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Depression and Anxiety Are Common Among Patients With Cirrhosis

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Abstract

BACKGROUND & AIMS: Depression and anxiety can have negative effects on patients and are important to treat. There have been few studies of their prevalence among patients with cirrhosis. We aimed to characterize the prevalence and risk factors for depression and anxiety in a large multi-center cohort of patients with cirrhosis.

METHODS: We conducted a telephone-based survey of patients with cirrhosis at 3 health systems in the United States (a tertiary-care referral center, a safety net system, and a Veterans hospital) from April through December 2018. Of 2871 patients approached, 1021 (35.6%) completed the survey. Depression and anxiety were assessed using the PHQ-9 (range 0–25) and STAI (range 20–80) instruments, with clinically significant values defined as PHQ-9 ≥ 15 and STAI ≥ 40. We performed multivariate logistic regression analysis to identify factors associated with significant depression and anxiety.

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Conflicts of Interest

The authors disclose no conflicts.

Supplementary Material

Note: To access the supplementary material accompanying this article, visit the online version of *Clinical Gastroenterology and Hepatology* at www.cghjournal.org, and at <https://doi.org/10.1016/j.cgh.2020.08.045>.

RESULTS: The median PHQ-9 score was 7 (25th percentile–75th percentile, 3–12) and the median STAI score was 33 (25th percentile–75th percentile, 23–47); 15.6% of patients had moderately severe to severe depression and 42.6% of patients had high anxiety. In multivariable analyses, self-reported poor health (odds ratio [OR], 4.08; 95% CI, 1.79–9.28), being widowed (OR, 2.08; 95% CI, 1.07–4.05), fear of hepatocellular carcinoma (OR, 1.89; 95% CI, 1.04–3.42), higher household income (OR, 0.30; 95% CI, 0.10–0.95), and Hispanic ethnicity (OR, 0.57; 95% CI, 0.33–0.97) were associated with moderately severe to severe depression. Male sex (OR, 0.71; 95% CI, 0.51–0.98), self-reported poor health (OR, 2.73; 95% CI, 1.73–4.32), and fear of hepatocellular carcinoma (OR, 2.24; 95% CI, 1.33–3.78) were associated with high anxiety.

CONCLUSIONS: Nearly 1 in 6 patients with cirrhosis have moderately severe to severe depression and nearly half have moderate–severe anxiety. Patients with cirrhosis should be evaluated for both of these disorders.

Keywords

Psychiatric Illness; Liver Disease; Comorbidity; Cirrhosis; Depression; Anxiety

Cirrhosis is a common cause of morbidity and mortality, ranking as the 12th leading cause of death overall in the United States.¹ Irrespective of cause, chronic liver damage can lead to the development of cirrhosis—a major risk factor for hepatocellular carcinoma and need for liver transplantation.¹ Viral hepatitis, nonalcoholic steatohepatitis (NASH), and alcohol use are major causes of chronic liver disease in the United States and Europe.² Worldwide, 2 billion people are either overweight or obese,³ over 400 million suffer from diabetes,⁴ and harmful use of alcohol results in 5.3% of all global deaths⁵—all of which are risk factors for chronic liver disease and cirrhosis.⁶

These predisposing risk factors are frequently associated with mental health disorders. For example, anxiety and depression are reported in 11.1% and 33% of patients with alcohol use disorders, respectively⁷; similarly, intravenous drug use is associated with depression in 7.3% and anxiety in 2.9% of patients.⁸ Depression and anxiety not only play a crucial role in a decreased health-related quality of life in patients with chronic diseases,⁹ but also can affect many aspects of care, including adherence to medical appointments, medications, and engagement with social risk behaviors (alcohol and drugs).^{10–12} Estimates for the prevalence of depression and anxiety are best known in patients with decompensated cirrhosis and liver transplant candidates^{13,14}; however, the burden of these mental health disorders in a broad cirrhosis patient population, particularly across different health care settings, is lacking. Therefore, we aimed to study the prevalence and risk factors associated with the presence of depression and anxiety in a diverse, outpatient cohort with well-compensated cirrhosis followed in 3 different types of health systems in the United States.¹⁵

