

ORIGINAL ARTICLE

Predictors of psychological morbidity in liver transplant assessment candidates: is alcohol abuse or dependence a factor?

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Summary

Orthotopic liver transplantation candidates with depressive and other symptoms report poorer perceived quality of life when compared with nondepressed patients, and are also significantly more likely to die while awaiting transplantation. Alcohol abuse and dependence have been associated with increased levels of psychological co-morbidity. This article presents data about psychological morbidity from a prospective study of patients being assessed for liver transplantation in Birmingham, UK, and explores whether those with a diagnosis of alcohol abuse or dependence are at increased risk of psychological symptoms. Of 399 consecutive patients assessed for liver transplantation between July 2004 and July 2005, a sample of 155 was included in the study. Eighty-three (53.5%) patients were identified as having general psychological distress that merited referral for specialist assessment using the Symptom Checklist-90-Revised instrument. The alcohol-dependent group achieved the highest overall 'case-ness' rates, with 72% ($n = 26$) compared with 52% ($n = 12$) of the alcohol-abuse group and 47% ($n = 45$) of those with no alcohol-related diagnosis. However, alcohol abuse or dependence was not the significant predictor of psychological symptoms in the final regression model. Higher rates of psychological distress were associated with greater severity of liver disease, being unemployed, and being a tobacco smoker. Possible reasons for these findings and potential future management strategies are discussed.

Introduction

Although it has been recognized that end-stage liver failure requiring orthotopic liver transplantation (OLT) is associated with poor physical condition, anxiety and depression, and organic brain deficits [1,2], there have been relatively few studies examining the psychological status of potential OLT candidates before transplantation [3–6]. The rate of depressive symptoms in patients with cirrhosis has been shown to be high, with 55% of a large sample ($n = 407$) of adult patients evaluated for liver

transplantation reporting at least mild symptoms of depression, and one-third with clinically elevated levels of anxiety [5]. OLT candidates with depressive symptoms report poorer perceived quality of life when compared with nondepressed patients, and are also significantly more likely to die while awaiting transplantation, even when possible confounding variables such as severity of liver disease are accounted for [7]. The presence of significant depression and/or anxiety before the OLT procedure is also associated with increased morbidity and mortality afterwards [8,9].

Particular sub-groups within the OLT candidate population are at increased risk of depression and other psychological problems. The lifetime prevalence of psychiatric co-morbidity (such as anxiety, depression, social phobia) is particularly high in non-OLT patients with alcohol abuse or dependence [10,11], and depressive symptoms have been shown to be two to three times higher among the alcoholic group. This is important as alcoholic liver disease (ALD) was the most common primary liver disease diagnosis in the 1258 patients who received a first elective transplantation in the UK and Ireland between 2002 and 2005, accounting for 257 (20.4%) of these cases [12]. Liver transplant candidates with a history of substance abuse also demonstrate significantly more emotional distress and instability, deviant behaviour patterns, disorderly thinking, impulsivity and agitation, and maladaptive coping styles than candidates with a negative history of substance abuse [13]. For example, Ewusi-Mensah *et al.* found that two-thirds of inpatients with ALD had diagnosable psychiatric disorders compared with one-third of a control group of patients with non-ALD [14]. Furthermore, the finding that a diagnosis of current major depression at entry into inpatient treatment for alcohol-dependence predicts shorter times to first drink and relapse has been replicated in the population transplanted for ALD [15,16].

The aims of this article are therefore to: (i) quantify the level of psychological symptoms in a UK OLT candidate population, and (ii) determine the factors that predict the severity of such psychological symptoms, and in particular whether a history of alcohol dependence is an independent predictor.

Patients and methods

Participants and setting

All adult (aged 18 years and above) patients who were admitted for liver transplant assessment at the Birmingham Liver Unit from July 2004 onwards were considered for the study. Patients referred for transplantation were usually first seen as an outpatient and, if considered potential transplant candidates, were admitted for assessment. During this period, a wide range of medical and psychosocial tests were carried out, and the decision as to whether to place the patient on the transplant list was then made by a multidisciplinary team.

