Scientific Research Publishing

Open Journal of Gastroenterology, 2023, 13, 369-376
https://www.scirp.org/journal/ojgas
ISSN Online: 2163-9469
ISSN Print: 2163-9450

Cardiovascular Disorders in Cirrhosis at the Brazzaville Teaching Hospital in 2022

Rody Stéphane Ngami[1,2*], Philestine Clausina Mikolele Ahoui Apendi[1,2], Relda Itoko Okombi[1], Christian Kouala Landa[2,3], Marlyse Ngalessami Mouakosso[1], Bénédicte Ahombo Niotsombe[1], Ngala Akoa Itoua-Ngaporo[1,2], Pérès Mardochée Motoula Latou[1,2], Jile Florient Mimiesse Monamou[1,2], Arnaud Mongo-Onkouo[1,2], Deby Gassaye[1,2], Blaise Irénée Atipo Ibara[1,2]

[1]Department of Gastroenterology and Internal Medicine, University Teaching Hospital, Brazzaville, Republic of the Congo
[2]Faculty of Health Sciences, Marien Ngouabi University, Brazzaville, Republic of the Congo
[3]Department of Cardiology and Internal Medicine, University Teaching Hospital, Brazzaville, Republic of the Congo
Email: *rodyngami@gmail.com

How to cite this paper: Ngami, R.S., Mikolele Ahoui Apendi, P.C., Itoko Okombi, R., Kouala Landa, C., Mouakosso, M.N., Ahombo Niotsombe, B., Itoua-Ngaporo, N.A., Motoula Latou, P.M., Monamou, J.F.M., Mongo-Onkouo, A., Gassaye, D. and Atipo Ibara, B.I. (2023) Cardiovascular Disorders in Cirrhosis at the Brazzaville Teaching Hospital in 2022. *Open Journal of Gastroenterology*, **13**, 369-376.
https://doi.org/10.4236/ojgas.2023.1311034

Received: October 23, 2023
Accepted: November 26, 2023
Published: November 29, 2023

Abstract

Cirrhosis is a liver disease that can lead to cardiovascular lesions that are often asymptomatic but potentially fatal. **Objective:** The aim of this study was to evaluate electrical and echographic cardiovascular abnormalities during cirrhosis at the Brazzaville University Hospital. **Patients and Methods:** We conducted a cross-sectional analytical study over a 2-year period at the Brazzaville Universitary Hospital. Cirrhotic patients at least 18 years of age who had undergone electrocardiogram and echocardiography were included. Patients with cardiac cirrhosis, hepatocellular carcinoma or spontaneous bacterial peritonitis were excluded. The outcome variables were cardiac electrical and echographic abnormalities. Data were analyzed using Epi info 7.2 software. Pearson's chi-square, Fisher's exact and Student's exact tests were used to compare proportions and means at a significance level of 0.05. **Results:** A total of 76 cirrhotic patients were recruited out of 186 patients, *i.e.* 40.9% of cirrhotic patients. There were 48 men and 28 women, for a sex ratio of 1.7. The median age was 56 (IQR 41.5 - 69.0). QTc prolongation, microvoltage and sinus tachycardia were the most frequent electrical disorders, respectively in 19 (29.7%), 11 (17.2%) and 11 (17.2%) cases. Electrical disorders were statistically related to cirrhosis stage (p = 0.0364). The most frequent ultrasound disorders were left ventricular systolic failure 11 (28.9%) and dilated cardiomyopathy 8 (21.1%). Seven (9.2%) patients had high pulmonary arterial pressure. Death, observed in 12 cases (15.8%), was statistically linked to the presence of echocardiographic disorders (p = 0.0089) and congestive heart failure (p = 0.0001). **Conclusion:** The search for cardiac disorders should be systematic during decompensated cirrhosis to detect potentially fatal abnormalities.

