

The relationship between transplant-related variables and the psychological problems of liver transplant recipients

A cross-sectional, observational cohort study

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DUTCH SUMMARY

Titel

De relatie tussen transplantatie-gerelateerde variabelen en psychologische problemen bij lever transplantatie patiënten.

Inleiding - Een groot aantal lever transplantatie patiënten ervaren psychologische gezondheidsproblemen als depressie, angst en posttraumatische stress, beïnvloed door persoonlijke karakteristieken, demografische variabelen en variabelen gerelateerd aan het transplantatieproces. Het is van belang voor verpleegkundigen om inzicht te krijgen in deze psychologische problemen en de beïnvloedende factoren, om hier vroegtijdig te herkennen en te behandelen.

Doel en Onderzoeksvraag - Het doel van deze studie was het bepalen van de prevalentie van symptomen van angst, depressie en posttraumatische stress bij lever transplantatie patiënten drie maanden na transplantatie en het onderzoeken van de relatie tussen transplantatie-gerelateerde variabelen en deze psychologische problemen.

Methode – In deze studie is een cross-sectionele analyse uitgevoerd op data verkregen uit vragenlijsten (STAI, CES-D en SRIP) drie maanden na transplantatie en transplantatie-gerelateerde variabelen, verkregen via medisch dossiers.

Resultaten - In deze studie ervoer 30.7% (n=42) van de transplantatie patiënten symptomen van angst, 22.6 % (n=31) depressieve symptomen en 19.7% (n=27) symptomen van posttraumatische stress drie maanden na transplantatie. Onafhankelijke associaties zijn gevonden met leeftijd ten tijde van de transplantatie ($r=-0.23$ tot $r=-0.32$, $p=.005$) en de periode van ziekte voor de transplantatie ($r=-0.17$ tot $r=-0.22$, $p=.005$) en alle drie psychologische problemen.

Conclusie – In tegenstelling tot andere studies is er in deze studie geen relatie gevonden tussen transplantatie-gerelateerde variabelen (per en postoperatieve complicaties) en de angst, depressie en posttraumatische stress, wat kan betekenen dat andere variabelen een meer significante rol kunnen spelen in het ontstaan van psychologische problemen vlak na transplantatie.

Aanbevelingen – Vervolgonderzoek is nodig om het gecombineerde effect van demografische variabelen, persoonlijke kenmerken, en transplantatie gerelateerde variabelen op psychische problemen na transplantatie verder te onderzoeken op de lange termijn.

Trefwoorden – *Lever transplantatie patiënten, transplantatie-gerelateerde variabelen, angst, depressie, posttraumatische stress*

ENGLISH ABSTRACT

Title - The relationship between transplant-related variables and the psychological problems of liver transplant recipients.

Background - A considerable number of liver transplant recipients experience psychological health problems as depression, anxiety and posttraumatic stress influenced by demographic, personal and transplant-related variables. It is important for health care workers to gain insight in the development of the psychological problems after transplantation in order to recognize and subsequently treat these at an early stage.

Aim - The aim of this study was to determine the prevalence of anxiety, depression and posttraumatic stress of liver transplant recipients three months after transplantation and to examine transplant-related factors associated with the psychological problems.

Method – A cross-sectional analysis was performed on data of psychological problems assessed by questionnaires (STAI, CES-D and SRIP) at three months after transplantation, and data regarding transplant-related variables (retrieved through medical record review).

Results - In this study 30.7% (n=42) of the 137 participating transplant recipients showed symptoms of anxiety, 22.6 % (n=31) depressive symptoms, and 19.7% (n=27) symptoms of posttraumatic stress. Evidence was found that age at transplant ($r=-0.23$ to $r=-0.32$, $p=.005$) and the period of illness before the transplant ($r=-0.17$ to $r=-0.22$, $p=.005$) are associated with all three psychological problems.