Patients were considered to be eligible for the study if they could speak English adequately and were not encephalopathic to a degree that prevented them providing informed consent to take part. The severity of encephalopathy was determined clinically and confirmed with the number connection test [17]. An assistant psychologist independent of the medical team conducted a

baseline assessment interview during the inpatient stay. For those patients who did not take part for whatever reason, basic demographic details were collected such as age, gender and ethnicity, as well as their liver diagnoses.

Measures

The baseline assessment consisted of a mixture of semi-structured research interviews and self-completion questionnaires, investigating variables in five broad areas: demographics, liver disease severity, social support, psychological symptoms, and the patient's lifetime alcohol use.

Demographics

The demographic information was collected using an adaptation of the relevant section of the Addiction Severity Index [18].

Liver disease severity

Disease severity was scored using the Model for End-Stage Liver Disease (MELD) [19].

Social support

Social support available to the recipient was assessed at baseline interview, in accordance with other studies in this area [20]. The transplant assessment patient was routinely asked to identify a person who would support them before, during and after the transplantation. The quality of the participant's relationship with this main carer was measured using a 20-item questionnaire used in previous transplant populations [20]. Each item was scored between 1 and 5 and an overall mean was calculated. In addition, support from friends was assessed with a 12-item scale developed by Moos [21] that explored the degree to which participants felt they could rely on friends for emotional and practical support, and where a mean value was calculated after each item was rated between 0 and 3. Therefore a higher score was interpreted as greater perceived support for both measures.

Psychological symptoms

Psychological symptomatology was assessed using the Symptom Checklist-90-Revised (SCL-90-R) [22,23]. This is a self-report symptom inventory designed to reflect the psychological symptom patterns of community, medical, and psychiatric respondents. Each of the 90 items is rated on a five-point scale of distress ranging from 0 (not at all) to 4 (extremely), and the instrument is scored and interpreted in terms of nine primary symptom dimensions and three global indices of distress [23].

Alcohol use

The alcohol history was obtained using a combination of the brief drinker profile (BDP) [24] and the lifetime drinking history (LDH) [25]. All measures of amounts of alcohol were converted to English 'units' to aid ease of comparison, irrespective of what the original measure used (i.e. standard ethanol content in the BDP, 'drinks' in the LDH). Diagnoses of alcohol abuse or dependence were made using chapter 11 of the Schedules for Clinical Assessment in Neuropsychiatry [26].

The study was approved by the Local Research Ethics Committee and The University Hospital NHS Foundation Trust. All participants gave fully informed, written consent.

Data analysis

The data collected were analysed using the SPSS statistical package, version 14.0. Statistical significance was established by means of the chi-squared test when the data was categorical, with Fisher's exact test being employed where necessary. For continuous data, two-tailed independent sample *t*-tests or Mann-Whitney *U*-tests were uti-

lized as appropriate depending on the normality of the parameter being tested. The overall predictors of severity of psychological symptoms were determined using a linear regression with backwards elimination. A *P*-value of less than 0.05 was considered to be significant.

Results

A total of 399 patients were assessed for liver transplantation between July 2004 and July 2007. As shown in Fig. 1, 212 were eligible for the study and chose to take part. A full dataset was collected on 155, and this article will report on this group. There were no significant differences in diagnostic category, age, gender, ethnicity, or living situation between the study sample and those that refused, or the study sample and the sub-group with an incomplete dataset.