Materials And Methods

Study Population

We included adult patients, 18 years of age, with cirrhosis of any etiology from any of the 3 participating centers: Parkland Health and Hospital System (Parkland), University of Texas Southwestern Medical Center (UTSW), and Michael E. DeBakey Veterans Affairs

(VA) Medical Center (MEDVAMC). Parkland is an integrated county health system that offers a sliding-fee scale program, providing access to primary and subspecialty medical services, including hepatocellular carcinoma (HCC) screening and treatment for Dallas County residents. UTSW is an academic tertiary care referral health system, with a large liver transplantation program. The MEDVAMC is one of the largest VA medical centers, with hepatology subspecialty clinics and serves as a liver transplantation center for veterans in the United States. All 3 sites have a comprehensive electronic medical record (EMR) system for inpatient and outpatient visits and have access to subspecialty care, including hepatology and mental health services.

Patients were identified by a validated EMR case identification algorithm based on International Classification of Diseases–Ninth Revision (ICD-9) or International Classification of Diseases–Tenth Revision (ICD-10) codes for cirrhosis (571.2 or 571.5; K70.30 or K74.6) or cirrhosis complications (456.0, 456.1, 456.2, 456.21, 567.23, 572.2, 572.3, 572.4; K65.2, K72.9, K72.91, K76.6, K76.7, I85.0, I85.1).^{16–18} In addition, we included patients with an aspartate aminotransferase-to-platelet ratio ≥ 1.5 , which has been shown to have an area under the receiver-operating curve of 0.94 to predict cirrhosis.¹⁹ All cases with cirrhosis were confirmed with chart-validation by 2 transplant hepatologists (R.H., A.G.S.) and disagreements were resolved by consensus. We excluded patients with a history of HCC, liver transplantation, presence of active cancer, enrolled in palliative care, Child-Turcotte-Pugh class C cirrhosis, or incarceration. We also excluded patients without known physical address or phone number and those with language other than English or Spanish. The study was approved by the UTSW and VA/Baylor College of Medicine institutional review boards.

Depression and Anxiety

As previously described,²⁰ participants eligible for the study were invited via letter and called thereafter to inquire their willingness to participate and conduct the baseline survey between April and December 2018, with a maximum of 6 call attempts. We assessed depressive symptoms with the Patient Health Questionnaire-9 (PHQ-9),²¹ which is accurate for grading depression severity and sensitive to changes over time, including in patients with cirrhosis.^{22,23} PHQ-9 scores range from 0 to 25, with moderately severe depression defined as a PHQ-9 score of 15–19 and severe depression defined as a PHQ-9 score ≥ 20 . We used a threshold of a PHQ-9 score ≥ 15 (ie, moderately severe to severe depression) as our outcome of interest, as treatment evaluation is recommended for this degree of depression, independent of duration and functional impairment. Anxiety was assessed using State–Trait Anxiety Inventory (STAI), which has been used in breast, colon, and lung cancer screening programs^{24–26} and in patients with cirrhosis.²⁷ The STAI ranges from 20 to 80, with moderate–severe anxiety defined as score ≥ 40 .

We collected demographics and clinical history through the EMR. Patient age, sex, race and ethnicity, preferred language, and type of insurance were obtained. Liver disease etiology was classified using laboratory data and ICD-9 and ICD-10 codes into the following categories: hepatitis C virus, hepatitis B virus, alcohol-related liver disease, NASH, and other. Ascites and hepatic encephalopathy were ascertained using ICD-9 and ICD-10 codes

and medications using a validated algorithm and classified as none, mild or controlled, and severe or uncontrolled.²⁸

Statistical Analyses

We compared baseline characteristics across the 3 different sites and used parametric and nonparametric tests depending on the normality distribution of the data. For survey questions with missing data, we performed single imputation using the mean of the patient's responses from similar survey items. To characterize variables independently associated with moderately severe to severe depression and moderate–severe anxiety, we used multivariable logistic regression to estimate prevalence odds ratios and 95% confidence intervals. Models were adjusted for study site and clinically meaningful factors that could act as confounders (eg, age, sex, language). For all analyses, statistical significance was defined as $P < .05$. All data analyses were performed using SAS 9.4 (SAS Institute, Cary, NC).

