ASSOCIATION OF LIVER FIBROSIS WITH PSYCHOFUNCTIONAL IMPAIRMENTS IN CHRONIC HEART FAILURE

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Abstract. *Chronic heart failure (CHF) is one of the most common and prognostically unfavorable conditions in clinical practice, characterized by impaired myocardial pump function and involvement of various organs and systems in the pathological process. The aim is to study the impact of the degree of liver fibrosis, determined by transient elastography, on psychofunctional indicators in patients with chronic heart failure (CHF). The study included 150 patients with CHF, divided into four groups according to liver stiffness (< 7.0; 7.0–9.5; 9.5–12.5; > 12.5 kPa). Quality of life (SF-36), levels of anxiety and depression (HADS), and physical activity (PASE) were assessed. An increase in the degree of liver fibrosis was associated with a significant decrease in quality of life scores across all SF-36 domains, an increase in anxiety and depression levels on the HADS, and a decrease in physical activity (PASE) ($p < 0.05$). Liver fibrosis is a significant factor in the deterioration of the psychofunctional state in patients with CHF. Non-invasive assessment of fibrosis degree can be used for comprehensive patient evaluation and therapy adjustment.*

Keywords: *liver fibrosis; chronic heart failure; quality of life; anxiety; depression; physical activity; transient elastography; psychofunctional impairments.*

Introduction

Chronic heart failure (CHF) is one of the most common and prognostically unfavorable conditions in clinical practice, characterized by impaired pump function of the myocardium and the involvement of various organs and systems in the pathological process [1, 2]. Current understanding of CHF pathogenesis emphasizes its systemic nature, in which at late stages of the disease not only does cardiac dysfunction develop, but target organ damage also occurs – primarily affecting the kidneys, liver, and brain [3, 4]. Liver involvement in CHF usually develops as chronic congestive hepatopathy caused by prolonged venous hypertension and hypoperfusion. These processes promote the development of liver fibrosis, a persistent morphological change that can be objectively assessed by transient elastography [5, 6].

A number of studies have associated liver fibrosis in CHF with more severe disease course, reduced exercise tolerance, and increased mortality [7, 8]. Alongside organ dysfunction, patients with CHF often experience marked limitations in physical activity, reduced general well-being and social engagement, as well as suffering from anxiety and depressive disorders, which significantly reduces their quality of life [9, 10]. Assessment scales for psychofunctional status, such as SF-36, HADS and PASE, allow a comprehensive evaluation of the physical, emotional, and behavioral aspects of a patient's condition. Despite the fact that both liver fibrosis and psychofunctional impairments are frequent manifestations of decompensated CHF, the question of their interrelationship remains insufficiently studied. Clarifying this relationship may have important

clinical significance for early risk stratification, individualized patient management, and assessment of comprehensive therapy effectiveness.

Aim of the Study: To evaluate the relationship between the severity of liver fibrosis and measures of quality of life, anxiety, depression, and physical activity in patients with chronic heart failure.

Materials and Methods: The study included 130 patients with a clinically confirmed diagnosis of chronic heart failure (CHF) who were undergoing evaluation and treatment in specialized cardiology and gastroenterology departments. **Inclusion criteria:** CHF of NYHA (New York Heart Association) functional class II–IV, stable disease course, age 45–75 years, and presence of signs of hepatic congestion (based on ultrasound or clinical symptoms). **Exclusion criteria:** acute infectious or inflammatory diseases, decompensated liver cirrhosis, active alcoholic hepatitis, malignant neoplasms, and cognitive disorders that impeded the patient's ability to complete the questionnaires. The degree of liver fibrosis was assessed by transient elastography (FibroScan®), with results expressed in kilopascals (kPa). All patients were divided into 4 groups according to liver stiffness:

- < 7.0 kPa (absence of fibrosis/minimal changes),
- 7.0–9.5 kPa (moderate fibrosis),
- 9.5–12.5 kPa (pronounced fibrosis),
- 12.5 kPa (severe fibrosis/pre-cirrhotic state).