Keywords

Cirrhosis, ECG, Echocardiography, Cardiovascular Disorders

1. Introduction

Cirrhosis is defined by the existence of an architectural disorder of the liver parenchyma marked by extensive fibrosis surrounding so-called regenerative liver nodules. It is a public health problem, with a worldwide incidence varying between 1.3% and 3.5% [1] [2]. The main causes of cirrhosis are viral hepatitis B and C, chronic alcohol consumption and non-alcoholic fatty liver. The most frequent manifestations are digestive, notably jaundice, ascites and digestive haemorrhage [2] [3]. Cardiomyopathy is a rare complication of cirrhosis, characterized by arterial vasodilation and increased cardiac output [4]. It may be responsible for a number of abnormalities, most often asymptomatic, discovered incidentally either on electrocardiogram and echocardiography [4] [5] [6] [7]. Cardiac decompensation may be a mode of revelation in the presence of a triggering factor such as physical exertion, digestive haemorrhage or surgery such as liver transplantation [8] [9]. The prevalence of cardiovascular disorders in cirrhosis is poorly understood. Mamadou *et al.* in Senegal found a prevalence of 23.3% [10]. In Congo Brazzaville, cirrhosis accounts for more than half of all liver diseases (54.7%), and mortality is high, according to Ibara *et al.* [11] [12]. However, to our knowledge, no study has assessed the prevalence of cardiovascular abnormalities during cirrhosis. The aim of this study was to assess cardiovascular abnormalities in cirrhosis at CHUB in 2022.

2. Patients and Methods

We conducted a cross-sectional analytical study from January 2021 to December 2022, a period of 2 years, in the Gastroenterology and Cardiology departments of the Brazzaville teaching hospital. The general population consisted of all cirrhotic patients hospitalized or followed up at this center. Cirrhotic patients aged at least 18 years were included, with a 12-lead electrocardiogram and standard echocardiography during the study period, without beta-blocker treatment at inclusion period and consenting to the study. Patients with previous cardiac disease, cirrhosis of cardiac origin, complications of cirrhosis such as hepatocellular carcinoma, spontaneous bacterial peritonitis were excluded from the study. Consecutive sampling of patients meeting inclusion criteria was performed. Assuming a prevalence of cardiovascular anomalies of 23.3% [10], a precision of 1/10 and a first-species α risk of 0.05, we calculated a sample size of 69 patients using Schwartz's formula [13]. Taking into account a predicted refusal rate of 10%, 76 patients were selected for the study. We studied sociodemographic variables, indirect signs of cirrhosis, notably signs of hepatocellular insufficiency (HCI) and portal hypertension (PH), and the causes of cirrhosis. The diagnosis

of IHC was made on the basis of clinical signs (jaundice, hepatic encephalopathy) and biological signs (Low prothrombin level, hypoalbuminemia). Since hepatic vein catheterization is not feasible in Brazzaville, PH was diagnosed using indirect signs such as ascites, collateral venous circulation, thrombocytopenia, esophageal varices. The Child Pugh score was used to assess the progressive stage of cirrhosis. The outcome variables were electrical abnormalities (frequency, rhythm, conduction or repolarization) and echocardiographic abnormalities related to left ventricular systolic ejection fraction (LVSEF), considered low when below 40% (normal values above 55%); cardiac chambers and pulmonary artery pressure (PAP), elevated at 20 mmHg and above. Bazett's formula was used to estimate the calculated QT interval (QTc) from the measured QT (QTm) as follows: $QTc = QTm/\sqrt{(60/FC)}$; FC being the heart rate. These disorders form part of the diagnosis of cirrhotic cardiomyopathy [7]. Data collected from a paper questionnaire were entered into Microsoft Excel 13 and analyzed in Epi info 7.2. Pearson's chi-square, Fisher's exact and Student's tests were used to compare proportions and means. The test was significant when the p-value was <0.05.

3. Results

During the study period, we identified 186 cirrhotic patients. Only the 76 who had undergone ECG and echocardiography were included, representing a participation rate of 40.9%. There were 48 men and 28 women, for a *sex ratio* of 1.7. The median age was 56 (IQR 41.5 - 69.0). The majority of patients were between 48 and 58 years of age (**Figure 1**). Signs of cirrhosis were portal hypertension (PH) in 48 (63.2%) cases and hepatocellular insufficiency (HCI) in 59 (77.6%) cases. Cirrhosis was diagnosed in stages A, B and C respectively in 4 (5.2%), 43 (56.6%) and 29 (38.2%) cases according to the Child Pugh classification. Hepatitis B virus (HBV) was the most frequent cause. The other most frequent causes were alcohol (9.2%), HCV (9.2%), HBV-HCV co-infection (10.5%), diabetes (6.6%). Electrical abnormalities were observed in 40 (52.6%) and were statistically more frequent in stages B (52.5%) and C (47.5%) cirrhosis (p = 0.0364). QTc prolongation was the most frequent electrical disorders observed in 19 (29.7%) cases (**Figure 2**). Ultrasound disorders were observed in 20 (26.3%) cases. The Median of left ventricular systolic ejection fraction (LVSEF) was 65% (IQR 55 - 76). Decreased LVSEF and dilated cardiomyopathy were most frequent, observed in 11 (14.5%) and 10 (10.5%) cases (**Figure 3**). Median pulmonary arterial pressure was 17 mmHg (IQR 15 - 20). Seven (9.2%) patients had high pulmonary arterial pressure. Six (7.9%) cases of congestive heart failure were diagnosed, including patients with left atrial dilatation (66.7% p = 0.0001) and high pulmonary pression (83.3%, p = 0.0001). In univariate analysis, the decrease in LVSF (p = 0.0072) and the DCM (p = 0.0324) were related to the stage of cirrhosis. Of the 76 patients included, 12 (15.8%) died during the study. Death was significantly observed in patients with echographic cardiac abnormalities (p = 0.0089), the decrease in LVSEF (p = 0.0007) and congestive heart failure (p = 0.0001) (**Table 1**).