Results

Patient Population

Of 2875 patients with cirrhosis who met inclusion criteria, 1021 (35.5%) completed the baseline survey: 629 at Parkland, 155 at UTSW, and 237 at MEDVAMC (Table 1). The median age was 61 years, and 63.9% ($n = 649$) were men. The cohort was racially and ethnically diverse, with 35.2% non-Hispanic White, 28.6% non-Hispanic Black, and 33.4% Hispanic White. The most common etiologies for cirrhosis were hepatitis C virus at Parkland and the MEDVAMC (60.9% and 76.9%, respectively) and NASH at UTSW (30.3%). Over three-fourths of participants at each site had Child-Pugh-Turcotte A cirrhosis. Health status was reported as excellent in 11.9%, 16.8%, and 17.4% at Parkland, UTSW, and MEDVAMC respectively, and reported as fair/poor in 58.5% at Parkland, compared with 44.5% at the MEDVAMC and 38.7% at UTSW. As previously published,²⁰ survey respondents had similar clinical characteristics compared with survey nonrespondents, although respondents had a higher proportion of women and Hispanics (Supplementary Table 1).

Prevalence of Depression and Anxiety

The median PHQ-9 score for the cohort was 7 (P25th–P75th, 3–12), with moderately severe (PHQ-9 score 15–19) and severe (PHQ-9 score ≥ 20) depression present in 11.3% and 4.3% of the population, respectively (Table 2, Figure 1). PHQ-9 scores were lower in patients from UTSW (median 5 [P25th–P75th, 2–9]) compared with those from Parkland or MEDVAMC (median 7 [P25th–P75th, 3–12] for both). UTSW also had fewer patients with moderately severe to severe depression than Parkland MEDVAMC as well (6.5% vs 17.3% and 16.9%, respectively). The median STAI score was 33.3 (IQR, 23.3–46.7), with moderate–severe anxiety being present in 42.6% of the cohort. Patients at Parkland had higher STAI scores than did those followed at UTSW or the MEDVAMC (median 36.7 vs 33.3 and 33.3), including a higher proportion of patients classified as having moderate–severe anxiety (46.7% vs 38.7% and 34.2%, respectively) (Table 2, Figure 1). Overall, half (55.0%) of the cohort had neither depression nor anxiety, 29.4% had anxiety alone, 2.5% had depression alone, and 13.1% had both depression and anxiety.

Specific HCC-related fears were reported by patients, although there continued to be notable differences across the 3 sites. Over one-fourth (28.0%) of patients from Parkland reported fear of HCC most of the time, compared with 16.1% and 15.7% of those at UTSW and MEDVAMC, respectively. Similarly, fear of having and dying from HCC most of the time was reported in 16.2% and 14.3% of the cohort, with the highest proportions among Parkland patients for both (Figure 2).

Correlates of Depression and Anxiety

In multivariable analysis, self-reported poor health, being widowed, and fear of having HCC were positively associated with having moderately severe to severe depression, while higher household income and Hispanic ethnicity were inversely associated with depression (Table 3). Female sex, self-reported poor health, fear of HCC and dying from HCC was associated with moderate–severe anxiety in multivariable analyses (Table 4). Age, liver disease etiology, and severity of liver dysfunction were not risk factors for either depression or anxiety in multivariable analyses. The prevalence depression and anxiety, stratified by Child-Turcotte-Pugh class, are presented in Supplementary Table 2. The prevalence of moderately severe to severe depression was 14.1% among Child-Turcotte-Pugh class A patients and 19.9% among patients with Child-Turcotte-Pugh class B or C cirrhosis, whereas moderate–severe depression was reported in 40.5% of patients with Child-Turcotte-Pugh class A cirrhosis and 48.5% of Child-Turcotte-Pugh class B patients.

Discussion

In this large, diverse cohort of 1021 patients with cirrhosis, we found moderately severe to severe depression and anxiety were both common, with over 15% having depression and over 40% having anxiety. Anxiety and depression were both associated with fear of HCC and self-reported poor health. There were notable site-level differences in the prevalence of depression and anxiety, with higher proportions among patients at the county and VA health systems than at the academic tertiary care referral center. However, these differences were no longer significant in multivariable models, suggesting that these differences were explained by patient-level differences.