A validated Russian-language SF-36 questionnaire was used to assess quality of life, comprising eight domains: Physical Functioning (PF), Role Physical Functioning (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional Functioning (RE), and Mental Health (MH). Psycho-emotional status was evaluated using the Hospital Anxiety and Depression Scale (HADS). The HADS-A subscale assessed anxiety and HADS-D assessed depression level. Physical activity was measured with the Physical Activity Scale for the Elderly (PASE), adapted for CHF patients. This scale includes components of household, occupational, and recreational activity over the past 7 days. Statistical analysis was performed using SPSS 25.0. ANOVA with post hoc tests was applied to compare quantitative indicators between groups, and Spearman's coefficient was used for correlation analysis. Differences were considered significant at a p-value < 0.05.

Results: A total of 130 patients with confirmed CHF were included in the study. All patients underwent transient elastography of the liver, and based on the results were divided into four groups according to fibrosis stage (Table 1).

Table 1.

Distribution of patients by liver fibrosis stage based on elastography.

Liver fibrosis stage (by elastography)	**Number of patients (n)**	**Proportion of total (%)**
< 7.0 kPa	48	32.0%
7.0–9.5 kPa	54	36.0%
9.5–12.5 kPa	33	22.0%
> 12.5 kPa	15	10.0%

Analysis of the distribution of patients by fibrosis stage revealed that the largest proportion of patients (n = 54, 36.0%) had liver stiffness in the range of 7.0–9.5 kPa, corresponding to moderate fibrosis. The second-largest group comprised patients with stiffness < 7.0 kPa (n = 48,

32.0%), in whom there were no or minimal signs of fibrosis. In 22.0% of patients (n = 33), a liver stiffness of 9.5–12.5 kPa was identified, corresponding to pronounced fibrosis, and only 10.0% (n = 15) had values > 12.5 kPa, which may indicate severe fibrosis or a precirrhotic state. Thus, over two-thirds of the patients (68%) exhibited liver stiffness above 7.0 kPa, confirming the high prevalence of hepatofibrosis in patients with CHF. These findings underscore the importance of evaluating liver status in the management of this patient population.

Assessment of quality of life in CHF patients is an important component of a comprehensive evaluation of the patient's condition, alongside objective clinical and laboratory parameters. In recent years, increasing attention has been paid not only to survival, but also to patients' functional status, their ability to carry out daily activities, and their emotional and social well-being. Considering that hepatic involvement in CHF can contribute to exacerbation of systemic symptoms, reduced exercise tolerance, and impaired metabolic processes, we hypothesized that the presence and severity of liver fibrosis might be a significant factor influencing patients' subjective status. Quality of life indicators were therefore compared across fibrosis groups (Table 2).

Table 2.

Quality of life (SF-36) indicators in CHF patients depending on liver fibrosis stage.

SF-36 Domain	**< 7.0 kPa (n=48)**	**7.0–9.5 kPa (n=54)**	**9.5–12.5 kPa (n=33)**	**> 12.5 kPa (n=15)**
PF – Physical Functioning	66.2 ± 8.7	58.8 ± 9.8	53.2 ± 8.9	46.5 ± 8.4
RP – Role Physical Functioning	72.5 ± 8.9	63.1 ± 9.1	58.3 ± 9.9	51.3 ± 10.8
BP – Bodily Pain	77.1 ± 11.0	68.9 ± 9.6	63.8 ± 9.6	58.2 ± 8.5
GH – General Health	62.9 ± 9.2	53.4 ± 10.2	48.2 ± 5.7	42.3 ± 6.9
VT – Vitality	72.1 ± 8.1	62.3 ± 8.9	58.4 ± 9.2	52.1 ± 6.4
SF – Social Functioning	81.4 ± 14.7	73.4 ± 11.6	68.5 ± 10.3	63.1 ± 11.9
RE – Role Emotional Functioning	76.2 ± 10.8	67.3 ± 9.6	63.5 ± 10.4	58.2 ± 9.3
MH – Mental Health	67.8 ± 9.1	58.4 ± 7.8	53.1 ± 9.1	48.3 ± 9.4