Conclusion - In contrary to other studies, transplant-related variables (per and postoperative complications) were not associated, meaning that other variables could play a more significant role at the onset of early post transplant psychological problems.

Recommendations - Further investigation should focus on the long-term influence of transplant-related variables on the development of psychological problems after transplantation over time. Also the exploration of the combined effect of demographic variables, personal characteristics, and transplant-related variables on the psychological problems after transplantation is suggested.

Keywords - *Liver transplant recipients, transplant-related variables, anxiety, depression, posttraumatic stress*

INTRODUCTION AND RATIONALE

Liver transplantation is a lifesaving treatment and prolongs the life expectancy for patients with end stage liver disease. In the Netherlands, approximately 145 patients receive a liver transplant per year.¹

Improvements in surgical techniques, post transplant intensive care and immunosuppressive medications have led to a higher survival rate and a better physical recovery after transplantation.² Moreover, studies have shown a significant improvement of the perceived health-related quality of life after organ transplantation.^{3,4} However, meta-analysis has shown that the quality of life of organ transplant recipients improves, but does not reach the level of the general population. Especially improvements in psychological health after liver transplantation are small, yet not significant.⁵ Liver transplant recipients have shown to score significantly lower in mental health, when compared to healthy controls.⁶

Since the overall survival rate after transplantation has increased, but considerable number of patients suffer from psychological problems after transplantation, the psychological impact of organ transplantation has become a primary target of investigation. For healthcare workers, especially nurse specialists involved in the care of transplant recipients, it is important to learn more about the prevalence of psychological problems, such as anxiety, depression, and posttraumatic stress (PTS) and variables associated with these problems.

Studies have shown that respectively 40.5% of solid organ transplant recipients developed a clinically significant level of depression, anxiety, or other psychological distress after transplant.⁷ Other studies confirm this by showing that 33.2% of the transplant recipients reported the presence of anxiety symptoms, 46.2% showed high to severe levels of stress and 33.6% had mild to moderate depressive symptoms after transplantation.⁸

Given the life-and-death consequences of transplantation and the often long waiting time for a donor organ, recipients may also experience psychological trauma. This may result in a (transplant-related) posttraumatic stress disorder (PTSD-T). In liver transplant recipients a prevalence rate for PTSD of 9.6% in the first year after transplant was found and was significantly associated with decreased quality of life.⁹

Variables that are related to the deterioration of psychological health post transplantation can be divided into the following categories: demographic variables, personal characteristics, and transplant-related variables. Demographic variables such as age, marital status, low income,

low education, and unemployment, causes distress and may lead to clinically relevant symptom levels of depression and anxiety.¹⁰⁻¹⁴

Other studies have shown that an increased risk for psychological problems after transplantation can be further increased by personal characteristics such as social support and coping strategies.¹⁵⁻¹⁷

Risk factors stated above are more of a general nature and also apply to the general population. Furthermore, there are specific characteristics related to the transplant process described in the literature, that also increase the risk for poorer psychological outcomes, such as recipients' physical health and physical functioning, side effects of immunosuppressive drugs, higher Model for End-stage Liver Disease (MELD) scores and the development of medical complications.^{9,18} In addition, there are risk factors identified before transplantation such as a prolonged waiting time and the primary liver disease that further increases distress, depression, anxiety and uncertainty with respect to the life-threatening disease/medical condition of the patients and may play a role after transplantation as well.^{19,20}

However, many studies do not consider a full range of potential transplant-related variables that may predict psychological health outcomes, but each describe (single) specific factors. These studies differ with regard to outcome on psychological health, such as anxiety, depression or PTS. Overall, findings are inconclusive, suggesting that given the variety of risk factors, future research should be focused on examining all potential transplant-related factors per specific psychological problem and per type of organ transplantation. Little is known on the short-term psychological consequences of transplantation and the influence of transplant-related variables on these problems.

Therefore this study will focus on the relationship between transplant-related variables and depression, anxiety and PTS in liver transplant recipients three months after transplantation.