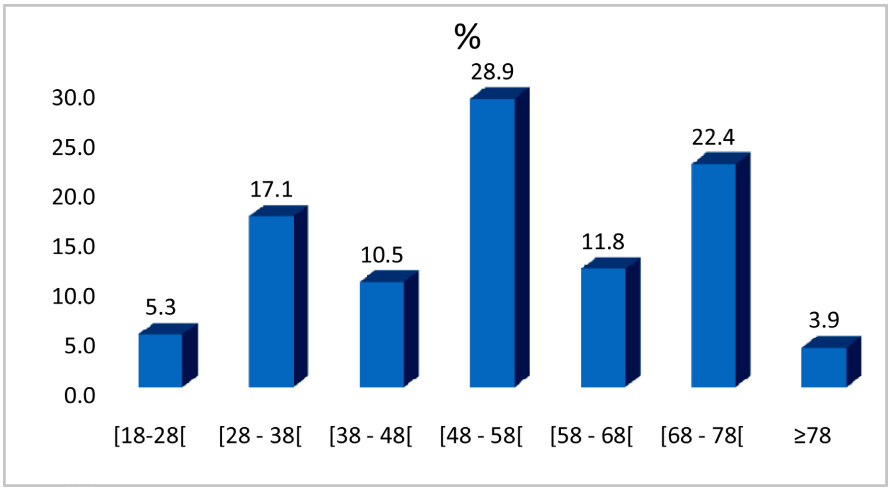


Figure 1. Age distribution of study population.

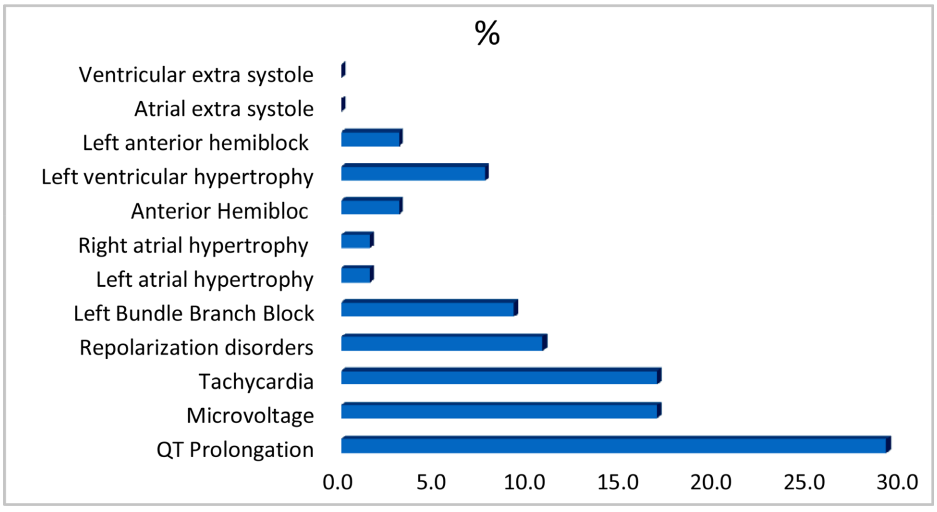
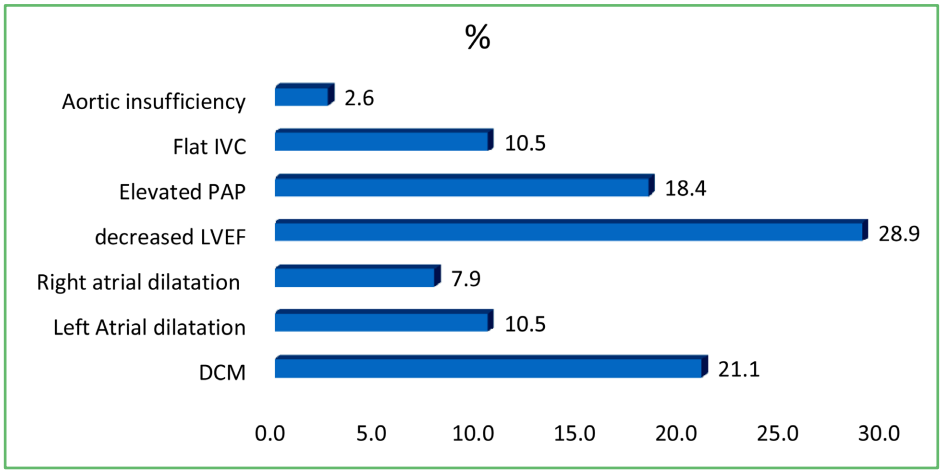


