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Body Composition Changes in Patients with Chronic Hepatitis C

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ABSTRACT

Aims: We aimed to quantify global and regional body composition changes in chronic hepatitis C (CHC) patients, compare them to healthy controls and identify possible association between body composition changes and CHC. To our knowledge, this study is the first one comparing CHC patients to controls with regard to soft tissue body composition changes.

Methods: We assessed 60 CHC patients and 60 healthy controls by Dual Energy X-Ray Absorptiometry. Soft tissue and bone body composition parameters were compared between the groups (using the Mann-Whitney test). These parameters were correlated (using Spearman's rank correlation coefficient - rho) with independent variables (age, gender, body mass index - BMI, cigarette smoking, time since CHC diagnosis, viral load, fibrosis grade, type of treatment, time of treatment) for the entire CHC group and also for subgroups according to gender.

Results: Total fat mass, trunk fat mass and percent body fat were lower in CHC patients as compared to controls. Several risk factors were associated with the reduced fat mass: low BMI, cigarette smoking and peginterferon alpha 2a plus ribavirin treatment. Peginterferon alpha 2a and ribavirin treatment negatively correlated with lean body parameters, especially in CHC males group. Bone mineral density (BMD) was lower as compared to controls and was correlated with low BMI, cigarette smoking and peginterferon alpha 2a and ribavirin treatment.

Conclusions: Patients with CHC have an acquired type of lipodystrophy (particularly in the trunk region), and also a reduced BMD as compared with controls. A low BMI, cigarette smoking and peginterferon alpha 2a and ribavirin therapy were associatd with a low fat mass and low BMD.

Key words: body composition – chronic hepatitis C – dual energy X ray absorptiometry – lipodystrophy – osteoporosis.

Abbreviations: BMD: bone mineral density; BMI: body mass index; CHC: chronic hepatitis C; DXA: Dual Energy X ray Absorptiometry; FM: fat mass; FMR: fat mass ratio; HCADS: hepatitis C associated dysmetabolic syndrome; HCV: hepatitis C virus; HO: hepatic osteodystrophy; LS: lumbar spine; LM: lean mass; PBF: percent body fat.

INTRODUCTION

Chronic hepatitis C (CHC) represents a systemic disease with multiple extrahepatic complications [1-3]. The prevalence of the chronic infection with hepatitis C virus (HCV) in Europe was reported to be between 0.4 - 3.5% in the general population [4]. Up to this moment, according to literature data, assessment of the body composition in patients with CHC was focused mainly to evaluate its impact on bone metabolism, while the exploration of fat and lean body mass has been insufficiently addressed.

Reduced bone mineral density (BMD), known as hepatic osteodystrophy (HO), represents a well known extrahepatic complication in chronic liver diseases (including CHC) [5, 6]. Hepatic osteodystrophy may be present as osteopenia, osteoporosis and, more rarely, as osteomalacia [5]. Many factors have been reported to be involved in the occurrence of HO, but its pathophysiology still remains unclear [6]. Chronic cholestasis (such as in primary biliary cirrhosis) [7], low levels of insulin-like growth factor-1 [8, 9], impairment of

receptor activator of nuclear factor κappa B ligand (RANKL) and osteoprotegerin system [10], vitamin D deficiency [11, 12], low body mass index (BMI) [13], chronic alcoholism [14] and sedentary lifestyle [15] were implicated in HO pathogenesis. In CHC, the main mechanism seems to be an inflammatory response that increases release of cytokines with bone resorption due to osteoclast activation [16, 17].

Little is also known about the changes in the body composition, such as fat and lean body mass changes in patients with CHC, whether undergoing or not an antiviral therapy. These metabolic disorders in CHC patients have been reported in the literature as hepatitis C associated dysmetabolic syndrome (HCADS) [18]. Thus, CHC patients may present an increased abdominal fat as a result of the interaction between HCV, visceral adipose tissue and host genetics [19, 20].

So far, a relationship between CHC and non-alcoholic fatty liver disease (NAFLD) has been reported, as well as the role of both disorders in the development of type 2 diabetes mellitus with an increase in cardiovascular complications and mortality [3]. Additionally, NAFLD and insulin resistance may be associated with sarcopenia and the mechanism has been reported to be mitochondrial dysfunction with loss of muscle mass [21-23]. NAFLD has also been reported to be associated with a low BMD [24]. Although these complications occur in CHC patients, they are still undervalued in relation to this pathology. The risk of developing these complications increases proportionally with the duration of illness (diagnosis of CHC from a young age) and the life expectancy (access to antiviral therapy and liver transplantation).