PROBLEM STATEMENT

Studies have shown that a considerable number of liver transplant recipients experience psychological problems such as depression, anxiety, and PTS. Little is known on the association between transplant-related variables and these psychological problems shortly after transplantation.

AIM

The overall aim of this study is to examine the prevalence of anxiety, depression and PTS at the short term after transplantation (three months) and to explore potential transplant-related factors associated with these psychological problems of liver transplant recipients.

Consequently patients at risk for development of psychological problems can be identified at an early stage by the nurse specialist involved in care of transplant recipients and adequately treated to restore psychological health and subsequent the quality of life.

RESEARCH QUESTIONS

Primary research question:

- What is the influence of transplant-related variables on symptoms of depression, anxiety and PTS of liver transplant recipients three months after transplantation?

Secondary research questions:

- What is the prevalence of symptoms of depression, anxiety and PTS of liver transplant recipients three months after transplantation?
- What is the bivariate correlation between transplant-related variables and symptoms of depression, anxiety, and PTS of liver transplant recipients at three months after transplantation?
- Which of the identified variables associated with anxiety, depression and PTS are independently associated with anxiety, depression and PTS in multivariate analysis?

METHODS

Study design

To investigate the prevalence of anxiety, depression and PTS and association of transplant-related variables with symptoms of depression, anxiety and PTS a secondary analysis was performed on data retrieved in the Psychological Aspects of Transplantation (PATx) study. The PATx study is a prospective cohort study among liver transplant recipients from three Dutch liver transplant centers and focuses on the positive and negative psychological consequences of liver transplantation. Participants are followed during the period they are enlisted on the waiting list for a liver transplant and the first two years after transplantation. In the current study, a cross-sectional analysis of data of psychological problems assessed by questionnaires at three months after transplantation, and data regarding transplant-related variables concerning the clinical phase of the transplantation were examined.

Setting and participants

All adult patients enlisted on the waiting list for a liver transplant at University Medical Center Groningen (UMCG), Erasmus Medical Center (ErasmusMC) and Leiden University Medical Center (LUMC) between October 2009 and April 2013 were asked to participate in the PATx study.

Inclusion criteria of the PATx-study were: enlisted on the waiting list for a liver transplant, age \geq 18 years, and receiving pre and posttransplant care at the UMCG, ErasmusMC or LUMC.

Exclusion criteria were: unable to fill in the questionnaires due to physical, psychological, or cognitive function, or due to language barrier.

The medical ethical committee (METC) of the UMCG provided approval for the conduct of the study, and a positive recommendation of local feasibility was obtained from the other transplant centers (METc2009.190).

For the purpose of the PATx study all transplant candidates were invited by letter to participate in the study and received written information together with an informed consent form from their medical specialist. In the informed consent form also permission to obtain information from the patient's medical record was requested.

Subjects of the PATx study could leave the study at any time for any reason if they wish to do so without any consequences. Since this study made use of convenience sampling, replacement of subjects after withdrawal was not relevant.

In the current study all respondents who filled out the questionnaires at three months after transplantation, were included in the analysis.

Demographic data were obtained from the questionnaire completed at baseline of the study.

Measurement instruments

The following measurement scales were used for data collection:

Posttraumatic stress

The Self-rating Inventory for Posttraumatic Stress Disorder (SRIP) is a 22-item self-report questionnaire to measure symptoms of PTSD based on DSM-IV criteria. This scale has been phrased in a trauma-independent way for use with all populations.²¹ The psychometric properties for the SRIP are satisfying: the internal consistency is stated at .92. In a validation study the SRIP showed high sensitivity (.80) and moderately high specificity (.73).²²

Clinically significant symptom levels of PTSD were identified using a cut off value of ≥ 39 on the SRIP scale.²³ In this study a Cronbach's alpha of .90 was obtained using the SRIP.