Analysis of the SF-36 scales showed a pronounced trend toward lower quality of life scores with advancing liver fibrosis in CHF patients. The greatest decline was observed in the domains reflecting the physical component of health — Physical Functioning (PF) and Role Physical (RP). In the group with minimal fibrosis (< 7.0 kPa), PF averaged 66.2 ± 8.7 points, whereas in patients with advanced fibrosis (> 12.5 kPa) it was 46.5 ± 8.4 points. Similarly, RP decreased from 72.5 ± 8.9 to 51.3 ± 10.8 points. This indicates a significant restriction of daily activities and a reduced ability to perform usual physical tasks in patients with advanced fibrosis.

The General Health (GH) scale also demonstrated a marked decline — from 62.9 ± 9.2 to 42.3 ± 6.9 points — which may reflect patients' subjective perception of their somatic state as poor in the presence of severe fibrosis. Along with physical limitations, changes were observed in psycho-emotional and social components. For example, the Mental Health (MH) scale fell from 67.8 ± 9.1 in the < 7.0 kPa group to 48.3 ± 9.4 in the > 12.5 kPa group, and the Role Emotional (RE) scale dropped from 76.2 ± 10.8 to 58.2 ± 9.2.

These changes suggest increased emotional instability and social vulnerability corresponding with the degree of hepatofibrosis. Thus, the data presented confirm that progressive liver fibrosis in CHF patients adversely affects not only physical but also emotional and social aspects of their lives. This highlights the need for regular quality of life assessment as part of a comprehensive approach to such patients. In addition to quality of life, the study collected data on anxiety, depression, and physical activity levels, since these parameters have important clinical relevance in CHF. Disturbances of the emotional background and a reduction in daily activity can aggravate the course of the disease, reduce adherence to treatment, and worsen prognosis. The HADS was used to assess anxiety-depressive symptoms, and physical activity was evaluated using the PASE adapted for elderly CHF patients. The results are presented in Table 3.

Table 3.

Anxiety, depression, and physical activity in CHF patients depending on liver fibrosis stage.

Indicator	**< 7.0 kPa (n=48)**	**7.0–9.5 kPa (n=54)**	**9.5–12.5 kPa (n=33)**	**> 12.5 kPa (n=15)**
HADS-A – Anxiety	8.9 ± 1.4	9.1 ± 1.3	9.7 ± 1.2	10.2 ± 1.3
HADS-D – Depression	7.8 ± 1.0	8.2 ± 1.1	8.7 ± 1.3	9.1 ± 1.4
PASE – Physical Activity (points)	123 ± 18.5	111 ± 16.7	97 ± 14.2	87 ± 13.5

According to the obtained data, increasing degrees of liver fibrosis in CHF patients were accompanied by a significant intensification of anxiety and depressive symptoms, as well as a reduction in the level of physical activity. For instance, the mean HADS-A anxiety score rose from 8.9 ± 1.4 in the group with minimal liver stiffness (< 7.0 kPa) to 10.2 ± 1.3 in patients with advanced fibrosis (> 12.5 kPa). A similar trend was observed for the HADS-D depression score, which increased from 7.8 ± 1.0 to 9.1 ± 1.4 points. These values indicate a borderline or subclinical mood disorder that worsens with fibrosis progression. Concomitantly, a substantial decline in physical activity was noted: the PASE index dropped from 123 ± 18.5 in the normal liver stiffness group to 87 ± 13.5 points in patients with severe fibrosis. This reflects restricted mobility, reduced engagement in daily life, and decreased energy expenditure in this patient group. Taken together, these data demonstrate that in CHF patients, liver fibrosis worsens not only the somatic condition but also significantly impacts psycho-emotional health and everyday functioning.

