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ORIGINAL ARTICLE

Inadequate social support decreases survival in decompensated liver cirrhosis patients

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KEYWORDS
Liver cirrhosis;
Mortality;
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Abstract
Introduction: Inadequate social support is associated with higher mortality both in the general population and in patients with chronic diseases. There are no studies that have described social support in liver cirrhosis and its impact on prognosis.
Objectives: To analyze the impact social support has in the survival of patients with decompensated cirrhosis.
Methods: Prospective multicentric cohort study (2016–2019). Patients with decompensated liver cirrhosis were included. Epidemiological, clinical and social variables were collected, using the validated Medical Outcomes Study Social Support Survey, with a 12-month follow-up.

Abbreviations: LC, liver cirrhosis; MELD, Model for End-Stage Liver Disease; EASL, European Association for the Study of the Liver; SS, social support; LT, liver transplant; MOS-sss, Medical Outcomes Study Social Support Survey; SD, standard deviation; CI, confidence interval; ANOVa, nalysis of variance.

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Results: A total of 127 patients were included, of which 79.5% were men. The most common etiology of cirrhosis was alcohol (74.8%), mean age was 60 years (SD 10.29), mean MELD was 15.6 (SD 6.3) and most of the patients had a Child–Pugh B (53.5%) or C (35.4%). In the assessment of social support, we observed that most of the patients (92.2%) had adequate global support. At the end of the follow-up (median 314 days), 70.1% of the patients survived. The 1-year survival rate in patients with inadequate global social support was 30%, compared to 73.5% in the presence of social support. In multivariate Cox regression analysis, inadequate social support predicted survival with an adjusted HR of 5.5 (95% CI 2,3-13,4) independently of MELD (HR 1.1, 95% CI 1–1.2), age (HR 1, 95% CI 1–1.1) and hepatocarcinoma (HR 10.6, 95% CI 4.1–27.4).
Conclusion: Adequate social support improves survival in liver cirrhosis, independently of clinical variables. Social intervention strategies should be considered for their management.

PALABRAS CLAVE
Cirrosis hepática;
Mortalidad;
Actividades preventivas;
Análisis de supervivencia

El apoyo social inadecuado disminuye la supervivencia en pacientes con cirrosis hepática descompensada

Resumen
Introducción: El apoyo social se asocia a mortalidad en población general y en pacientes con enfermedades crónicas. No hay estudios que hayan descrito el apoyo social en cirrosis hepática y su impacto sobre el pronóstico.
Objetivo: Analizar el impacto del apoyo social en la supervivencia en cirrosis hepática descompensada.
Material y métodos: Estudio multicéntrico prospectivo de cohortes (2016–2019). Se incluyeron pacientes con cirrosis hepática descompensada. Se recogieron variables epidemiológicas, clínicas y sociales mediante la escala validada *Medical Outcomes Study Social Support Survey* (MOS), realizando un seguimiento de 12 meses.
Resultados: Se incluyeron 127 pacientes, el 79,5% eran hombres. La causa más común de la cirrosis hepática fue alcohol (74,8%), la edad media 60 años (DE: 10,29), la media de MELD 15,6 (DE: 6,3) y la mayoría tenían Child-Pugh B (53,5%) o C (35,4%). Se observó que la mayoría de pacientes (92,2%) tenían un apoyo social adecuado (MOS global > 56). Al finalizar el seguimiento (mediana 314 días), el 70,1% de los pacientes sobrevivieron. La supervivencia al año en falta de apoyo social fue del 30%, comparado con el 73,5% en los que el apoyo social era adecuado. En el análisis de regresión multivariante el apoyo social predijo la supervivencia con un HR ajustado de 5,5 (IC 95%: 2,3-13,4) independientemente del MELD (HR: 1,1; IC 95%: 1-1,2), edad (HR: 1; IC 95%: 1-1,1) y hepatocarcinoma (HR: 10,6; IC 95%: 4,1-27,4).
Conclusión: El apoyo social inadecuado en pacientes con CH disminuye la supervivencia, independientemente de las variables clínicas. Se deberían plantear estrategias de intervención social para su manejo.

Introduction

Natural history of liver cirrhosis (LC) is characterized by an asymptomatic phase, known as compensated LC followed by the development of complications of portal hypertension and liver dysfunction, designated decompensated LC. These decompensations (ascites, portal hypertensive gastrointestinal bleeding, encephalopathy, or jaundice) strongly interfere in the prognosis of these patients.[1] As some studies have demonstrated, medium survival in decompensated liver cirrhosis (LC) is less than 2 years, while in compensated LC is 12 years.[2,3] Other authors have described a statistically significant difference of 1-year mortality rate, being 5.4% in compensated and 20.2% in decompensated patients.[4] Several independent predictive survival factors have been described, mainly related to the liver function (Child–Pugh score and Model for End-Stage Liver Disease (MELD) score) and the age.[1,3,4]