Our study extends the prior literature of depression and anxiety in patients with cirrhosis, which have largely focused on patients with more advanced liver dysfunction.^{27,29,30} Prior studies have reported depression and anxiety in 15% to >50% of patients with Child-Turcotte-Pugh class B or C and liver cancer. High levels of anxiety and depression are expected in these populations given high morbidity, with frequent complications, hospitalizations, caregiver dependency, and high risk of mortality. Interestingly, we found similar proportions of depression and anxiety despite most patients in our cohort having compensated cirrhosis. In our cohort, moderately severe to severe depression was also not associated with degree of liver dysfunction or comorbidity. Although our study did not conduct in-depth analyses for reasons underlying depression and anxiety, this finding suggests that depression and anxiety may contribute to behaviors leading to chronic liver disease (eg, substance abuse, unhealthy eating habits, and lack of physical exercise) rather than cirrhosis causing depression and anxiety, we note that depression and anxiety were both

associated with fear of HCC. HCC is a common cause of death in patients with cirrhosis, and prior studies have similarly suggested patients express fear of developing or dying from HCC.^{31,32} It is unclear if improved surveillance effectiveness and increased patient engagement would help mitigate HCC-related fears.

Even though depression and anxiety are common, with significant implications for patient adherence and satisfaction, these comorbidities unfortunately often go unnoticed in clinical practice. Screening for depression and anxiety should be encouraged in all patients with cirrhosis to identify those in need of mental health counseling. Doing so can improve patient quality of life, improve compliance with medical recommendations, and may reduce unhealthy behaviors such as alcohol or drug abuse that can exacerbate underlying liver dysfunction.^{33,34} Once identified, the creation of either co-located clinics or multidisciplinary care in which mental health or social workers are embedded could tailor the needs for patients with high anxiety or depression scores, as they already exist in other fields.³⁵ Screening in subsets of patients, such as those with alcohol-related cirrhosis, may be ineffective, given that this was not a major correlate of depression or anxiety in our study. Notably, we did not capture granular information on alcohol use via validated measures such as Alcohol Use Disorders Identification Test-Concise in all patients, nor other substance abuse behaviors.

We acknowledge that our study had several limitations. First, our survey was limited by nonresponse bias, although our response rate is similar to those of similar mailed efforts.^{36,37} Characteristics of respondents and nonrespondents appeared similar overall, although respondents had a higher proportion of women and Hispanics than nonrespondents. It is possible that our results may underestimate the prevalence of depression and overestimate anxiety based on associations seen in multivariable analysis. Further, unmeasured differences, such as social withdrawal, may also lead to differential prevalence estimates in non-respondents. Second, our results may not be generalizable to all patients and settings, particularly those outside the United States, although we examined patients across 3 major types of US health systems. Although we included patients with Child-Turcotte-Pugh class A or B cirrhosis, we excluded those with Child-Turcotte-Pugh class C cirrhosis, who may have increased depression and anxiety, given the increased risk of liver-related mortality. Third, we were unable to determine reasons for the depression and anxiety in this study, and the associations with HCC-related concerns and poor overall health status may not be causal. Finally, the present study only assessed these symptoms at a single time point, so we could not determine if these mental health symptoms would persist or change over time. However, we feel that these weaknesses are outweighed by several strengths, including the large sample size, the largest in the field of depression and anxiety and cirrhosis to our knowledge, including a high proportion of patients with compensated cirrhosis, manual chart review of all patients to confirm the presence of cirrhosis, and the use of validated symptom scales (PHQ-9 and STAI).

In conclusion, we found that moderately severe to severe depression and anxiety were both common among patients with cirrhosis. Providers should consider screening for these conditions and initiate early referral to mental health providers as needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations used in this paper:

EMR	electronic medical record
HCC	hepatocellular carcinoma
ICD-9	International Classification of Diseases–Ninth Revision
ICD-10	International Classification of Diseases–Tenth Revision
IQR	interquartile range
MEDVAMC	Michael E. DeBakey Veterans Affairs Medical Center
NASH	nonalcoholic steatohepatitis
PHQ-9	Patient Health Questionnaire-9
STAI	State–Trait Anxiety Inventory
UTSW	UT Southwestern Medical Center
VA	Veterans Affairs

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What You Need to Know

Background

Depression and anxiety can have negative effects on patients and are important to treat. There have been few studies of prevalence of these disorders among patients with cirrhosis.