Depression

The Center for Epidemiological Studies Depression Scale (CES-D) is a short self-report scale, designed to measure current depressive symptomatology and to identify possible cases of depressive disorders.²⁴ The psychometric properties of the CES-D scale have been tested in several populations. These studies supported the reliability and validity of the scale in identifying individuals with depressive symptomatology. The internal consistency is found to be sufficient (between .79 and .92) and the test-retest reliability is adequate (.90).²⁴⁻²⁶ The threshold for diagnosing depression is stated at a score of ≥ 16 on the CES-D Scale.²⁴ In this study reliability analyses showed a Cronbach's alpha of .93.

Anxiety

The State-Trait Anxiety Inventory (STAI) is a self-report scale to measure state and trait anxiety. A six-item short form of the STAI has been constructed and validated. Correlation coefficients greater than .90 were obtained using this six-item short form of the STAI. The Dutch translation of the short form of the STAI-state has proven good reliability and validity and is found to be useful as a quick tool to evaluate the effectiveness of screening programs on anxiety levels.²⁷ The scores are transformed to the original 40-80 scale and participants with a score of ≥ 40 are

suspected of experiencing clinically significant anxiety.²⁸ In this study the Cronbach's alpha was .84.

Comorbidities

A checklist of 20 common medical problems adapted from the health survey of the Dutch central statistics office, Statistics Netherlands, was used to measure comorbidities.²⁹ This checklist included common medical conditions such as pulmonary diseases, heart diseases, stroke, gastrointestinal disorders, kidney function disorder, diabetes mellitus, joint complaints, and cancer. Previous studies suggest that this method of self-reported comorbidity tends to be an accurate representation of actual comorbidity.³⁰ Moreover, it has been found to be applicable in a transplant population.³¹

Transplant-related variables

Transplant-related variables were retrieved from the patient's medical record and recorded on a case record forms (CRF), developed for the PATx study. The following variables were assessed: primary liver disease, encephalopathy before transplantation (yes/no), time on waiting list (months), number of years sick before the transplantation, first transplantation or re-transplantation(s), donor type (heart-beating, non-heart-beating), MELD score pre transplantation, Karnofsky score pre transplantation, length of hospitalization (days), length of stay on Intensive Care Unit (ICU), duration of mechanical ventilation (days), type of immunosuppressive medication, number and type of postoperative complications. The complications were divided into two categories: complications related to the transplanted organ and non-transplant-related variables.

Medical record review yielded a total of 84 different complications. To be able to analyse these data the complications were categorized into larger groups e.g. cardiovascular (hyper- and hypotension, bleeding thorax, vascular problems, neurological (cerebrovascular accident, polyneuropathy, epileptic seizures), pulmonary (pneumonia, bronchitis, stridor), gastrointestinal (e.g. gastrointestinal perforation or bleeding, pancreatitis, nausea), psychological (delirium, depression, anxiety) and renal complications (urinary infection, adrenal adenoma), infections, wound problems, abnormal blood values, ascites production, skeletal complications (e.g. osteoporosis, vertebra and sternum fracture), skin problems(decubitus, skin necrosis) and severe complications (systemic inflammatory response syndrome, septic shock, multi organ failure and collapse).

Demographic variables used in this study are gender, age, living status (with partner or family/alone) and employment status.

Statistical procedures

All statistical procedures were performed using SPSS version 20.0 by IBM for Windows. Descriptive statistics were used to describe data on demographic and clinical characteristics and to establish the prevalence rates of anxiety, depression, and PTS.

A normal Q-Q plot as well as a Kolmogorov-Smirnov test was applied in order to confirm or reject the assumption of normality. Since data was not normally distributed, log transformation was applied.

Pearson's product-moment correlation coefficient was used to determine associations between the transplant-related variables and symptoms of anxiety, depression, and PTS. Multivariate linear regression analysis was used to examine transplant-related variables independently associated with symptoms of anxiety, depression, or PTS. The method used for multivariate linear regression was backward elimination of the variables. Model-explained variation was estimated by the R^2 statistic.