Although early intervention in the modifiable factors may improve hospital outcomes and mortality, mortality remains high and prognosis of decompensated LC is poor in the medium-long term.[3,5] According to World Health Organization's data, age-adjusted mortality of liver diseases ranged between 10 and 36 deaths per 100,000 across European countries. Moreover, on average two-thirds of all potential years of life lost were working years of life, therefore, liver diseases, specifically LC, still represent a very important

economic burden for European health management systems nowadays.[6]

Social support (SS) is defined as an interactive process through which the individual obtains emotional, instrumental or economic help from the social network in which he is immersed.[7–9] It has been demonstrated in many publications that the influence of SS on mortality risk is comparable with well-established risk factors in the general population.[10] In chronic diseases, such as arterial hypertension or diabetes, patients with lower SS have a higher risk of developing cardiovascular events and die during long-term follow-up.[11,12] In population-based studies, social isolation has been associated with higher rates of mortality, accidents and suicides.[13–15] Due to these facts, the European Association for the Study of the Liver (EASL) has stated that future priorities to reduce the burden of liver diseases in European countries should be focused on education, both of medical professionals and the public, health system changes and social factors.[6] In Spain, the national strategic program of intervention in chronic diseases, in which LC is included, specifically states that one of the priority lines in which we must focus our work is the social network's activation, SS of the patient and relatives and his or her cognitive and functional preservation. It also specifies that investigation and innovation in these aspects is urgently needed to improve the quality of life and the prognosis of these patients.[16]

With regard to LC, on the one hand, SS is an important variable for liver transplant (LT) candidates, providing them with psychological and social well-being, and might be decisive in their admission in the waiting list for an organ.[17,18] On the other hand, LC is usually associated with higher social risk factors, such as alcoholism or drug abuse. However, SS has barely been analyzed in these patients.[6,19–22] Furthermore, there is no evidence on the impact of SS on decompensated LC prognosis, so we decided to design a prospective non-intervention study to describe the prevalence of inadequate social support in a cohort of patients that required admission due to decompensated liver cirrhosis, as well as its impact on one-year mortality.

Methods

Description of the study

This is a multicentric prospective non-intervention longitudinal study that took place in two Spanish hospitals (University Hospital of La Fe, Valencia and University Hospital of Ourense) between 2016 and 2019. We enrolled all consecutive patients older than 18 years of age with decompensated LC after hospital admission secondary to clinical decompensation (ascites, gastrointestinal variceal bleeding, encephalopathy or jaundice) who preserved cognitive function after giving informed consent. All patients with previous personal history of LT or other types of transplants and those who were not able to cooperate were excluded.

Patients were followed up to death, liver transplant or 1 year from inclusion.

Variables assessed

Epidemiological and clinical variables were analyzed, including age, sex, comorbidities such as hypertension, diabetes, hypercholesteremia or hypertriglyceridemia, obesity, smoking habit, alcohol consumption, etiology of the LC, presence of hepatocarcinoma, and liver function (using MELD and Child Pugh).[23,24] We also registered personal history that determined life expectancy of less than 1 year (advanced oncological disease, advanced heart failure, pneumopathy requiring home oxygen or chronic kidney failure on hemodialysis programmes).[25]

Social support assessment

For the assessment of SS, all the surveys were carried out by investigators who were previously instructed to guide these interviews and performed in a private consult with the patient in person. We assessed the SS using the Medical Outcomes Study Social Support Survey (MOS-sss), which was designed and validated by Shebourne et al.[26] as a multidimensional, self-administered survey and has been adapted in Spanish[27] (Supplementary Material 1 and 2). This survey was developed to measure perceived social support in a cohort of patients with chronic illnesses. SS can be classified into: quantitative or support social network, which refers to the number of people someone can turn to in case of need; and qualitative or subjective functional support, which refers to the perception that each individual has of the availability of support. In this sense, MOS-SS survey assesses SS quantitatively by measuring the social network and qualitatively as a whole and by differentiating 4 categories: emotional support (expression of positive affect, empathetic understanding, and the encouragement of expressions of feelings), instrumental support (tangible aid and services), positive social interaction (availability of people to have fun with) and affectionate support (involving expressions of love and affection). SS is defined as inadequate or lacking when the global score of the 19 questions is less than 57. The cut-off points for the lack of emotional, instrumental, positive social interaction and affectionate support are 23/24, 11/12, 8/9 and 8/9, respectively.[26]

Statistical analysis

Data were collected from personal interviews with the patients and electronic clinical history after their inclusion. For univariate analyses, centrality measures (mean and standard deviation (SD)) were used for quantitative variables and percentages for qualitative variables. For comparative analyses, we carried out parametric tests. Student's *T*-test was performed for quantitative variables and Chi-square test was carried out for qualitative variables. We analyzed the stability of SS through the follow-up by analysis of variance (ANOVA-Friedman). In time-to-event analyses, we considered that the event of interest was death, LT, or abandonment of follow-up. The observation started from the time of inclusion and data were censored on the date of the last follow-up visit. Survival analysis was done using Kaplan–Meier method. For multivariate analyses, Cox proportional hazard regression modeling was used to analyze