Sample characteristics

Table 1 shows the demographic characteristics of the sample. At initial assessment, the primary diagnoses were

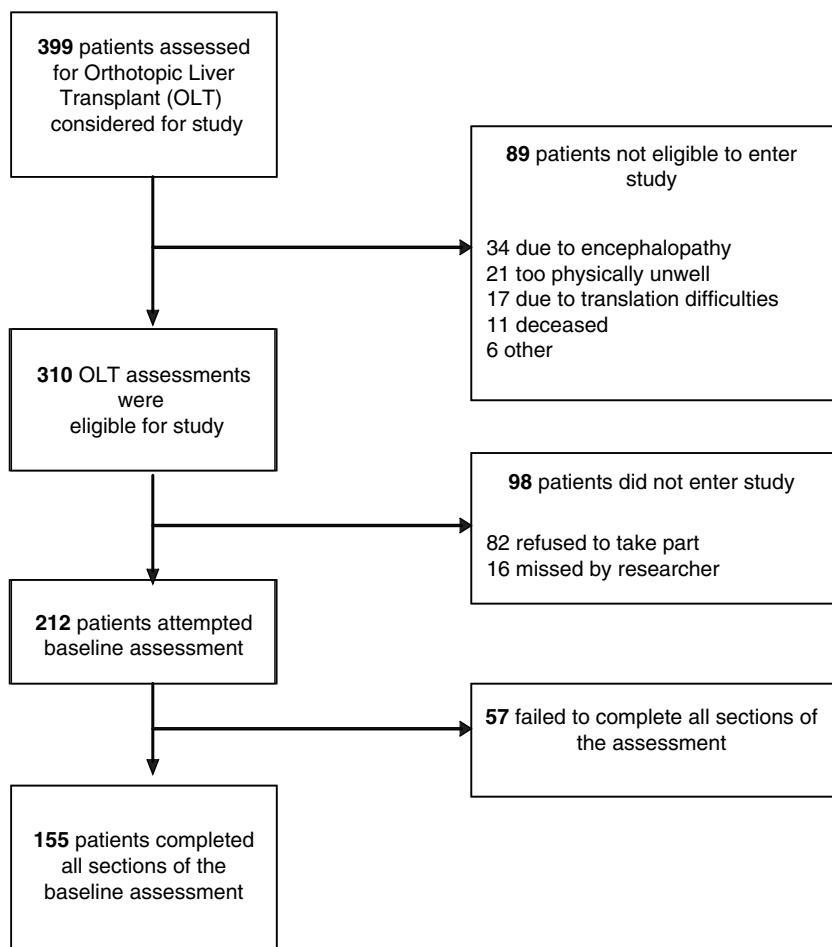


Figure 1 Flowchart showing the study recruitment process.

Table 1. Demographics for the full population ($n = 155$).

Parameter	Total ($n = 155$)
Gender	
Male	95 (61.3)
Mean age \pm SD	51.09 \pm 10.63 (range 18–69)
Ethnicity (%)	
White	146 (94.2)
Asian	4 (2.6)
Black	4 (2.6)
Other	1 (0.6)
Living alone	23 (14.8)
Relationship status	
Living with partner	106 (68.4)
Number of times married	
None	29 (18.7)
Once	93 (60)
More than once	33 (21.3)
Qualifications	
None	40 (25.8)
GCSE or above	115 (74.2)
Working status	
Employed at assessment	51 (32.9)
Religious preference	
Yes	114 (74)
Tobacco use	
Smokers	29 (18.7)
Mean no. of cigarettes/day \pm SD	8.90 \pm 4.72 (range 0–35)
Mean days in hospital in the last 6 months \pm SD	15.90 \pm 24.78 (range 0–150)
Mean social support	
Primary caregiver	4.17 \pm 0.95 (range 0–5)
Friends	1.84 \pm 0.68 (range 0–3)

as follows: 56 (36.1%) ALD, 26 (16.8%) primary biliary cirrhosis, 18 (11.6%) cryptogenic cirrhosis, 14 (9%) primary sclerosing cholangitis (PSC), 11 (7.1%) hepatitis C infection (HCV), 8 (5.2%) metabolic, 6 (3.9%) autoimmune hepatitis, 5 (3.2%) polycystic liver, 3 (1.9%) malignancy, 2 (1.3%) hepatitis B infection, and 6 (3.9%) other causes. In addition, 22 (14%) cases had a secondary diagnosis of malignancy, 8 (5.2%) HCV, 1 (0.6%) PSC and 1 (1.3%) HBV.