Figure 2. Distribution of electrical anomalies in cirrhosis.



VC: inferior vena cava; PAP: pulmonary arterial pressure; LVEF: left ventricular ejection fraction; DCM: dilated cardiomyopathy.

Figure 3. Distribution of ultrasound heart disorders in cirrhosis.

Table 1. Univariate analysis between cirrhosis stage and cardiac disorders.

Anomalies cardiaques		Décès (n)		
		Oui	Non	
Dilatation auriculaire gauche	Oui	4	0	0.0001
	Non	8	64	
Diminution de la FEVG	Oui	6	5	0.0007
	Non	6	59	
Insuffisance cardiaque	Oui	6	0	0.0001
	Non	6	64	

4. Discussion

The characteristics of our patients in terms of age at diagnosis time, sex ratio probably, signs and cirrhosis causes reflect the situation of cirrhosis in the Congo [11]. They do not seem to differ greatly from the data in the literature. Indeed, Guèye M. in Senegal and Baldé in India found that cirrhotic patients were predominantly male, with an average age of over 50 years [10] [14]. As compensated cirrhosis is most often asymptomatic, diagnosis is often made in stages B or C, which are symptomatic [15]. The south of the Sahara countries are areas where viral hepatitis B is highly endemic, which explains the preponderance of this disease among the causes of cirrhosis [10] [12]. With regard to cardiac electrical disorders in cirrhosis, left ventricular hypertrophy and QTc prolongation were the most frequent abnormalities [5] [10] [15]. In comparative studies between cirrhotic patients and healthy subjects, QTc prolongation was statistically related to cirrhosis, its duration and severity according to the Child Pugh score [16] [17]. The circulatory dysfunction described during cirrhosis responsible for hypovolemia could explain these electrical abnormalities [5] [18]. However, more in-depth studies using holter-ECG combined with plasma calcium measurement will enable a better assessment of the QT interval in cirrhosis patients, as recommended by Genovesi *et al.* [19] [20]. Guèye *et al.* in Senegal found 23% echographic cardiomyopathy in cirrhosis, compared with 26.3% in our study. Ultrasound disorders described in the literature include dilated cardiomyopathy and dilatation of the left ventricle, found in 70% of compensated cirrhotic patients [10] [21]. Regarding the LVSEF, several authors have found a normal mean in cirrhotic patients, testifying to the asymptomatic nature of these disorders [15] [21]. Indeed, in the absence of triggering factors such as digestive hemorrhage, beta-blockers treatment or placement of TIPS (porto-systemic intrahepatic shunt) during cirrhosis, cardiac abnormalities are often compensated and asymptomatic [22] [23]. Balde *et al.* in India, in a study of 42 cirrhosis patients, found no association between echographic cardiac abnormalities and Child Pugh score, in contrast to our findings [14]. Some authors have shown a link between advanced fibrosis and the risk of heart failure and death [24]. For Billey *et al.*, cardiac decompensation was observed in 20% of cirrhotic patients