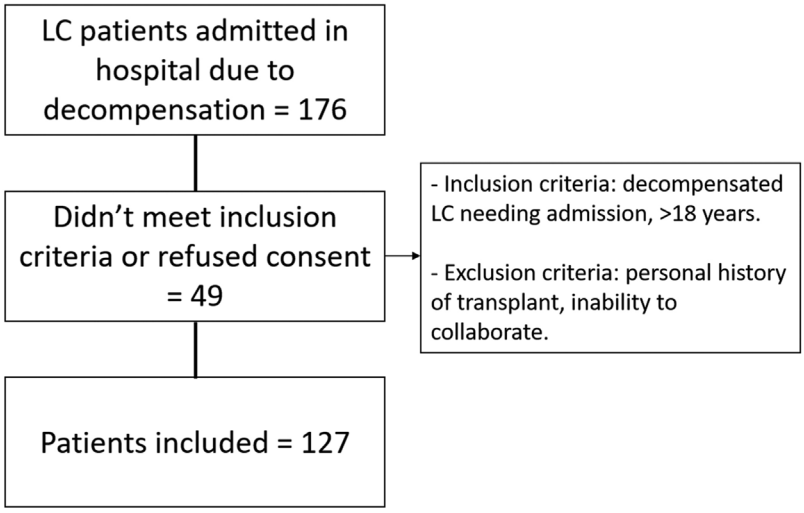


Figure 1 Flowchart of the participants of the study: *LC: liver cirrhosis.*

the factors associated with the outcomes and hazard ratios and 95% Confidence Intervals (CIs) were calculated for the strength of association. All results were considered significant if a $p < 0.05$ was obtained. All statistical analyses were performed using SPSS statistical software, version 22.0 (SPSS Inc., Chicago, IL, USA).

Ethical considerations

This study has the approval of the local Research Ethics Committee (registration number 2017/0620 and 2016/465). All participants signed the informed consent. The project was developed in accordance with the Declaration of Helsinki, the International Guidelines for Ethical Review of Epidemiological Studies, the European and Spanish regulations on biomedical research, and European and Spanish regulations (General Data Protection Regulation 2016/679 – GDPR-2016, and Organic Law 3/2018, of December 5, on the Protection of Personal Data and Guarantee of Digital Rights – LOPDP-2018, respectively) on personal data protection.

The researchers signed a confidentiality pledge and specific measures were also adopted to maintain the integrity and security of the data and prevent access by third parties to any identified or identifiable personal data. No publication or report derived from the study will use or contain data or images identified or identifiable.

Results

Description

A total of 127 patients were recruited prospectively between 2016 and 2019 (Fig. 1). Medium age was 60 years (SD 10.29) and 79.5% of them were men. The most common etiology of the cirrhosis was alcohol (74.8%), followed by hepatitis C (19.8%), of which 20.8% had previously eradicated the virus. There was a personal history of hepatocellular carcinoma in 23.6% of the patients and 73.3% of these were candidates for LT, surgery or locoregional treatment (radiofrequency or chemoembolization). Regarding liver function, mean MELD was 15.6 (SD 6.3) and most of the patients had a Child–Pugh B (53.5%) or C (35.4%). The most frequent cause of admission in the hospital at the moment of the inclusion was ascites (31.3%), gastrointestinal variceal bleeding (31.3%) and encephalopathy (11%). Comorbidities, baseline characteristics of the population are summarized in Table 1.

At the end of follow-up 18 patients had received a liver transplant (14.2%), with a mean follow-up time of 75.2 days (SD 57.5).

One year after the inclusion, 38 patients passed away (29.9%). For those patients who survived at the end of follow-up, the mean survival period was 322.5 days (SD 15.2, 95% CI 292.8–352.3).

Social support

In the assessment of SS, we observed that, at the moment of the enrollment, 92.2% of the patients had adequate global SS, compared to 7.9% of the patients that did not have adequate SS. With regard to the different dimensions of SS, the prevalence of inadequate positive social interaction, emotional, instrumental and affectionate support was 14.2%, 13.4%, 3.1%, and 7.1%, respectively. The social network was low (0–1 contacts) in 5.6% and medium (2–5 contacts) in 29.4% of the patients. The results of the MOS-SS survey are schematized in Table 2.

During the follow-up, we assessed SS twice more, at 2 and 6 months, and we observed that there were no statistically significant differences compared to baseline SS, meaning SS was stable through time (global MOS $p = 0.81$; emotional support $p = 0.27$; instrumental support $p = 0.92$; positive social interaction $p = 0.60$; affectionate support $p = 0.39$) (Table 3).