Levels of psychological morbidity

The SCL-90-R yields raw scores on nine primary symptom dimensions: somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism, and can be summarized by a global parameter, the global severity index (GSI). The mean raw GSI score for the whole sample was 0.68 (SD \pm 0.54, range = 0–2.98), and the mean scores for each dimension are shown in Table 2.

To enable a comparison of the status of an individual with that of a relevant reference group (i.e. adult non-

Table 2. Mean SCL-90-R raw and T scores across all symptom dimensions and percentage of T scores greater than 63 ($n = 155$).

SCL-90-R dimensions	Mean raw score \pm SD	Mean T score \pm SD	Percentage with T score \geq 63
Somatization	0.91 \pm 0.73	61.0 \pm 11.6	45.2
Obsessive–compulsive	0.93 \pm 0.82	59.6 \pm 11.2	39.4
Interpersonal sensitivity	0.49 \pm 0.61	54.6 \pm 10.9	23.2
Depression	0.93 \pm 0.68	62.3 \pm 9.5	51.0
Anxiety	0.58 \pm 0.64	56.8 \pm 11.7	31.0
Hostility	0.32 \pm 0.47	50.0 \pm 9.6	12.9
Phobic anxiety	0.38 \pm 0.68	55.5 \pm 11.2	29.7
Paranoid ideation	0.39 \pm 0.52	50.8 \pm 10.3	12.9
Psychoticism	0.41 \pm 0.42	59.4 \pm 9.4	41.3
Global Severity Index (GSI)*	0.68 \pm 0.54	60.9 \pm 10.3	39.4
Adjusted GSI†	0.65 \pm 0.51	60.0 \pm 10.3	38.1

*A composite value of the total reported symptoms and the intensity of perceived distress.

†A composite value of the total reported symptoms and the intensity of perceived distress with the somatization removed.

psychiatric patients), the raw scores were converted to standard (normalized) T scores using the process outlined in the SCL-90-R Procedures Manual [23]. Each norm group has separate norms (or T-score transformations) for male and female subjects. This reflects the consistent observation that female patients routinely report significantly more symptoms than males and express greater levels of distress associated with emotional conflict. The normalizing ‘area’ transformation of individual respondents’ scores allows T scores to communicate the patient’s centile position relative to the norm. Thus, a T score of 60, regardless of the symptom dimension, will place an individual in the 84th centile of the normative sample, and a T score of 70 will place the respondent in approximately the 98th centile [23]. The mean GSI T score for the whole sample was 60.9 (SD \pm 10.3, range = 35–80), and the mean T scores for each dimension are shown in Table 2.

However, the issue of measuring psychological morbidity in populations with chronic physical illness is a complex one and there is some overlap between physical and psychological symptoms. For example, the somatization scale includes a range of physical symptoms including headaches, faintness, chest and back pain, nausea, muscular soreness and weakness, and these are likely to be experienced by a population with liver failure. In order to adjust for this, further analyses were carried out using an adjusted GSI total, with the somatization dimension removed. The mean raw score of the adjusted GSI total was 0.65 (SD \pm 0.51, range = 0–2.88). The adjusted GSI T score for the full sample was 60.0 (SD \pm 10.3, range = 30–80).

An operational definition of 'caseness' has been defined for the SCL-90-R to allow it to be used as a screening measure for psychiatric disorders. This operational rule states that if the respondent has a GSI score [on Norm B, the non(psychiatric) patient norm] greater than or equal to a T score of 63, or if any two primary dimension scores are greater than or equal to a T score of 63, then the individual is considered a positive risk or a case and should be referred for psychiatric assessment [23]. This might be considered to be similar to the threshold a primary care physician may use when considering a referral to specialist psychiatric or psychological services. Using this definition, and with the somatization scale removed, 53.5% ($n = 83$) were identified as 'cases'. This consisted of 38.1% ($n = 59$) who achieved case status on the basis of the adjusted GSI total score, and 15.5% ($n = 24$) on the second threshold of two sub-scores with T scores greater than 63 (excluding the somatization sub-scale). In total, 56 out of 95 (59.0%) males and 27 out of 60 (45.0%) females satisfied the 'caseness' criteria and 10.8% ($n = 9$) obtained a maximum score of 80. The percentage of T scores equal to or greater than 63 (the cut off for 'caseness') are also shown in Table 2.