within a year of intrahepatic shunt placement. They therefore suggested combining BNP, Pro-BNP and echocardiography in these patients to select those at risk of cardiac decompensation [23]. Large-scale cohort studies will be able to confirm the link between myocardial abnormalities and the progression of cirrhosis, as dysfunction is more pronounced in advanced stages of cirrhosis. For Cesari *et al.*, in a 6-year cohort study, certain factors are associated with the risk of death during cirrhosis: increasing age, decreasing body surface area, left atrial dilatation and Meld score [25]. In our context, cardiac echocardiography could enable early detection of left atrial dilatation, statistically associated with cardiac decompensation in our study. On the one hand, we found an association between death and the presence of ultrasound abnormalities and heart failure, and between the stage of cirrhosis and certain cardiac abnormalities on the other. However, the size of our sample and the low theoretical numbers in certain categories do not allow us to conclude on the statistical links found. A comparative study between different ultrasound anomalies and death could be conducted to identify risk factors on a larger scale. Finally, among the limitations of this study, the absence of comprehensive health insurance coverage for cirrhosis in our country was a limitation in the performance of ECG and echocardiography examinations. Also, the pandemic linked to COVID-19 led to a drop in hospital attendance and follow-up of patients with chronic diseases such as cirrhosis.

5. Conclusion

Cirrhosis exposes patients to cardiovascular abnormalities such as QT prolongation, left atrial dilatation and dilated cardiomyopathy, which are potentially fatal through heart failure. The search for cardiac abnormalities in cirrhosis should be systematic. Risk factors for cardiac decompensation in cirrhosis will be evaluated in a comparative study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Friedman, S.L. (2003) Liver Fibrosis—From Bench to Bedside. *Journal of Hepatology*, **38**, 38-53. https://doi.org/10.1016/S0168-8278(02)00429-4

[2] Haute autorité de santé (2007) Prise en charge des complications chez les malades atteints de cirrhose Recommandations professionnelles. *Médecine Thérapeutique*, **14**, 47-59.

[3] Pariente, A. (2018) Cirrhose et complications. *Revue du praticien*, **68**, e135-e147.

[4] Cohen-Solal, A., Seghatol, F. and Durand, F. (2007) Cœur et cirrhose hépatique. *MT Cardio*, **3**, 448-452.

[5] Seirafi, M. and Spahr, L. (2009) La cardiomyopathie cirrhotique. *Revue Médicale Suisse*, **5**, 1725-1731.

[6] Izzy, M., VanWagner, L.B., Lin, G., Altieri, M., Findlay, J.Y., Oh, J.K., *et al.* (2020) Re-

defining Cirrhotic Cardiomyopathy for the Modern Era. *Hepatology*, **71**, 334-345. https://doi.org/10.1002/hep.30875

[7] Marchetta, S., Altieri, M., Weil-Verhoeven, D., Mouhat, B., Piérard, L. and Thévenot, T. (2021) La cardiomyopathie cirrhotique : De nouvelles approches diagnostiques. *Hépato-Gastro & Oncologie Digestive*, **28**, 584-592.

[8] Al-Hamoudi, W.K. (2010) Cardiovascular Changes in Cirrhosis: Pathogenesis and Clinical Implications. *The Saudi Journal of Gastroenterology*, **16**, 145-153. https://doi.org/10.4103/1319-3767.65181

[9] Baik, S.K., Fouad, T.R. and Lee, S.S. (2007) Cirrhotic Cardiomyopathy. *Orphanet Journal of Rare Diseases*, **2**, Article No. 15. https://doi.org/10.1186/1750-1172-2-15

[10] Guèye, M.N., Louise, B.M., Malick, B., Salamata, D., Aïssé, T.M., Ambdil, H., *et al.* (2018) Anomalies electrocardiographiques et echocardiographiques au cours de la cirrhose virale b: A propos de 60 cas au service d'hepato-gastroenterologie de l'Hopital Aristide Le Dantec de Dakar (HALD). *The Pan African Medical Journal*, **30**, Article 169. https://doi.org/10.11604/pamj.2018.30.169.12344

[11] Mimiesse, J.F., Marlyse, N.M., Clausina, A.A., Arnaud, M.O., Ollandzobo Lucie, A.I., Bossali, F., *et al.* (2020) Evolutionary and Pronostic Aspects of Cirrhosis at the University Hospital of Brazzaville (Congo). *Open Journal of Gastroenterology*, **10**, 23-29. https://doi.org/10.4236/ojgas.2020.101003

[12] Ahoui Apendi, C.P., Monamou, J.M., Mongo-Onkouo, A., Itoua-Ngaporo, N., Ngami, R., Mouakosso, M.N., *et al.* (2019) Mortalité liée aux hépattes B et C dans le service de Gastroentérologie et Médecine interne du CHU de Brazzaville. *Annale Des Sciences De La Santé*, **19**, 85-93.