Factors associated with 1-year mortality

In the bivariant analyses, we found a statistically significant association between survival and age, severe comorbidities, personal history of hepatocarcinoma and impaired liver function measured by MELD. On the contrary, no significant

Table 1 Comorbidities, baseline characteristics of the population and bivariant analyses ($n = 127$).

	Global $n = 127$	Alive $n = 89$ (70.1%)	Death $n = 38$ (29.9%)	HR (95% CI)
Age, mean (SD)	60.00 (10.29)	58.70 (9.45)	63.00 (11.62)	1.041 (1.009–1.075)
Sex, n (%)				
Men	101 (79.5)	71 (70.3)	30 (29.7)	1
Women	26 (20.5)	18 (69.2)	8 (30.8)	1.064 (0.486–2.328)
Smoking habit, n (%)				
No	81 (63.8)	57 (70.4)	24 (29.6)	1
Yes	46 (36.2)	32 (69.6)	14 (30.4)	0.965 (0.499–1.866)
Hypercholesterolemia, n (%)				
No	105 (82.7)	74 (70.5)	31 (29.5)	1
Yes	22 (17.3)	15 (68.2)	7 (31.8)	1.147 (0.504–2.611)
Mellitus diabetes, n (%)				
No	79 (62.2)	57 (72.2)	22 (27.8)	1
Yes	48 (37.8)	32 (66.7)	16 (33.3)	1.339 (0.699–2.566)
Arterial hypertension, n (%)				
No	79 (62.2)	59 (74.7)	20 (25.3)	1
Yes	48 (37.8)	30 (62.5)	18 (37.5)	1.635 (0.865–3.091)
Obesity, n (%)				
No	91 (71.7)	63 (69.2)	28 (30.8)	1
Yes	36 (28.3)	26 (72.2)	10 (27.8)	0.846 (0.410–1.749)
Other comorbidities conditioning < 1 year life expectancy, n (%)				
No	120 (94.5)	88 (73.3)	32 (26.7)	1
Yes	7 (5.5)	1 (14.3)	6 (85.7)	4.217 (1.713–10.381)
Hepatocarcinoma				
No	97 (76.4)	76 (78.4)	21 (21.6)	1
Yes	30 (23.6)	13 (43.3)	17 (56.7)	3.397 (1.771–6.516)
Child–Pugh				
A	14 (11.0)	11 (78.6)	3 (21.4)	1
B	68 (53.5)	55 (80.9)	13 (19.1)	0.841 (0.240–2.954)
C	45 (35.4)	23 (51.1)	22 (48.9)	3.159 (0.940–10.610)
MELD	15.63 (6.34)	14.55 (5.27)	18.16 (7.84)	1.119 (1.060–1.180)
Etiology (OH)				
No	32 (25.2)	24 (75.0)	8 (25.0)	1
Yes	95 (74.8)	65 (68.4)	30 (31.6)	1.307 (0.599–2.851)
Alcohol abstinence n (%)				
No	42 (33.1)	26 (61.9)	16 (38.1)	1
Yes	85 (66.9)	63 (74.1)	22 (25.9)	0.727 (0.382–1.385)
Etiology (HCV)				
No	102 (80.3)	70 (68.6)	32 (31.4)	1
Yes	25 (19.7)	19 (76.0)	6 (24.0)	0.902 (0.376–2.164)
SVR				
No	19 (76.0)	13 (68.4)	6 (31.5)	
Yes	5 (20.0)	4 (80.0)	1 (20.0)	
Hospital				
Ourense	30 (23.6)	21 (70.0)	9 (30.0)	1
Valencia	97 (76.4)	68 (70.1)	29 (30.0)	1.151 (0.544–2.434)

Abbreviations: MELD: Model for End-Stage Liver Disease, OH: alcohol, HCV: hepatitis C virus.
Cox proportional hazard regression modeling was used to analyze the factors associated with the outcomes and hazard ratios and 95% Confidence Intervals (CIs) were calculated for the strength of association.

Table 2 Results of the MOS-sss in the patients ($n = 127$).

	Global $N = 127$	Alive $n = 89$ (70.1%)	Dead $n = 38$ (29.9%)	HR (95% CI)
Global support				
Absence of social support	10 (7.9)	3 (30.0)	7 (70.0)	3.637 (1.594–8.301)
Presence of social support	117 (92.1)	86 (73.5)	31 (26.5)	1
Emotional support				
Absence	17 (13.4)	4 (23.5)	13 (76.5)	6.046 (3.055–11.963)
Presence	110 (86.6)	85 (77.3)	25 (22.7)	1
Instrumental support				
Absence	4 (3.1)	1 (25.0)	3 (75.0)	4.464 (1.362–14.636)
Presence	123 (96.9)	88 (71.5)	35 (28.5)	1
Positive social interaction				
Absence	18 (14.2)	9 (50.0)	9 (50.0)	2.053 (0.968–4.358)
Presence	109 (85.8)	80 (73.4)	29 (26.6)	1
Affectionate support				
Absence	9 (7.1)	4 (44.4)	5 (55.6)	2.140 (0.821–5.582)
Presence	118 (92.9)	85 (72.0)	33 (28.0)	1
Social network				
Low (0–1 contacts)	7 (5.6)	3 (42.9)	4 (57.1)	2.193 (0.735–6.538)
Medium (2–5 contacts)	37 (29.4)	24 (64.9)	13 (35.1)	1.460 (0.730–2.922)
High (>5 contacts)	83 (65.1)	62 (74.7)	21 (25.6)	1