Dual-energy X-ray absorptiometry (DXA) is a technique for measuring both total body and regional body BMD and also soft tissue body composition. Thus, using the total body application of DXA we can easily quantify the fat mass (FM), lean mass (LM) and bone mineral mass. This technique is very reliable for studying the influence of different diseases or treatments on BMD and soft tissue composition [25].

Considering the lack of solid evidence for the impact of CHC on body composition, we aimed to quantify global and regional body composition changes in patients with CHC, to compare them to healthy controls and to identify a possible association between body composition changes and CHC.

METHODS

We performed a cross-sectional study on a cohort of 60 CHC patients enrolled at Prof. Dr. Matei Balş National Institute for Infectious Diseases, Bucharest, Romania, from August 2015 to February 2016. Also, we selected 60 healthy controls having gender, age and anthropometric parameters similar to the study group. The study protocol was approved by the Ethics Committee of the Institute, according to the ethical and moral principles stated in the Helsinki 1966 Declaration on Human Rights.

All study participants were aged over 18. Before enrollment, all signed an informed consent. The relevant demographic (age, gender), anthropometric (BMI), cigarette smoking data and disease related data (time since the CHC diagnosis, viral load, fibrosis grade and antiviral therapy) were collected. Body mass index (BMI) was calculated as weight (kg)/height (m^2) and classified according to World Health Organization (WHO) criteria [26]. For the non-invasive liver fibrosis assessment we used FibroTest (BioPredictive, Paris, France) [27].

Chronic hepatitis C was diagnosed in cases of persistently (≥ 6 months) positive serological markers (antiHCV antibodies and HCV-RNA level) and/or histological diagnosis. All women included in the study were premenopausal. Exclusion criteria were: menopause (physiological/surgical), human immunodeficiency virus (HIV) coinfection, autoimmune liver disease, bone disorders, endocrinopathies, vitamin D deficiency, severe heart disease, history of malignancy, chronic kidney disease (estimated glomerular filtration rate <50 ml/min/1.73 m^2), cortisone therapy >3 months, treatment for osteoporosis, prolonged immobilization, malnutrition.

There was no family history of osteoporosis. The enrolled patients and the controls reported moderate physical activity (more than 3 times per week of at least 30 minutes of activity equivalent of alert walking or jogging).

The total and regional bone and soft tissue composition measurements were performed using DXA machine (GE LUNAR DPX-NT, General Electric Company, New York, Connecticut, USA) as were indicated by the manufacturer. Regarding soft tissue composition, we assessed: total FM, total LM, percent body fat (PBF), FM ratio (FMR, i.e. FM distribution expressed as the ratio between the arms and legs fat over the trunk fat), limbs FM, limbs LM, trunk FM, and trunk LM.

We also assessed total and regional BMD, T-score (patient BMD compared to the BMD of a young adult reference population of the same sex) and Z-score (patient BMD compared to the BMD of an age, sex, ethnicity-matched reference population). We diagnosed osteopenia as the T-score between -1 and -2.5 standard deviations (SD) and osteoporosis as a T-score ≤ -2.5 SD below the mean BMD for young adults. A Z-score ≤ -2 defined low BMD for chronological age (below the expected range for age). According to the guidelines, we used Z-score for patients aged < 50 years and the T-score for patients aged ≥ 50 years [28].

Practically, we compared all these DXA parameters in CHC patients with those in the controls and correlated them with variables such as: age, gender, BMI, cigarette smoking, time since CHC diagnosis, viral load, fibrosis grade, type of treatment and time of treatment (the cumulative period in which the patients had received treatment). After analyzing these parameters in the entire CHC patients group, we also analyzed them according to gender after dividing the study groups in males and females.

Statistical analyses

Data were expressed as means and standard deviations for quantitative variables and frequencies and percentages for the qualitative variables. Chronic hepatitis C patients and healthy controls were compared according to the body composition (soft tissue and bone). We used Mann-Whitney U test for continuous variables in order to evaluate the differences between groups. Also, we used Spearman's rank correlation coefficient (rho) to find out the strength of relationship between variables from the two groups (rho ranges in value from −1 to +1 and the sign of the coefficient indicates the direction of

the relationship). We considered rho as "very weak" for 0.00-0.19, "weak" for 0.20-0.39, "moderate" for 0.40-0.59, "strong" for 0.60-0.79 and "very strong" for 0.80-1.0, respectively. In this paper, we are presenting the results with a rho correlation coefficient higher than 0.40. Correlations are expressed as positive (variables change directly proportional) or as negative (variables change inversely proportional). A p-value ≤ 0.05 was considered significant. We used SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, NY, USA).