Findings

A telephone-based survey of patients with cirrhosis at 3 health systems in the United States found that almost 1 in 6 patients with cirrhosis have moderately severe to severe depression and nearly half have moderate–severe anxiety.

Implications for patient care

Patients with cirrhosis should be evaluated for depression and anxiety.

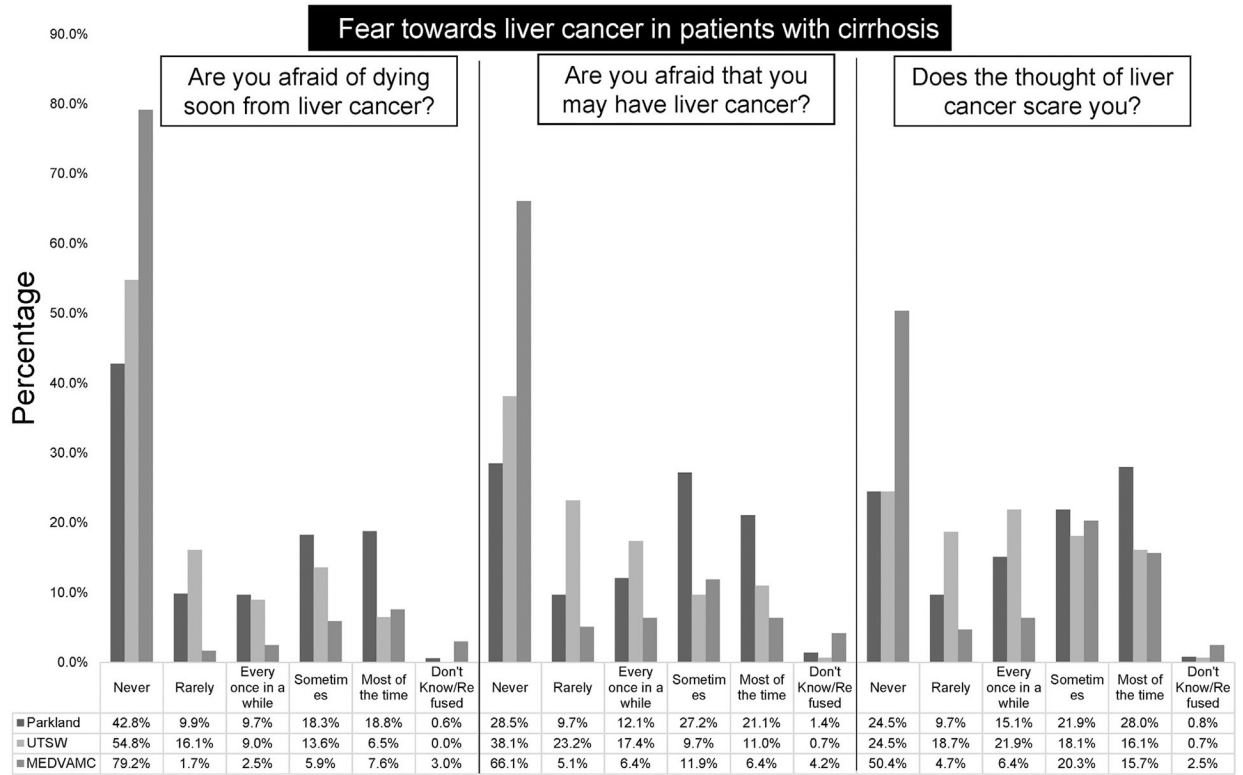


Figure 1.
Distribution of depression and anxiety scores in a cohort of patients with cirrhosis.