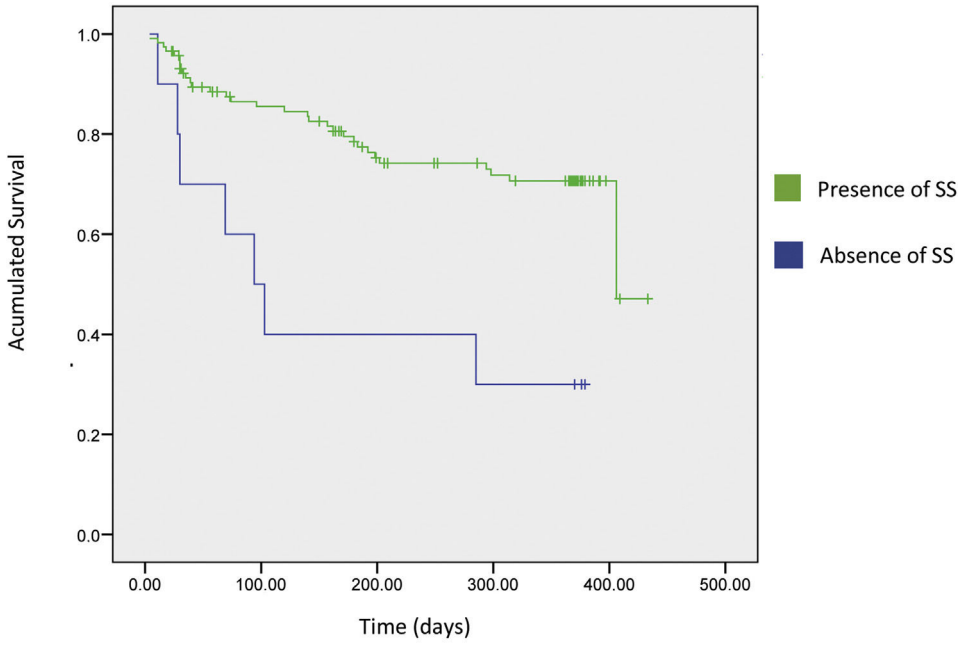
Cox proportional hazard regression modeling was used to analyze the factors associated with the outcomes and hazard ratios and 95% Confidence Intervals (CIs) were calculated for the strength of association.

Table 3 Analyses of variance (ANOVA-Friedman) of social support (MOS-sss punctuation).

	Baseline	2 months	6 months	*p*
Global, n (%)				
94 (maximum)	39 (30.7)	24 (40.0)	16 (36.4)	0.819
93–57 (medium)	78 (61.4)	32 (53.3)	26 (59.1)	
<56 (minimum)	10 (7.9)	4 (6.7)	2 (4.5)	
Emotional, n (%)				
40 (maximum)	52 (40.9)	30 (50.0)	19 (43.2)	0.276
39–24 (medium)	58 (45.7)	27 (45.0)	21 (47.7)	
<23 (minimum)	17 (13.4)	3 (5.0)	4 (9.1)	
Instrumental, n (%)				
20 (maximum)	75 (59.1)	41 (68.3)	27 (61.4)	0.926
19–12 (medium)	48 (37.8)	18 (30.0)	16 (36.4)	
<11 (minimum)	4 (3.1)	1 (1.7)	1 (2.3)	
Positive social interaction, n (%)				
20 (maximum)	49 (38.6)	29 (48.3)	19 (43.2)	0.607
19–12 (medium)	60 (47.2)	23 (38.3)	21 (47.7)	
<11 (minimum)	18 (14.2)	8 (13.3)	4 (9.1)	
Affectionate, n (%)				
15 (maximum)	81 (63.8)	40 (66.7)	25 (58.1)	0.397
14–9 (medium)	37 (29.1)	15 (25.0)	17 (39.5)	
<8 (minimum)	9 (7.1)	5 (8.3)	1 (2.3)	

association was observed regarding the Child–Pugh score, alcohol abstinence or HVC treatment (Table 1).