RESULTS

The characteristics of the CHC patients according to clinical, biological and virological parameters are presented in Table I. A total of 60 CHC patients were enrolled (mean age 46.1 years, range 25-68), 37 men (61.6%) and 23 females (38.4%). Active smokers were 25 patients (41.6%), ex-smokers 13 (21.6%) and non-smokers 22 (36.6%). Regarding time since CHC diagnosis, half of the patients (31, 51.6%) had less than 5 years disease evolution. About half of them presented detectable viral load (33, 55.0%). Regarding fibrosis grade, half of the patients were in stage F2-F3. The majority of them (44 patients, 73.3%) had been treated with antiviral therapy (Table I).

Table I. Characteristics of the chronic hepatitis C (CHC) patients according to clinical, biological, virological parameters

Age, years, mean (SD)	46.1 (12.5)
Males, n (%)	37 (61.6)
Females, n (%)	23 (38.4)
Smoker status	
Non-smoker, n (%)	22 (36.67)
Ex-smoker, n (%)	13 (21.66)
Active smoker, n (%)	25 (41.67)
Time since CHC diagnosis	
< 5 years, n (%)	31 (51.66)
5-10 years, n (%)	19 (31.67)
> 10 years, n (%)	10 (16.67)
Viral load	
Un-detectable HCV RNA, n (%)	27 (45)
Detectable HCV RNA, n (%)	33 (55)
Fibrosis stage, n (%)	
F0	8 (13.32)
F1	7 (11.67)
F2	22 (36.67)
F3	12 (20.0)
F4	11 (18.34)
Treatment	
Untreated, n (%)	16 (26.67)
Treated, n (%)	44 (73.33)
PegIFN alpha 2a + RBV, n (%)	37 (61.67)
PegIFN alpha 2b + RBV, n (%)	7 (11.66)
Time of treatment, weeks, mean (SD)	32.78 (29.16)

SD: standard deviation, PegIFN: peginterferon; RBV: Ribavirin.

Comparative body composition in CHC patients and controls

Soft tissue composition

No differences were found between CHC patients and controls regarding age, height, weight, BMI and lean body mass. Considering the fat body mass, we found significantly reduced total FM, trunk FM and PBF in CHC patients versus controls. The reduced fat body mass was reflected in a higher FMR (limbs fat/trunk fat) in the group of CHC patients (Table II).

Table II. Comparison of anthropometric and soft tissue composition (fat and lean body mass) characteristics between CHC patients and controls

Characteristic	CHC patients (n=60) Mean (SD)	Controls (n=60) Mean (SD)	p value
Age, years	46.1 (12.5)	47 (12.8)	0.34
Height, cm	170.9 (7.8)	170.7 (7.9)	0.43
Weight, kg	72.1 (15.5)	73 (13.3)	0.39
BMI, kg/m^2	24.7 (4.7)	25 (4.1)	0.33
Total FM, kg	24 (14.6)	24.9 (9.5)	0.02
Total LM, kg	45.7 (11.1)	43.6 (8.3)	0.1
PBF, %	31.6 (11.1)	35.7 (10.1)	0.01
FMR [(arms+legs)/ trunk]	0.7 (0.2)	0.6 (0.2)	0.02
Limbs FM, kg)	9.09 (5.1)	9.49 (4.4)	0.17
Limbs LM, kg	20.4 (4.4)	19.6 (4.1)	0.09
Trunk FM, kg)	12.7 (6.4)	14.7 (5.6)	0.01
Trunk LM, kg	21.8 (4.5)	20.5 (3.8)	0.06

BMI: body mass index; CHC: chronic hepatitis C; FM: fat mass; FMR: fat mass ratio; LM: lean mass; PBF: percent body fat.

Bone mineral composition

The BMD values were lower in CHC patients, in contrast to the controls, with statistically significant decrease not only in total body scan but also in the scan of specific regions (hip, lumbar spine - LS, trunk, arms and legs). Additionally, in patients aged both < 50 years and ≥ 50 years, the Z and T-scores were significantly lower than in controls at all the three sites. The lowest mean Z-score was revealed at the LS (-0.69, p=0.0006) and the lowest mean T-score was obtained at the hip (-0.34, p=0.003) (Table III).