For the adjusted GSI score, skewness scores were more than twice the standard error of skewness. As a result, the adjusted GSI score was transformed by square root of the variable before further analysis.

SCL scores by demographic characteristics

The adjusted GSI score is the most useful single summary measure yielded by the SCL-90-R, and Table 3 compares this score between different demographic sub-groups. Participants not working at the point of transplant assessment had a significantly higher adjusted GSI average than those in employment, as did those with no formal academic qualifications when compared to individuals with basic school leaving qualifications. Tobacco smokers had significantly higher scores than nonsmokers. There was a significant association between adjusted GSI score and the mean number of days spent in hospital in the previous 6 months ($r = 0.21$, $P = 0.01$), but a negative correlation between adjusted GSI total and the perceived support received from those rated as primary caregivers ($r = -0.19$, $P = 0.02$).

Liver disease severity

Liver dysfunction was assessed using the MELD score. The sample had a mean of 14.2 ± 4.5 (range 6–31), and there was a nonsignificant positive correlation between adjusted GSI total score and MELD score ($r = 0.12$, $P = 0.15$).

Table 3. Mean adjusted SCL-90-R Global Severity Index (GSI) raw scores by demographic characteristics.

Parameter	Adjusted GSI (mean \pm SD)	GSI significance
Gender		
Male	0.73 \pm 0.31	$t(153) = 0.54$,
Female	0.76 \pm 0.28	$P = 0.59$
Age	51.1 \pm 10.6	$r = -0.12$, $P = 0.16$
Ethnicity		
White	0.74 \pm 0.30	$t(153) = 0.67$,
Other	0.81 \pm 0.43	$P = 0.50$
Living situation		
Alone	0.75 \pm 0.33	$t(153) = 0.04$,
With others	0.74 \pm 0.30	$P = 0.96$
Relationship status		
Living with partner	0.73 \pm 0.30	$t(153) = 0.80$,
Not living with partner	0.77 \pm 0.32	$P = 0.43$
Number of times married		
None	0.75 \pm 0.33	$F(2,152) = 0.27$,
Once	0.73 \pm 0.30	$P = 0.77$
>Once	0.78 \pm 0.30	
Qualifications		
None	0.83 \pm 0.33	$t(153) = 2.04$,
School leaving qualifications (e.g. GCE/GCSE) or above	0.72 \pm 0.29	$P < 0.05$
Working status		
Working	0.79 \pm 0.33	$t(149.48) = 3.60$,
Not working	0.64 \pm 0.19	$P < 0.01$
Religious preference		
Yes	0.73 \pm 0.26	$t(153) = 0.40$,
No	0.75 \pm 0.32	$P = 0.69$
Tobacco use		
Smokers	0.71 \pm 0.28	$t(153) = 2.69$,
Nonsmokers	0.88 \pm 0.35	$P < 0.01$
Mean days in hospital in the last 6 months ($n = 154$)		$r = 0.18$, $P < 0.05$
Social support		
Primary caregiver		$r = -0.19$, $P = 0.02$
Friends		$r = -0.10$, $P = 0.20$

The influence of lifetime drinking diagnosis on psychological morbidity

In order to explore the influence of alcohol-related problems on overall psychological morbidity, the sample was divided into three groups by lifetime drinking diagnosis according to DSM-IV criteria [27]: no-alcohol history, alcohol abuse and alcohol dependence. The alcohol-dependent group reported a raw mean adjusted GSI score of 0.81 (± 0.37), compared with 0.76 (± 0.26) for the alcohol abusers and 0.71 (± 0.28) for those with no alcohol-related diagnosis, but this difference was not statistically significant ($F = 1.47$; d.f. = 2,152; $P = 0.23$). However,

Table 4. Mean SCL-90-R raw scores (transformed) compared between those with no lifetime alcohol diagnosis, alcohol abuse and alcohol dependence.