Based on previous studies and literature four confounders were added to the regression analyses: total number of comorbidities revealed by the SCQ questionnaire, age at transplant, gender, and history of psychological problems before transplantation.

These confounding variables were added (only when significantly correlated) to the regression equation in order to analyze if there was a combined effect of two or more independent variables on the dependent variables and to identify if the effect of one variable varied at different levels of the other variables.

A p-value of $<.05$ was considered statistically significant.

RESULTS

Participants

A total of 260 of the 378 eligible patients on the waiting list agreed to participate in the PATx study, of which 155 patients were transplanted before the end of the inclusion period in October 2013. Of these, 137 transplant recipients filled in the questionnaire at three months after transplantation. Of 18 participants data were not available: six respondents/participants died shortly after the transplantation, six r/p were too ill at the time of the measurement and therefore not able to fill in the questionnaire, and six r/p did not return the questionnaire.

Demographics and clinical characteristics of the participants are described in table 1.

The mean age of the sample was 51 years [20-69]. Of the participants, 69% were men, and 77% reported to live with a partner or family. Most participants were diagnosed with Primary Biliary Cirrhosis (37%) and Alcoholic Cirrhosis (23%) as primary liver disease. The participants were on average 5 years sick before they were placed on the waiting list, and had to wait for their transplantation for about 11 months. Medical record review showed that the participants experienced an average of six postoperative complications during hospitalization and only 5.5% of the 137 participants of the study reported having no complications. Most common complications were: bacterial infection (n=104), renal complications (n=55), cardiovascular complications (n=52), pulmonary complications (n=53), gastrointestinal complications (n=41) and ascites production (n=40).

The prevalence rates of the psychological problems three months after transplantation were respectively 30.7% (n=42) for symptoms of anxiety, 22.6 % (n=31) for depressive symptoms, and 19.7% (n=27) for symptoms of PTS.

Since the three psychological problems strongly interrelate (depression and pts: $r=0,682$, $p=.000$), (anxiety and pts: $r=0,537$, $p=.000$), (anxiety and depression: $r=0,658$, $p=.000$), the analyses were performed for each psychological problem separately.

Anxiety

Significant bivariate correlations were found between symptoms of anxiety and the number of years sick ($r=-0.17$, $p=.048$), alcohol liver cirrhosis as primary liver disease ($r= -0.20$, $p= .017$), age at transplant ($r=-0.23$, $p=.007$), type of graft ($r=-0.17$, $p=.044$), whether or not it concerns a

re-transplantation ($r=-0.18$, $p=.041$) and the number of days on mechanical ventilation at the ICU ($r=0.18$, $p=.036$).

The multivariate analysis showed that symptoms of anxiety post transplantation was independently associated with the number of days on mechanical ventilation ($r=0.014$, $p=.029$), the type of graft ($r=-0.180$, $p=.029$) and the number of years sick ($r=-0.012$, $p=.010$). Patients with alcoholic cirrhosis as etiology of the organ failure ($r=-0.149$, $p=.018$) and having a re-transplantation ($r=-0.212$, $p=.012$) showed less symptoms of anxiety. Of the confounding variables added to the equation age at transplant ($r=-0.006$, $p=.017$) and number of comorbidities ($r=0.024$, $p=.087$) were significant.

This regression model accounted for 23.2% of the variance in symptoms of anxiety ($r^2=0.232$).

Depression

Bivariate correlation analyses demonstrated significant correlations between symptoms of depression and number of years sick ($r=-0.20$, $p=.021$), age at transplant ($r=-0.25$, $p=.003$), and psychological problems before transplantation ($r=0.27$, $p=.001$).

Regression analyses resulted in the finding that age ($r=-0.027$, $p=.000$) and number of years sick ($r=-0.041$, $p=.005$) were independently associated with symptoms of depression. Of the confounding variables, the number of comorbidities ($r=0.096$, $p=.043$) and a history of psychological problems ($r=0.523$, $p=.003$) were found to be independently associated with symptoms of depression after transplantation.