Median (p25th-p75th) scores of depression and anxiety by sites

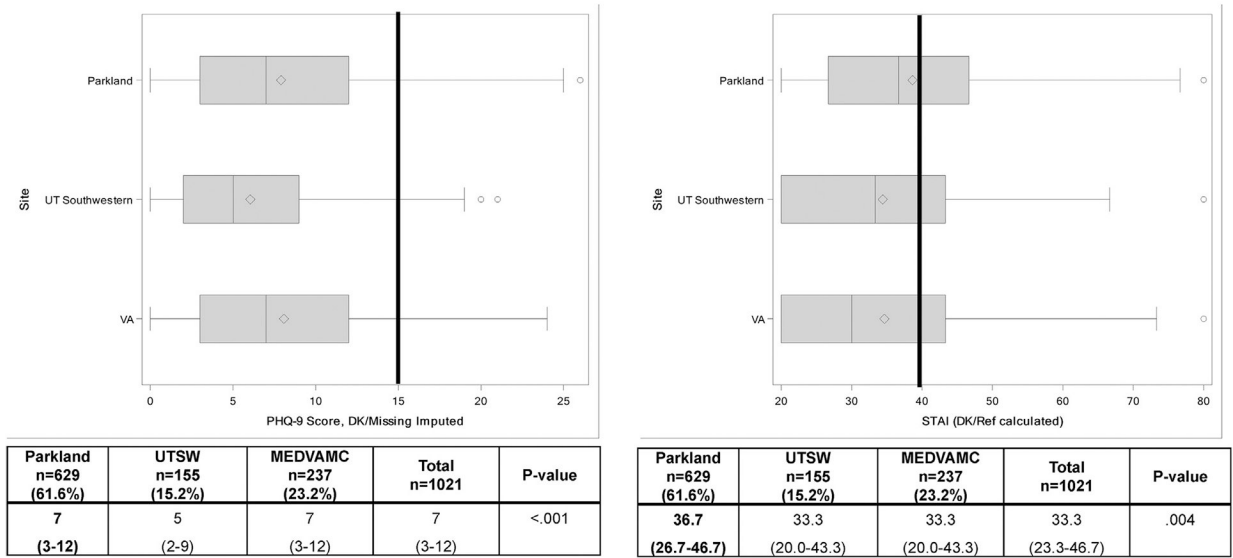


Figure 2. Percentages of participants with cirrhosis World Health Organization reports.

Table 1.

Baseline Characteristics of Patients With Cirrhosis, Stratified by Site (N = 1021)

Age category	Parkland (n = 629)	UTSW (n = 155)	MEDVAMC (n = 237)	P value
21–50y	105 (16.7)	23 (14.8)	15 (6.4)	<.0001
51–60 y	260 (41.3)	37 (23.9)	37 (15.7)	
61–90 y	264 (42.0)	95 (61.3)	184 (78.0)	
Sex				
Female	265 (42.1)	90 (58.1)	16 (6.8)	<.0001
Male	364 (57.9)	65 (41.9)	220 (93.2)	
Race/ethnicity				
White	113 (18.0)	102 (65.8)	144 (61.0)	<.0001
Black	219 (34.8)	16 (10.3)	57 (24.2)	
Hispanic	10 (1.6)	11 (7.1)	7 (3.0)	
Other	287 (45.6)	26 (16.8)	28 (11.9)	
Health status				
Excellent/very good	75 (11.9)	26 (16.8)	41 (17.4)	<.0001
Good	184 (29.3)	69 (44.5)	88 (37.3)	
Fair/poor	368 (58.5)	60 (38.7)	105 (44.5)	
Refused/don't know	2 (0.3)	0 (0.0)	2 (0.9)	
Marital Status				
Married	169 (26.9)	83 (53.6)	96 (40.7)	<.0001
Living with partner	48 (7.6)	6 (3.9)	17 (7.2)	
Widowed	62 (9.9)	21 (13.6)	20 (8.5)	
Separated	68 (10.8)	5 (3.2)	9 (3.8)	
Divorced	119 (18.9)	23 (14.8)	38 (16.1)	
Single, never married	163 (25.9)	17 (11.0)	52 (22.0)	
Don't know/refused	0 (0.0)	0 (0.0)	4 (1.7)	
Etiology				
HCV	383 (60.9)	41 (26.5)	179 (75.9)	<.0001
HBV	20 (3.2)	7 (4.5)	1 (0.4)	

	Parkland (n = 629)	UTSW (n = 155)	MEDVAMC (n = 237)	P value
Alcohol	123 (19.6)	30 (19.4)	26 (11.0)	
NASH	74 (11.8)	47 (30.3)	15 (6.4)	
Other	29 (4.6)	30 (19.4)	15 (6.4)	
Child-Turcotte-Pugh class				
A	443 (70.4)	126 (81.3)	185 (78.4)	
B/C	186 (29.6)	29 (18.7)	51 (21.6)	
Household income				
<\$15,000	340 (54.1)	18 (11.6)	42 (17.8)	<.0001
\$15,000–\$25,000	93 (14.8)	11 (7.1)	33 (14.0)	
\$25,000–\$50,000	55 (8.7)	32 (20.7)	32 (13.6)	
\$50,000+	11 (1.8)	75 (48.4)	28 (11.9)	
Don't know/refused	130 (20.7)	19 (12.3)	101 (42.8)	

NOTE. Values are n (%).