Table III. Comparison of bone mineral density (BMD), Z and T-scores between CHC patients and controls

Characteristic	CHC patients Mean (SD)	Controls Mean (SD)	p value
All patients			
BMD tb, g/cm^2	1.18 (0.11)	1.21 (0.08)	0.03
BMD trunk, g/cm^2	0.98 (0.11)	1.02 (0.08)	0.038
BMD arms, g/cm^2	0.96 (0.14)	0.98 (0.13)	0.35
BMD legs, g/cm^2	1.23 (0.12)	1.27 (0.11)	0.04
BMD LS, g/cm^2)	1.14 (0.17)	1.93 (0.95)	< 0.0001
BMD hip, g/cm^2	1.01 (0.14)	1.05 (0.08)	0.01
Patients < 50 yrs (M < 50 yrs, F)			
Z-score tb	0.14 (0.90)	0.5 (0.60)	0.01
Z-score LS	-0.69 (0.92)	-0.08 (0.64)	0.0006
Z-score hip,	-0.22 (1.08)	0.18 (0.73)	0.04
Patients ≥ 50 yrs (M ≥ 50 yrs)			
T-score tb	0.05 (1.50)	0.78 (0.90)	0.03
T-score LS,	-0.31 (1.94)	0.18 (1.19)	0.013
T-score hip	-0.34 (0.97)	0.1 (0.32)	0.003

BMD: Bone Mineral Density; BMD tb: Bone Mineral Density total body; LS: lumbar spine, CHC: Chronic hepatitis C, pts: patients, SD: standard deviation.

The overall prevalence of low BMD in CHC patients was 36.66%, out of which 6 (10% of the patients) were < 50 years and 16 (26.66% of patients) were ≥ 50 years. There were 11 cases of osteopenia (18.33%) and 5 cases of osteoporosis (8.33%)).

Association between changes in body composition and CHC

Soft tissue composition and CHC

Total FM was negatively correlated with the antiviral treatment in all CHC patients, with stronger correlation in the male group. Furthermore, in the CHC male group, total FM was negatively associated with peginterferon apha 2a + ribavirin treatment and with HCV RNA level. We found strong correlations between the BMI and total FM in all CHC groups (Table IV).

Table IV. Independent variables associated with total fat mass (FM) in CHC patients

Variable	CHC Total group Rho	CHC Males group Rho	CHC Females group Rho
BMI	0.77**	0.71**	0.93***
HCV RNA	-0.37	-0.41	-0.19
Treatment	-0.57**	-0.84***	-0.08
PegIFN alpha 2a + RBV	-0.37	-0.44*	-0.15

CHC: Chronic Hepatitis C; Rho: Spearman's Rank Correlation Coefficient; BMI: Body Mass Index; PegIFN: PegInterferon; RBV: Ribavirin.
*moderate Rho coefficient, **strong Rho coefficient, *** very strong Rho coefficient
Note: Variables included in the analyses were: gender, age, BMI, cigarette smoking, time since CHC diagnosis, RNA HCV, fibrosis grade, treatment, treatment with PegIFN alpha 2a + RBV, treatment with PegIFN alpha 2b + RBV, time of treatment (see Methods).

Regarding regional fat mass (trunk FM and limbs FM), we found correlations similar to those for total FM (excepting HCV RNA). Moderate negative correlations were demonstrated between both trunk and limbs FM and cigarette smoking (Table V and VI).

We found a strong negative correlation between PBF and the antiviral treatment, especially in the total CHC group and in the males group. In the same groups, we found a moderate negative correlation between PBF and peginterferon alpha 2a + ribavirin treatment. Also, in the CHC males group, moderate and negative correlations were found between PBF and fibrosis grade or cigarette smoking (Table VII).

Similar negative correlations between the fat mass distribution (FMR) and treatment and type of treatment with peginterferon alpha 2a + ribavirin were found in the CHC total group and in the male group.

Table V. Independent variables associated with trunk fat mass (FM) in CHC patients

Variable	CHC Total Group Rho	CHC Males group Rho	CHC Females group Rho
Age	0.14	0.04	0.44*
BMI	0.87***	0.82***	0.93***
Cigarette smoking	-0.32	-0.50*	-0.09
Treatment	-0.55*	-0.89***	-0.11
PegIFN alpha 2a + RBV	-0.39	-0.54*	-0.16

See Table IV for abbreviations.

Table VI. Independent variables associated with limbs fat mass (FM) in CHC patients

Variable	CHC Total Group Rho	CHC Males group Rho	CHC Females group Rho
BMI	0.71**	0.77**	0.93***
Cigarette smoking	-0.32	-0.47*	-0.06
Treatment	-0.68**	-0.91***	-0.10
PegIFN alpha 2a + RBV	-0.45*	-0.50*	-0.15

See Table IV for abbreviations.