At the end of the follow-up (mean 241 days, SD 145.7), 70.1% of the patients survived. The 1-year survival in patients with absence of global SS was 30%, compared to 73.5% in patients with a preserved f SS ($p = 0.01$), represented in Fig. 2. When analyzing the different categories of SS contemplated in the MOS-SSS scale, we found that



Probability of success	1 year	Log-rank
Presence of adequate SS	73.5%	0.001
Absence of SS	30.0%	

Figure 2 Survival probability during 12 months follow up according to global Social Support (SS): Definitions: Absence of SS: global score of Mos-sss < 57; adequate SS global score of Moss-sss ≥ 57. Survival curves were calculated using Kaplan–Meier method. Log Rank test was used to detect differences between the groups. A $p < 0.05$ is considered statistically significant.

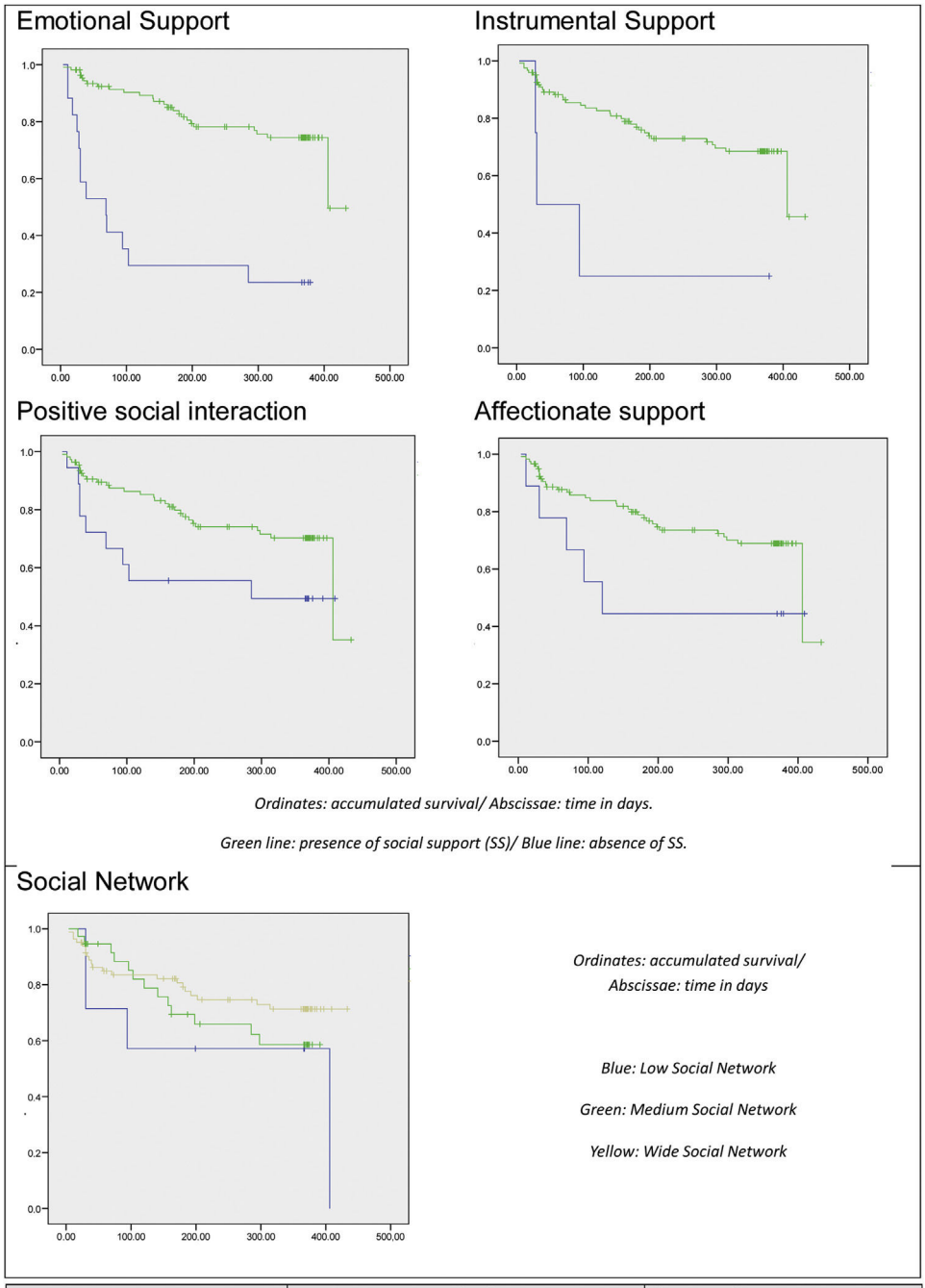
there were statistically significant differences in the survival regarding the emotional and instrumental support and patients with absence of that kind of support had a lower 1-year survival rate (77.3 vs. 23.5%, $p < 0.01$; 71.5 vs. 25%, $p < 0.01$). In regard to positive social interactions, there was a tendency to significant differences (73.4 vs. 50%, p 0.06), meanwhile the affective support and the social network did not have an impact on the survival rate (Fig. 3).