The variance in symptoms of depression explained by this model was 20.8% ($r^2=0.208$).

Posttraumatic stress

With regard to symptoms of PTS, significant bivariate correlations were found with the number of years sick ($r=-0.22$, $p=.010$), age at transplant ($r=-0.32$, $p=.000$), the Karnofsky score pre transplantation ($r=-0.19$, $p=0.25$), acute liver failure as primary liver disease ($r=0.17$, $p=.048$), the length of hospitalization in days without ICU duration ($r=0.18$, $p=.035$), severe complications ($r=0.20$, $p=.022$) and psychological problems before transplantation ($r=0.23$, $p=.008$).

Multivariate linear regression analysis showed that the duration of the hospitalization ($r=0.003$ with $p=.002$), age at transplant ($r=-0.008$, $p=.000$) and number of years sick ($r=-0.011$, $p=.001$), were independently associated with PTS symptoms three months after transplantation.

When entering the confounding factors to the model psychological problems prior to transplantation ($r=0.095$, $p=.012$) and the total number of complications ($r=0.018$, $p=.079$) were found to be significantly related with symptoms of PTS. A total of 28.4% ($r^2=0.284$) of the variance of PTS symptoms can be explained by this model. An overview of the results are demonstrated in table 2-7.

DISCUSSION

This study confirms that psychological problems after liver transplantation are common. Prevalence rates in our study population showed that symptoms of anxiety (30.7%), depression (22.6%), and PTS (19.7%) are substantial at three months after transplantation.

An overall finding of the study is that the age at time of transplantation is a protective factor for all three psychological problems. Younger liver transplant recipients are at greater risk to develop anxiety, depression or PTS symptoms three months after transplantation, confirmed also by previous studies. Due to the transplantation, recipients are often unable to work or to succeed in school, which can also cause difficulty in their social life and relationships and therefore likely to cause deterioration of the psychological health.^{10,11}

In line with the findings of other studies, severe complications in particular after liver transplantation, are associated with the occurrence of PTS symptoms.⁹ Pre and postoperative complications after organ transplantation are common and only 5.5% of 137 participants of the study reported an uncomplicated course of the transplant process. Whereas studies regarding other types of organ transplantation specifically report pulmonary complications, renal complications, decreased graft functioning, and rejection episode as risk factors for psychological problems,^{13,14,32,33} no associations of these variables with anxiety, depression and PTS were found in this study. This study showed that other factors, such as number of years sick and comorbidities play a role in the development of psychological problems. Overall, the associations found through bivariate correlation analyses between the transplant-related variables and the psychological problems, although significant, are weak (between $r=0.17$ and $r=0.25$).

A limitation of this study that needs to be addressed is the cross-sectional design, with data collection being limited to the time of transplantation and short-term follow-up, prevents to determine any causal or predictive direction of observed associations, regarding the effect of potential risk factors. Also the analysis of the cross-sectional data does not provide sufficient information for understanding the changes in the severity of symptoms of psychological problems over time. Therefore no strong statements can be made based on the results. This study however provides preliminary findings on associations between transplant-related variables and psychological problems shortly after transplantation.

Although the response rate was positive (89%), the transplant population constitutes a small number of patients and liver transplant recipients with long hospitalization duration, since they were too ill and consequently not able to fill in the questionnaires, were excluded.

Data was obtained from all three transplant centers in the Netherlands, therefore the findings are considered to be representative for the Dutch liver transplant population.

The results of this study stress the importance of health care workers to be aware of the high prevalence rate of the psychological problems and to consider liver transplant recipients as a population at risk for these problems. During hospitalization it is important to acknowledge and pay attention to the psychological aspects and the impact of the process of the transplantation. Also in the outpatient visits during the three months after transplantation systematic screening and a follow-up on the psychological health is recommended. Consequently symptoms of anxiety, depression or PTS can be recognized at an early stage and adequately treated to restore the psychological health of transplant recipients.