Dimensions	Mean raw score \pm SD	Mean raw score \pm SD	Mean raw score \pm SD	<i>F</i> , d.f., sig
	None <i>n</i> = 96	Abuse <i>n</i> = 23	Dependence <i>n</i> = 36	
Somatization	0.81 \pm 0.39	0.92 \pm 0.31	0.92 \pm 0.55	1.26 (2,152), <i>P</i> = 0.29
Obsessive–compulsive	0.80 \pm 0.42	0.94 \pm 0.33	0.96 \pm 0.51	2.16 (2,152), <i>P</i> = 0.12
Interpersonal sensitivity	0.52 \pm 0.39	0.49 \pm 0.42	0.68 \pm 0.51	2.02 (2,152), <i>P</i> = 0.14
Depression	0.86 \pm 0.34	0.97 \pm 0.28	0.95 \pm 0.42	1.44 (2,152), <i>P</i> = 0.24
Anxiety	0.61 \pm 0.36	0.61 \pm 0.45	0.71 \pm 0.53	0.87 (2,152), <i>P</i> = 0.42
Hostility	0.36 \pm 0.49	0.40 \pm 0.31	0.51 \pm 0.41	1.69 (2,152), <i>P</i> = 0.19
Phobic anxiety	0.36 \pm 0.49	0.24 \pm 0.40	0.53 \pm 0.50	2.83 (2,152), <i>P</i> = 0.06
Paranoid ideation	0.40 \pm 0.43	0.43 \pm 0.41	0.57 \pm 0.46	1.94 (2,152) <i>P</i> = 0.15
Psychoticism	0.49 \pm 0.32	0.65 \pm 0.21	0.62 \pm 0.43	3.29 (2,152), <i>P</i> = 0.04
Global Severity Index (GSI)	0.73 \pm 0.28	0.79 \pm 0.23	0.85 \pm 0.39	1.90 (2,152), <i>P</i> = 0.15
Adjusted GSI	0.72 \pm 0.28	0.76 \pm 0.26	0.81 \pm 0.37	1.47 (2,152), <i>P</i> = 0.23

the alcohol-dependent group did achieve the highest overall 'caseness' rates, with 72% (*n* = 26) compared with 52% (*n* = 12) of the alcohol abuse group and 47% (*n* = 45) of those with no alcohol-related diagnosis ($\chi^2 = 6.78$, d.f. = 2, *P* = 0.03). Table 4 shows the raw scores on the SCL-90-R symptom sub-scales for each of the diagnostic groups for alcohol. As with the adjusted total GSI score, each of the domain scores were transformed before further analysis as the skewness scores were more than twice the standard error. This was done by computing the square root of each domain score. The only significant difference was that clients with no history of alcohol problems had significantly lower scores on the (transformed) sub-scale for psychoticism.

More male- than female subjects met the DSM-IV alcohol abuse (22.1% male and 3.3% female) and dependence criteria (29.5% male and 13.3% female), and there was a significant difference between gender and alcohol related DSM-IV diagnosis ($\chi^2 = 20.10$, d.f. = 2, *P* < 0.001). Furthermore, 82.6% (*n* = 19) of those classified as alcohol abusers and 86.1% (*n* = 31) of those classified as alcohol-dependent were unemployed ($\chi^2 = 13.52$, d.f. = 2, *P* < 0.001). There was also a significant difference in tobacco-smoking status at the point of assessment between the different categories of alcohol diagnosis ($\chi^2 = 12.33$, d.f. = 2, *P* < 0.01), with more in the dependent group (*n* = 13) than in the nondrinking (*n* = 10) and abuse groups (*n* = 6). The difference in number of days spent in hospital in the 6 months prior to assessment was also significant (none = 12.24 \pm 17.50, abuse = 12.13 \pm 9.43, dependent = 30.20 \pm 40.16, *F* = 7.71; d.f. = 2,151, *P* < 0.01). However, there was no significant association between MELD scores and alcohol-related DSM-IV diagnosis (*F* = 0.28; d.f. = 2,151; *P* = 0.76), living situation, level of qualification attainment or religious preference.