HBV, hepatitis B virus; HCV, hepatitis C virus; MEDVAMC, Michael E. DeBakey VA Medical Center; NASH, nonalcoholic steatohepatitis; PHQ-9, Patient Health Questionnaire-9; UTSW, UT Southwestern Medical Center; VA, Veterans Affairs.

Table 2.

Prevalence of Depression and Anxiety in Patients With Cirrhosis, Stratified by Site

	Parkland (n = 629)	UTSW (n = 155)	MEDVAMC (n = 237)	Total (N = 1021)	P Value
Depression measured by PHQ-9 score					
No-minimal depression (0–4)	238 (37.8)	72 (46.5)	86 (36.3)	396 (38.8)	.03
Mild depression (5–9)	153 (24.3)	45 (29.0)	64 (27.0)	262 (25.7)	
Moderate depression (10–14)	129 (20.5)	28 (18.1)	47 (19.8)	204 (20.0)	
Moderately severe depression (15–19)	82 (13.0)	8 (5.2)	25 (10.6)	115 (11.3)	
Severe depression (20–25)	27 (4.3)	2 (1.3)	15 (6.3)	44 (4.3)	
Anxiety measured by STAI score					
Mild anxiety (<40)	335 (53.3)	95 (61.3)	156 (65.8)	586 (57.4)	.002
Moderate-severe anxiety (≥ 40)	294 (46.7)	60 (38.7)	81 (34.2)	435 (42.)	

MEDVAMC, Michael E. DeBakey VA Medical Center; PHQ-9, Patient Health Questionnaire-9; STAI, State-Trait Anxiety Inventory; UTSW, University of Texas Southwestern Medical Center.

Table 3. Multivariable Logistic Regression for Correlates of Moderately Severe to Severe Depression (PHQ-9 Score 15)

Age category	Prevalence odds ratio	95% Confidence interval	P value
21–50 y	Reference	Reference	Reference
51–60 y	0.96	0.53–1.75	.90
61–90 y	0.90	0.49–1.68	.74
Sex			
Female	Reference	Reference	Reference
Male	0.72	0.47–1.12	.14
Race/ethnicity			
White	Reference	Reference	Reference
Black	0.65	0.38–1.11	.11
Hispanic	0.57	0.33–0.97	.04
Other	0.91	0.28–2.95	.88
Are you afraid of dying soon from liver cancer?			
Never	Reference	Reference	Reference
Rarely	1.04	0.50–2.15	.92
Every once in a while	0.43	0.16–1.13	.09
Sometimes	0.91	0.49–1.69	.77
Most of the time	1.41	0.73–2.71	.31
Are you afraid that you may have liver cancer?			
Never	Reference	Reference	Reference
Rarely	0.87	0.38–2.02	.75
Every once in a while	2.16	1.10–4.22	.03
Sometimes	1.89	1.04–3.42	.04
Most of the time	1.43	0.73–2.81	.30
Does the thought of liver cancer scare you?			
Never	Reference	Reference	Reference
Rarely	1.14	0.50–2.60	.75
Every once in a while	0.82	0.37–1.78	.61