CONCLUSION/RECOMMENDATIONS

In summary, this study characterizes the level of psychological problems in a sample of liver transplant recipients three months after transplantation, and describes the relationship between transplant-related variables and these problems. Evidence was found that a younger age and a shorter period off illness before the transplant are associated with symptoms of anxiety, depression and PTS at three month after transplantation. In contrary to the findings of other studies, pre and postoperative complications are not associated, meaning that other variables like social support and coping strategies could play a more significant role at the onset of early post transplant psychological problems.

Further investigation should focus on the long-term influence of transplant-related variables on the development of psychological problems after transplantation over time. Also the exploration of the combined effect of demographic variables, personal characteristics, and transplant-related variables on the psychological problems after transplantation is suggested.

TABELS

Table 1 Demographics and clinical characteristics of the study population

	N (=137)	Mean (SD)	Range (min-max)
Age at Tx		50.81 (11.5)	20-69
Gender			
<i>Male</i>	94 (68.6%)		
<i>Female</i>	43 (31.4%)		
Living status			
<i>With partner or family</i>	105 (76.6%)		
<i>Alone</i>	32 (23.4%)		
Educational level (2 missing)			
<i>Low educational level</i>	37 (27.4%)		
<i>Middle educational level</i>	37 (27.4%)		
<i>High educational level</i>	61 (45.2%)		
Employment status			
• <i>Employed</i>	60 (43.8%)		
• <i>Unemployed</i>	77 (56.2%)		
Etiology organ failure			
• <i>Biliary disorders</i>	50 (36.5%)		
• <i>Metabolic disorders</i>	16 (11.7%)		
• <i>Cirrhosis of unknown origin</i>	9 (6.6%)		
• <i>Alcoholic cirrhosis</i>	32 (23.4%)		
• <i>Viral hepatitis</i>	15 (10.9%)		
• <i>Acute liver failure</i>	3 (2.2%)		
• <i>Other/Miscellaneous</i>	12 (8.8%)		
HCC			
Yes	20 (14.6%)		
No	117 (85.4%)		
Number of years sick before Tx		5.43 (5.6)	0-29
Encephalopathy			
Yes	48 (35.0%)		
No	89 (65.0%)		
Time on waiting list (<i>months</i>)		11.19 (15.5)	0-82
Re-transplantation	13 (9.5%)		
Re-transplantation during hospitalization	11 (8.0%)		
Donor type			
<i>Heart beating</i>	95 (69,3%)		
<i>Non heart beating</i>	42 (30.7%)		
MELD score at Tx		22.22 (7.3)	6-40
Karnofsky score before Tx		64.23 (21)	20-90
Length of hospitalization after Tx (<i>days</i>)		31.22 (25.2)	8-180
ICU duration (<i>days</i>)		4.56 (7.5)	0-44
ICU mechanical ventilation (<i>days</i>)		1.91 (3.9)	0-25
Immunosuppressive regimen at discharge			
<i>Prednisolon</i>	130 (94.9%)		
<i>Cyclosporine</i>	13 (9.5%)		
<i>Tacrolimus</i>	120 (87.6%)		
<i>Cellcept</i>	63 (46.0%)		
<i>Imuran</i>	7 (5.1%)		
Number of per/postoperative complications		6.21 (3.4)	0-19
<i>Transplant-related complications</i>		0.82 (1.1)	0-4
<i>Non-transplant-related complications</i>		5.39 (2.9)	0-17
Number of comorbidities before Tx		1.93 (1.8)	0-10
History of psychological problems before Tx	47 (34.3%)		