Predictors of psychological symptoms

The overall predictors of severity of psychological symptoms were determined using a linear regression with enter method. Variables entered into the regression analysis were alcohol diagnosis (participants were classified according to whether they had a lifetime diagnosis of either 'harmful or dependent drinking') and those that had reached significance (*P*-values \leq 0.05) in the previous bi-variate analyses, predicting adjusted GSI total score by demographic factors, DSM-IV alcohol diagnosis and MELD scores. Thus, the variables entered into the regression model were working status (employed or unemployed) at assessment, tobacco-smoking status (smoker or nonsmoker) at assessment, lifetime qualifications, lifetime diagnosis of DSM-IV alcohol dependence or abuse, total number of days in hospital for medical problems in the 6 months prior to assessment, MELD score, and perceived caregiver support at assessment. The final model produced an adjusted *R*² of 0.16 (*F* = 5.87; d.f. = 6,146; *P* < 0.001), with three significant predictor variables: working status ($\beta = -0.18$, *P* = 0.03), tobacco-smoking status ($\beta = 0.20$, *P* = 0.01), and MELD score ($\beta = 0.19$, *P* = 0.01). This suggests that higher global severity of psychological symptoms was associated with being unemployed, being a smoker, and having a higher MELD score.

Discussion

This study points to a wide range of psychological health problems across the liver transplant candidate population, with over half (52.2%) of the sample reaching the level of a psychiatric 'case'. The mean score of the whole sample was on the 84th centile or above of a normative sample for depression, obsessive–compulsion, and somatization,

representing significant psychological pathology. Higher rates of psychological distress were associated with greater severity of liver disease, not being in work, and being a tobacco smoker. This study reinforces the findings of Streisand *et al.* that greater liver disease severity (as measured by the Child's Pugh score) was associated with more depression and anxiety, poorer psychosocial adjustment to illness, more frequent use of avoidant coping strategies, and higher symptom frequency [5]. Rocca *et al.* also found that 43% of 165 liver transplant candidates had at least one psychiatric diagnosis, and that liver disease severity (Child-Pugh score) and previous psychiatric diagnoses were independent significant predictors of depressive disorders [4].

Tobacco smoking has considerable health implications for liver transplant candidates, and yet has not been the subject of much research attention. Tobacco use has been found to be associated with graft loss and mortality in a range of transplant populations, and has been associated with lower quality of life benefit gained from surgical interventions [28]. Smoking is often used as a coping mechanism to deal with stress or to alleviate the symptoms of mental illness [29], and current tobacco smoking is associated with all forms of mental disorder [30]. This also appears to be the case in this sample of liver transplant candidates, and the fact that nearly 20% were active tobacco smokers at the time of assessment merits further attention.

In this study, the group with a lifetime diagnosis of alcohol abuse or dependence scored higher than the nonalcohol diagnosis group across the whole range of SCL-90-R dimensions. However, a diagnosis of alcohol-related problems was not a predictor of overall severity of psychological symptoms when other factors such as MELD score and employment were controlled for. Furthermore, when this group is compared with alcoholics attending an addiction centre [31], the levels of psychological morbidity are higher in the addiction centre sample across all dimensions except somatization and obsessive-compulsion. Mercier *et al.* concluded that on global measures as well as on symptom scales, the scores of alcoholic groups revealed a symptomatology two to five times as severe as that observed in the general population [31]. However, in our study the alcoholic groups were an atypical group in as much as abstinence was a prerequisite for assessment. Patients reaching this stage of the assessment process for liver transplantation are a highly selected group, and although a fixed 6-month abstinence rule is not strictly enforced at the Birmingham unit, the mean length of abstinence of the alcohol sample was 2 years. De Soto *et al.* found that psychiatric symptoms in alcoholics gradually faded after first few months of abstinence to approximately normal after 10 months, with paranoid ideation, somatization, phobic anxiety and hostility normalizing

quickest [32]. Although there was no correlation between length of abstinence and total GSI score in this sample, this might suggest why this group had less psychological morbidity than a group of alcoholics without liver failure.