In multivariate Cox regression analysis, SS predicted survival with an adjusted HR of 5.5 (95% CI 2.3–13.4), regardless of MELD score (HR 1.1, 95% CI 1–1.2), age (HR 1, 95% CI 1–1.1) and presence of hepatocarcinoma (HR 10.6, 95% CI 4.1–27.4).

Discussion

Inadequate SS is infrequent in patients with decompensated LC who need hospital admission. However, despite being a minority, the lack of adequate SS is independently associated with mortality in the first year of follow-up. To our knowledge, this is the first published investigation that demonstrates and quantifies the influence of the SS in LC mortality. We have assessed the prevalence of impaired SS among patients requiring hospitalization due to decompensated LC as well as the effect on one-year mortality.

It is well known that SS has a significant influence in mortality of chronic diseases, such as arterial hypertension, diabetes, heart failure or cancer.[11,12,14,28] However, there is scant evidence on the effect that SS has in liver diseases. Social interventions in clinical practice have shown solid results in the improvement of the management and evolution of chronic diseases and they also influence the results of liver transplantation.[29,30] European consensus and the Spanish strategic program of intervention in chronic diseases, in which LC is included, affirm that we must focus our work in the management of SS by activating the social network and enhancing the SS of the patients and their relatives.[6,16,22] However, these social variables have not previously been investigated as prognosis factors in LC and, consequently, not used as standardized and systematic in the daily practice. In 2015, a systematic review was published showing the results of publications related to supportive needs in chronic liver disease.[22] Only 26 articles reported supportive care needs among patients with liver disease, not specifically LC. In particular, there was very little data on the supportive care needs of patients with LC and few of the investigations were patient-reported needs and used a validated instrument. The authors concluded that more specific studies focused on LC, using validated instruments, are necessary, given the importance of the social environment in the management of chronic disease patients.



	1-year survival (%)			Log-rank
Social Support Dimension	Presence	Absence		p
Emotional	77.3	23.5		0.01
Instrumental	71.5	25		0.01
Social Interaction	73.4	50		0.06
Affectionate	72	44		0.11
Social Network	Low	Medium	Wide	
	42.9	64.9	74.4	0.26

Figure 3 Survival probability during 12 months follow up according to MOS-SSS evaluation. Definitions: Absence of SS: emotional < 24, instrumental < 12, positive social interaction < 9 and affectionate < 9; Adequate SS: emotional ≥ 24, instrumental ≥ 12, positive social interaction ≥ 9 and affectionate ≥ 9. Survival curves were calculated using Kaplan–Meier method. Log Rank test was used to detect differences between the groups. A $p < 0.05$ is considered statistically significant.

A study from North America analyzing the relationship of SS with the rate of hospital readmission due to decompensation has been recently published.[31] The authors did not find statistically significant differences in readmission depending on SS and they did not analyze the effect of SS on mortality. Their results showed that the only factor related with it was the liver function (measured by MELD-Na). These results were unexpected, because the importance of the influence of SS in chronic diseases has been widely demonstrated.[10–13] This could be explained by the small size of the population studied ($n = 73$), population non comparable to European countries, recruitment by telephone or email in the majority of cases or short-term follow-up.

To our knowledge, our study is the first to assess SS as a mortality risk factor in LC patients following European and national recommendations, by using a validated instrument, as MOS-sss.[6,16,22,26,27] The demographic and epidemiologic baseline characteristics of our cohort of patients are similar to previously published cohorts of decompensated LC patients.[4,19,32,33] Our patients were more frequently affected of alcoholic LC or HCV LC, and they were predominantly middle-aged men, these results being similar to those found in previous investigations as well. Thus, we conclude that our sample is representative of decompensated LC patients that need admission worldwide.[29] In the recently published study[31] that analyzed the relationship of SS with the rate of readmission in hospital, the results could not demonstrate a statistically significant association between them. It is important to underline that their cohort of patients was different to ours with regard to the etiology of LC, as during the time our investigation took place (2016–2019) in the majority of European countries, the most common cause of LC still remained alcohol or viral hepatitis, followed by NASH.[6,34,35] However, in North America NASH prevalence is increasing exponentially in the past few years,[36] so probably the results of this investigation cannot be compared to ours, because the most common etiologies in our population were different.

Regarding the analyses of SS, our investigation shows that it is a solid prognostic factor for patients with decompensated LC. The results of the analyses in our cohort showed that most of the patients had adequate global SS, which agrees with other investigations.[31,37] However, at the end of the follow-up the 1-year survival in patients with inadequate SS was significantly lower, which highlights the importance of adequate SS. Surprisingly, we did not find differences in the bivariant analysis regarding alcohol abstinence or HCV treatment, which are variables that have an impact on the survival of this patients. This might be explained by the low proportion of patients actively consuming alcohol or without being treated for the HCV, or the high rate of patients with adequate social support, which is usually associated with lower rates of alcohol consumption or low adherence to treatments.