	Prevalence odds ratio	95% Confidence interval	P value
Sometimes	1.44	0.77–2.69	.25
Most of the time	1.61	0.82–3.17	.17
Health status			
Excellent/very good	Reference	Reference	Reference
Good	1.59	0.66–3.80	.30
Fair/poor	4.08	1.79–9.28	.001
Marital status			
Single, never married	Reference	Reference	Reference
Divorced	1.24	0.69–2.25	.47
Living with partner	0.92	0.41–2.05	.83
Married	1.14	0.65–2.01	.64
Separated	1.32	0.63–2.78	.46
Widowed	2.08	1.07–4.05	.03
Child-Turcotte-Pugh class			
A (5–6)	Reference	Reference	Reference
B (7–9)	1.19	0.79–1.813	.40
Etiology			
HCV	Reference	Reference	Reference
Alcohol	1.40	0.82–2.39	.22
HBV	1.20	0.38–3.78	.76
NASH	0.90	0.47–1.75	.76
Other	0.92	0.40–2.11	.84
Household income			
<\$15,000	Reference	Reference	Reference
\$15,000–\$25,000	1.10	0.61–1.96	.76
\$25,000–\$50,000	0.89	0.45–1.76	.74
\$50,000+	0.30	0.10–0.95	.04
Site			
Parkland	Reference	Reference	Reference
UTSW	0.52	0.23–1.20	.13
VA	1.37	0.77–2.46	.29

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HBV, hepatitis B virus; HCV, hepatitis C virus; NASH, nonalcoholic steatohepatitis; PHQ-9, Patient Health Questionnaire-9; UTSW, UT Southwestern Medical Center; VA, Veterans Affairs.

Table 4. Multivariable Logistic Regression for Correlates of Moderate–Severe Anxiety (STAI score >40)

Age category	Prevalence odds ratio	95% Confidence interval	P value
21–50 y	Reference	Reference	Reference
51–60 y	1.02	0.66–1.59	.93
61–90 y	0.71	0.45–1.11	.14
Sex			
Female	Reference	Reference	Reference
Male	0.71	0.51–0.98	.04
Race/ethnicity			
White	Reference	Reference	Reference
Black	0.90	0.60–1.34	.60
Hispanic	0.97	0.64–1.45	.87
Other	0.67	0.28–1.62	.37
Are you afraid of dying soon from liver cancer?			
Never	Reference	Reference	Reference
Rarely	1.41	0.84–2.39	.19
Every once in a while	1.31	0.75–2.28	.35
Sometimes	1.61	1.01–2.54	.04
Most of the time	2.24	1.33–3.78	.003
Are you afraid that you may have liver cancer?			
Never	Reference	Reference	Reference
Rarely	1.60	0.97–2.66	.07
Every once in a while	1.40	0.85–2.32	.19
Sometimes	1.15	0.74–1.78	.54
Most of the time	1.08	0.66–1.79	.75
Does the thought of liver cancer scare you?			
Never	Reference	Reference	Reference
Rarely	0.96	0.55–1.68	.89
Every once in a while	1.37	0.82–2.30	.23

	Prevalence odds ratio	95% Confidence interval	P value
Sometimes	1.78	1.13–2.80	.01
Most of the time	2.13	1.29–3.51	.003
Health status			
Excellent/very good	Reference	Reference	Reference
Good	1.35	0.84–2.19	.22
Fair/poor	2.73	1.73–4.31	<.0001
Marital status			
Single, never married	Reference	Reference	Reference
Divorced	1.05	0.67–1.63	.84
Don't know/refused	2.08	0.16–26.54	.57
Living with partner	1.14	0.63–2.05	.67
Married	0.76	0.50–1.14	.18
Separated	1.22	0.70–2.15	.48
Widowed	1.02	0.60–1.73	.95
Child-Turcotte-Pugh score			
Class A (5–6)	Reference	Reference	Reference
Class B (7–9)	1.10	0.79–1.52	.59
Etiology			
HCV	Reference	Reference	Reference
Alcohol	1.01	0.67–1.52	.97
HBV	1.34	0.56–3.18	.51
NASH	0.86	0.54–1.37	.53
Other	1.05	0.59–1.87	.88
Household income			
<\$15,000	Reference	Reference	Reference
\$15,000–\$25,000	0.98	0.63–1.54	.94
\$25,000–\$50,000	1.00	0.61–1.64	.99
\$50,000+	0.71	0.38–1.30	.26
Site			
Parkland	Reference	Reference	Reference
UTSW	1.23	0.73–2.08	.43

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	Prevalence odds ratio	95% Confidence interval	P value
VA	1.21	0.78–1.88	.39

HBV, hepatitis B virus; HCV, hepatitis C virus; NASH, nonalcoholic steatohepatitis; STAI, State-Trait Anxiety Inventory; UTSW, UT Southwestern Medical Center; VA, Veterans Affairs.