Psychological research has been more extensive with other organ transplant populations, particularly in linking psychosocial factors with outcome [13]. However, research with heart and bone marrow transplantation patients suggests that the presence of significant depression and/or anxiety before transplantation places patients at risk for increased morbidity and mortality after transplantation [8,9], and psychiatric diagnoses are specifically related to increased post-transplant hospital utilization and costs [33,34]. Furthermore, psychological distress scores for a liver transplant candidate sample have been found to be higher than heart, kidney, lung, and bone marrow transplant candidates [5]. There is therefore a need to implement and evaluate the effectiveness of psychological screening and treatment interventions in reducing affective disturbance and in improving post-transplant morbidity and mortality rates. There is little research into what aspects of assessment are important in recommending acceptance or rejection of liver candidates on psychiatric grounds, and follow-up of this sample post-transplantation will be important.

There are a number of potential limitations to this study. First, the issue of measuring psychological morbidity in hospitalized populations is confounded by the overlap between physical and psychological symptoms in physically ill populations. However, even when the somatization score was removed from the GSI, the results still highlighted high levels of psychological morbidity in a liver transplant candidate population. A second limitation was the number of patients who failed to complete the SCL-90-R (57 or 14% of the possible sample of 399). A significant number of these cases came early in the period of data collection when the procedures for administering and collecting the research questionnaires had not been fully developed, and the rate of noncompletion dropped as the study progressed. The impact of these missed cases on the results is difficult to determine, but when the group of patients who failed to complete the SCL-90-R were compared with those that did there was no statistically significant difference in MELD score, employment status, number of days spent in hospital in the past 6 months or status as a tobacco smoker.

A third limitation may have been the impact of undetected cognitive impairment. Cognitive disability can decrease the validity of self-report measures [35], and psychological symptoms may be related to hepatic encephalopathy or subclinical hepatic encephalopathy [4]. The researcher conducting the interviews in this study was aware of the clinical team's assessment of potential

encephalopathy, but ultimately patients were only excluded if they did not have capacity to consent to the study. However, it is possible that some patients had subclinical hepatic encephalopathy, and 37 (24%) had a number connection test time longer than 50 s (suggesting stage I to II encephalopathy). Although there was no statistical difference between the adjusted GSI score for the population taking longer than 50 s and those taking less than 50 s (0.73 vs. 0.63, $t = 0.97$, d.f. = 143, $P = 0.34$), further work is needed to elucidate the potential link between subclinical HE and psychological symptoms in this population.

Psychological symptoms are common in the OLT candidate population, and treatment may improve outcomes. However, it is often impractical to conduct psychiatric assessments on all transplant candidates. Furthermore, the traditional unstructured psychiatric interview can be inaccurate [36], and so even lengthier structured psychiatric assessments are needed [37]. The SCL-90-R is a self-completion instrument that covers a variety of psychiatric symptoms (in contrast to the Hospital Anxiety and Depression scale or the Beck Depression Inventory), and can be administered during the transplant assessment. This study has shown that it is feasible to use it to highlight the need for more detailed psychiatric assessment and on-going treatment. However, its true value as a screening test in this population would require a comparison with a gold-standard diagnostic test (such as the Structured Clinical Interview for DSM-IV), and a receiver operating characteristic analysis [37]. A number of reports have also shown the utility of the SCL-90-R in measuring change in various clinical cohorts [23]. By administering the instrument at regular intervals during the post-transplantation period, it will be possible to explore the impact of the procedure (and the anticipated improvement in MELD score) on psychological health.

Authorship

ED: designed study, analysed data, wrote article. DB: analysed data, wrote article. RS: collected data, analysed data, wrote article. RR: collected data. KW: wrote article. GG: wrote article. JN: designed study, wrote article.

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