In spite of this, in multivariate analysis, SS predicted survival independently of relevant and solid clinical variables, such as Child–Pugh score, etiology of HC, age and hepatocellular carcinoma. Also, the degree of association of the SS in survival was higher than liver function, age and etiology, and it was only surpassed by the presence of hepatocarcinoma, which highlights the clinical importance of social factors in prognosis.

While analyzing specific dimensions of SS, we demonstrated that instrumental support and emotional support have a significant association with mortality. These findings correlate with other investigations in chronic disease. For example, emotional support has been previously associated with complications of ischemic cardiopathy, such as new episodes of angina or need to repeat catheterization,[14] or the increase of social interaction reduces the prevalence of depression.[38] Nevertheless, we did not find differences regarding positive social interactions and affective support, probably secondary to the few numbers of patients reporting inadequate SS. We also did not find differences in quantitative SS measured by the social network. Social network refers to the number of people someone can count on in case of need, and numerous studies have shown association with the prognosis of chronic diseases.[17–20] For example, in breast cancer, a recent systematic review showed that social isolation and lower social network worsen survival rates.[28] However, our results are consistent with other investigations in non-oncologic chronic diseases, that have found association between social network and different clinical outcomes such as rate of readmission or rate of depression, but not mortality.[39,40]

LC is a chronic disease with special and complex characteristics, because it is usually associated with inadequate lifestyle, substance or alcohol abuse, among other factors, so these patients might not be comparable to other populations under study. In addition, while analyzing the different categories of SS assessed in MOS-sss, we did not find differences regarding positive social interactions and affective support, which might be explained by the same reason as the results found by the analyses of the social network.

Moreover, these findings could be associated to the mechanisms through which social network and SS influence health. Nowadays, there are two hypotheses: on the one hand, the theory of ''direct effect'' that affirms there is a direct relation between SS and the levels of neurotransmitters, sympathetic activity or immune status. On the other hand, the theory of ''buffering effect'', which postulates that SS have a protective or buffer effect on the stressful events that happen to the person.[41] It remains to be elucidated, with studies designed for this purpose, how both pathophysiological mechanisms behave in patients with liver cirrhosis.

Our study has some limitations. The sample size ($n = 127$) and the duration of the follow-up may be not long enough to detect differences, which might explain part of the surprising results that we have had discussed. As we did not have previous data on the prevalence of inadequate SS and associated mortality in decompensated LC, we were unable to perform a sample size while designing the project. However, the data are extraordinarily robust since there is a relevant difference in mortality one year after inclusion in the study. Moreover, patients who were later transplanted were included, assuming that these patients have adequate SS, which can cause a selection bias. However, despite this limitation, the magnitude of the difference that we have obtained in our results is so remarkable that the effect caused by the possible biases is probably not relevant. Besides, there are other validated methods to measure SS that may be more appropriate for this type of patient, in addition to other areas of the social environment that

have not been assessed in this research (type of family, family function, quality of life, etc).[42,43] Therefore, by measuring only social support we might be overlooking other features of the sphere of social risk (lifestyle factors, level of education of the patient, space and living environment).[18] Further investigations specifically designed to corroborate our results are needed in order to make solid conclusions.

Nevertheless, our study demonstrates in a forceful way that SS has an impact in the survival of LC patients. Our investigation evaluates a solid outcome that is mortality in the long term. One of its strengths is the prospective assessment and the inclusion of patients from different regions of the north and south of Spain. Another major strength of our study is the use of a validated SS survey that comprehensively measures support rather than inferring support based on solitary factors.

Conclusion

The importance of SS in the prognosis of chronic diseases is a reality. Specifically in LC patients, adequate SS improves long-term survival, regardless of clinical variables. A correct assessment of SS is necessary in order to modify different social aspects and identify patients at risk in this sense, since it could improve the prognosis, thus enhancing their quality of life and reducing healthcare costs. Information about the social status is necessary to develop policies and homogeneous protocols of social intervention to enable prioritization of support services for each patient with LC. Physicians managing chronic diseases, especially LC, should integrate the social assessment routinely in daily practice. There is a need for a multidisciplinary team composed of hepatologists, social workers, and primary care physicians working together to introduce instruments to asses SS, and, subsequently, plan intervention strategies to improve the prognosis of these patients. It is true that evaluating the social sphere of all the patients that have a LC nowadays is difficult due to the high volume of patients. However, it is easy, to incorporate validated measurement instruments such as the MOS-sss in our daily clinical practice, which is a self-administered scale that is easily filled in, in order to carry out a ''social deficit screening'', to be able to notify social workers to act on those patients at risk.

Ethical considerations

This study has the approval of the local Research Ethics Committee (registration number 2017/0620 and 2016/465). All participants signed the informed consent.

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Conflict of interest

The authors declare no conflicts of interest for this investigation.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.gastrohep.2022.04.006.

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