater than 18-years-old and who can communicate verbally and understand and answer the questions were included in the present study. We interviewed 320 liver transplant recipients in the present study

considering the proportion of the recipients with missing data. Of those, 316 recipients who answered the questionnaire forms accurately were included in the present study. The dependent variables were Beck Depression Scale, State-Trait Anxiety Scale (Form I and II) and Self-Care Agency Scale. The independent variables of the study were sociodemographic characteristics, biliary complications, hepatocellular carcinoma, recommending liver transplantation to other patients, and the interval of out-patient clinic visits.

Research results

Self-care ability scores were lower and anxiety scores were higher in recipients with biliary complications. On the other hand, in recipients with hepatocellular carcinoma, self-care scores were lower and depression and anxiety scores were higher. In liver transplantation recipients with a monthly income < 3000 Turkish liras had higher depression and anxiety scores. The recipients who stated that they would not recommend liver transplantation to others had lower self-care scores and higher depression, state anxiety, and trait anxiety scores.

Research conclusions

Presence of biliary complications and hepatocellular carcinoma, low income level, and an obligation monthly visits to the outpatient clinic are factors that are found to affect self-care capability, depression and anxiety.

Research perspectives

To our knowledge, this study is one of the most comprehensive studies examining the relationships between post liver transplant quality of life indicators and various clinical parameters.

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