[13] Serhier, Z., Bendahhou, K., Abdelaziz, A.B. and Othmani, M.B. (2020) Methodological Sheet n°1: How to Calculate the Size of a Sample for an Observational Study? *La Tunisie Médicale*, **98**, 1-7.

[14] Balde, J., Rao, N.K., Ballala, K., Samanth, J., Shetty, K.R., Patil, N., *et al.* (2016) Echocardiographic Abnormalities in Cirrhosis & Their Correlation with Severity of Cirrhosis Using Child-Pugh Score among Patients in a Tertiary Care Hospital. *Indian Journal of Medical Research*, **144**, 935-937. https://doi.org/10.4103/ijmr.IJMR_1486_15

[15] Yap, E.M.L., Supe, M.G.S. and Yu, I.I. (2018) Cardiac Profile of Filipino Patients with Liver Cirrhosis: A 10-Year Study. *Cardiology Research*, **9**, 358-363. https://doi.org/10.14740/cr804

[16] Møller, S. and Henriksen, J.H. (2009) Cardiovascular Complications of Cirrhosis. *Postgraduate Medical Journal*, **85**, 44-54.

[17] Abd-El-Aziz, T.A., Abdou, M., Fathy, A. and Wafaie, M. (2010) Evaluation of Cardiac Function in Patients with Liver Cirrhosis. *Internal Medicine*, **49**, 2547-2552. https://doi.org/10.2169/internalmedicine.49.3520

[18] Weil, D., André, M., Cervoni, J., Di Martino, V., Moreau, R. and Thévenot, T. (2022) Utilisation de l'albumine au cours de la cirrhose décompensée : Vers de nouveaux concepts. *Hépato-Gastro & Oncologie Digestive*, **29**, 478-487. https://doi.org/10.1684/hpg.2022.2360

[19] Bhardwaj, A., Joshi, S., Sharma, R., Bhardwaj, S., Agrawal, R. and Gupta, N. (2020) QTc Prolongation in Patients of Cirrhosis and Its Relation with Disease Severity: An Observational Study from a Rural Teaching Hospital. *Journal of Family Medicine and Primary Care*, **9**, 3020-3024. https://doi.org/10.4103/jfmpc.jfmpc_341_20

[20] Genovesi, S., Prata Pizzala, D.M., Pozzi, M., Ratti, L., Milanese, M., Pieruzzi, F., *et al.* (2009) QT Interval Prolongation and Decreased Heart Rate Variability in Cirr-

hotic Patients: Relevance of Hepatic Venous Pressure Gradient and Serum Calcium. *Clinical Science*, **116**, 851-859. https://doi.org/10.1042/CS20080325

[21] Tint, D., Radoi, M., Coman, F., Zayarache, C. and Rosca, E. (2002) Les atteintes cardiaques dans la cirrhose hépatique—Corrélations avec l'étiologie. *La Revue de Médecine Interne*, **23**, 690s. https://doi.org/10.1016/S0248-8663(02)80673-7

[22] Brondex, A., Arlès, F., Lipovac, A.S., Richecoeur, M. and Bronstein, J.A. (2012) Cardiomyopathie cirrhotique: Une entité spécifique. *Annales de Cardiologie et d'Angéiologie*, **61**, 99-104. https://doi.org/10.1016/j.ancard.2011.07.004

[23] Billey, C., Billet, S., Robic, M.A., Cognet, T., Guillaume, M., Vinel, J.P., *et al.* (2019) A Prospective Study Identifying Predictive Factors of Cardiac Decompensation after Transjugular Intrahepatic Portosystemic Shunt: The Toulouse Algorithm. *Hepatology*, **70**, 1928-1941. https://doi.org/10.1002/hep.30934

[24] Park, J., Kim, G., Kim, H., Lee, J., Lee, Y.B., Jin, S.M., *et al.* (2021) The Association of Hepatic Steatosis and Fibrosis with Heart Failure and Mortality. *Cardiovascular Diabetology*, **20**, Article No. 197. https://doi.org/10.1186/s12933-021-01374-8

[25] Cesari, M., Frigo, A.C., Tonon, M. and Angeli, P. (2018) Cardiovascular Predictors of Death in Patients with Cirrhosis. *Hepatology*, **68**, 215-223. https://doi.org/10.1002/hep.29520