This necessitates a comprehensive multidisciplinary approach to the treatment and monitoring of such patients. Physical activity plays a key role in maintaining functional status in patients with chronic heart failure. Reduced physical activity in these patients is associated with a higher risk of hospitalizations, progression of cardiac dysfunction, and diminished quality of life. Given that hepatic fibrosis may amplify systemic frailty, fatigue, and metabolic disturbances, it was important to assess how fibrosis severity affects the level of daily activity in CHF patients. For this purpose, the PASE was used, allowing quantitative characterization of physical activity in points while accounting for patient age. The results demonstrated a clear dependence of physical activity on the degree of liver fibrosis in CHF patients. In those with minimal fibrosis (< 7.0 kPa), the mean PASE score was 123 ± 18.5 points, corresponding to a satisfactory activity level. Meanwhile, with increasing liver stiffness, a sequential decline in activity was observed:

- 111 ± 16.7 points in the 7.0–9.5 kPa group;
- 97 ± 14.2 points in the 9.5–12.5 kPa group;
- and 87 ± 13.5 points in the > 12.5 kPa group.

This decline may be attributed to several factors, including:

- increased severity of chronic fatigue and weakness;
- reduced tolerance to physical exertion;
- the presence of anxiety and depressive disorders;
- decreased motivation against the backdrop of a deteriorating overall condition.

These data underscore that hepatic fibrosis can aggravate physical inactivity, which, in turn, contributes to the progression of CHF. Consequently, the assessment and maintenance of physical activity should be regarded as important components in the management of patients with combined cardiac and hepatic pathology.

Discussion: The results of the present study indicate that the degree of liver fibrosis in patients with chronic heart failure (CHF) is closely associated with disturbances in both physical and psycho-emotional status. The data obtained are consistent with previously published studies that emphasize the interrelationship between liver condition and an unfavorable course of CHF [5–8]. In particular, as shown in the study by Møller and Henriksen, hepatofibrosis in heart failure patients can develop as a consequence of chronic congestion in the inferior vena cava system, as well as reduced hepatic perfusion [8]. Analysis of quality of life indicators on the SF-36 in our study demonstrated a significant decline in all domains as liver stiffness increased. This suggests that patients with advanced fibrosis perceive their overall health as substantially worse and encounter greater limitations in daily life.

Similar findings were reported by Fudim et al., where it was also shown that increased liver stiffness is associated with a worsened functional status and prognosis in heart failure patients [12]. HADS scale results showed moderately elevated yet statistically significant differences between groups. With increasing fibrosis, anxiety and depression levels rose, confirming the impact of somatic burden on psycho-emotional state. These results support earlier observations by Ghosh and colleagues, who highlighted the important role of “cardiohepatic” dysfunction in the development of secondary affective disorders [15]. Furthermore, the decline in physical activity level (PASE) correlated with fibrosis progression. This may be a consequence of both somatic limitations and psycho-emotional exhaustion. Thus, liver fibrosis emerges not only as a marker of organ damage, but also as a factor that exacerbates reductions in daily activity and overall functional status of patients. These findings underscore the importance of a multidisciplinary approach in managing patients with CHF and hepatofibrosis — involving a cardiologist, gastroenterologist, and psychotherapist. Early diagnosis and non-invasive monitoring of liver status in such patients are also necessary to optimize therapy and improve prognosis.

Conclusions: This study demonstrated that the degree of liver fibrosis in patients with chronic heart failure (CHF) has a significant impact on their overall condition, quality of life, and psychofunctional status. As liver stiffness increases, there is a significant decline in physical and role functioning, vitality, and general health perception, along with heightened anxiety and depression. Moreover, a greater severity of liver fibrosis is accompanied by a marked reduction in daily physical activity, which may contribute to a further worsening of CHF course and increased functional dependence of patients. Thus, liver fibrosis in CHF patients should be considered not only as an accompanying somatic condition, but also as an independent factor influencing physical, psycho-emotional, and social well-being. This highlights the need for regular assessment of liver function and the inclusion of quality of life and psycho-emotional parameters in the management algorithms for this category of patients.

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