Table 2 Bivariate correlations of anxiety

	Anxiety	Years sick	Alcoholic cirrhosis	Re-transplant	Graft type	Mechanical ventilation (days)
Anxiety	1	-0.17*	-0.20*	-0.18*	-0.17*	0.18*
Years sick before Tx	-0.17*	1	-0.16	-0.00	-0.05	-0.05
Alcoholic cirrhosis	-0.20*	-0.16	1	-0.18*	0.04	0.02
Re-transplant	-0.18*	-0.00	-0.18*	1	-0.05	-0.09
Graft type	-0.17*	-0.05	0.04	-0.05	1	-0.05
Mechanical ventilation (days)	0.18*	-0.05	0.02	-0.09	-0.05	1
Age at Tx	-0.23**	-0.07	0.35**	0.02	0.06	0.13

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 3 Bivariate correlations of depression

	Depression	Years sick before Tx	Age at Tx	Psychological problems before Tx
Depression	1	-0.20*	-0.25**	0.27**
Years sick before Tx	-0.20*	1	-0.07	0.02
Age at Tx	-0.25**	-0.07	1	-0.02
Psychological problems before Tx	0.27**	0.02	-0.02	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 4 Bivariate correlations of posttraumatic stress

	Posttraumatic stress	Years sick before Tx	Acute liver failure	Karnofsky score	Length of hospitalization (days without ICU duration)	Severe complications (SIRS/MOF/septic shock/collapse)	Age at Tx	Psychological problems before Tx
Posttraumatic stress	1	-0.22*	0.17*	-0.19*	0.18*	0.20*	-0.32*	0.23**
Years sick before Tx	-0.22**	1	-0.15	0.06	0.01	0.07	-0.67	0.02
Acute liver failure	0.17*	-0.15	1	-0.29**	0.00	0.16	-0.17*	-0.00
Karnofsky score	-0.19*	0.06	-0.29*	1	-0.39**	-0.18**	0.01	0.06
Length of hospitalization (days without ICU duration)	0.18*	0.01	0.00	-0.39*	1	0.44**	0.18*	0.03
Severe complications (SIRS/MOF/septic shock/collapse)	0.20*	0.07	0.16	-0.18*	0.44**	1	-0.09	-0.07
Age at Tx	-0.32**	-0.67	-0.17*	0.01	0.18*	-0.09	1	-0.02
Psychological problems before Tx	0.23**	0.02	-0.00	0.06	0.03	-0.07	-0.02	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 5 Regression analysis for anxiety

Anxiety	B	SE	Standardized β	<i>t</i>	<i>P</i>
Years sick before Tx	-0.012	0.004	-0.207	-2.612	.010
Alcoholic Cirrhosis	-0.149	0.062	-0.208	-2.400	.018
Re transplantation	-0.212	0.083	-0.207	-2.555	.012
Graft type	-0.180	0.081	-0.175	-2.213	.029
Mechanical ventilation (days)	0.014	0.006	0.176	2.205	.029
Age at Tx	-0.006	0.002	-0.210	-2.248	.017
Number of comorbidities before Tx	0.024	0.014	0.139	1.726	.087

Table 6 Regression analysis for depression

Depression	B	SE	Standardized β	<i>t</i>	<i>P</i>
Years sick before Tx	-0.041	0.015	-0.220	-2.829	.005
Age at Tx	-0.027	0.007	-0.289	-3.634	.000
Number of comorbidities before Tx	0.096	0.047	0.165	2.040	.043
Psychological problems before Tx	0.523	0.173	0.241	3.032	.003

Table 7 Regression analysis for posttraumatic stress

Posttraumatic stress	B	SE	Standardized β	<i>t</i>	<i>p</i>
Years sick before Tx	-0.011	0.003	-0.256	-3.452	.001
Length of hospitalization (days without ICU duration)	0.003	0.001	0.243	3.216	.002
Age at Tx	-0.008	0.002	-0.388	-5.043	.000
Number of comorbidities before Tx	0.018	0.010	0.137	1.769	0.079
Psychological problems before Tx	0.095	0.037	0.193	2.552	.012

APPENDIX - NA

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