Considering the LM, both total LM and regional (trunk and limbs) LM were strongly and negatively correlated with peginterferon alpha 2a + ribavirin treatment in the CHC male group. In the same group, a moderate negative correlation was found for cigarette smoking and total LM (Table VIII).

No correlations were found between the reduced FM or LM parameters and time since CHC diagnosis, peginterferon alpha 2b + ribavirin therapy and time of treatment.

Bone mineral composition and CHC

Low BMD (total body, LS and hip scans) was associated with low BMI for all the groups. In the total CHC group and in the male group, cigarette smoking, treatment and peginterferon alpha 2a + ribavirin treatment were correlated with low BMD (total body, LS, hip). In addition, BMD at LS and at hip was negatively correlated with HCV-RNA level in the same two groups. Among the three scans, the strongest correlations were obtained for BMD at LS (Table IX).

No correlations were found between the low BMD and age, fibrosis grade, time since CHC diagnosis, peginterferon alpha 2b and ribavirin treatment and the time of treatment.

Table VII. Independent variables associated with percent body fat (PBF) in CHC patients

Variable	CHC Total group Rho	CHC Males group Rho	CHC Females group Rho
Age	0.15	-0.03	0.41*
BMI	0.61**	0.68**	0.92***
Cigarette smoking	-0.36	-0.44*	-0.31
Fibrosis grade	-0.09	-0.44*	0.26
Treatment	-0.72**	-0.93***	-0.08
PegIFN alpha 2a + RBV	-0.48*	-0.51*	-0.13

See Table IV for abbreviations.

Table VIII. Independent variables associated with total lean mass (LM) in CHC patients

Variable	CHC Total group Rho	CHC Males group Rho	CHC Females group Rho
Gender	-0.58*	-	-
Age	0.49*	0.19	0.25
BMI	0.43*	0.48*	0.44*
Cigarette smoking	-0.17	-0.51*	-0.39
Treatment	-0.33	-0.71**	-0.30
PegIFN alpha 2a + RBV	-0.32	-0.70**	-0.24

See Table IV for abbreviations.

Table IX. Independent variables associated with bone mineral density (BMD) at lumbar spine (LS) in CHC patients

Variable	CHC Total Group Rho	CHC Males group Rho	CHC Females group Rho
BMI	0.31	0.40*	0.40*
Cigarettes smoking	-0.42*	-0.58*	-0.21
HCV RNA	-0.33	-0.40*	-0.19
Treatment	-0.60**	-0.82***	-0.19
PegIFN alpha 2a + RBV	-0.42*	-0.56*	-0.21

See Table IV for abbreviations.

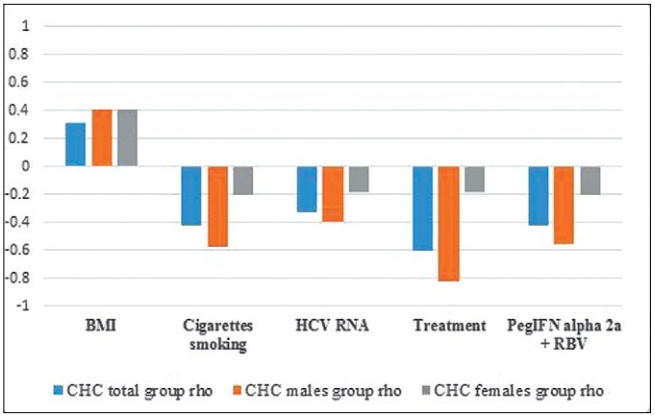

Fig. 1. Independent variables associated with bone mineral density (BMD) at lumbar spine (LS) in CHC patients (graph illustrating Table IX).

DISCUSSION

The most important result of our study is the demonstration of reduced FM (total FM, trunk FM and PBF) in CHC patients. This finding suggests that CHC patients may acquire lipodystrophy. The loss of FM was found only for the trunk FM and not for the peripheral sites (limbs FM). We identified several risk factors associated with reduced FM: low BMI, cigarette smoking and treatment with peginterferon alpha 2a + ribavirin. Increased abdominal fat and liver steatosis have been reported in patients with CHC and seem to be determined by the relationship between virus and host (visceral adipose tissue, genetic factors) [19, 20]. Against this data, our results showed that CHC patients that are smokers, with low BMI and were treated with peginterferon alpha 2a and ribavirin may acquire troncular lipodystrophy.

Similar changes were reported in children with CHC and peginterferon alfa 2a ± ribavirin treatment, with significant changes in growth, body weight, BMI and body composition (PBF and fat free mass decreased with therapy) [29].

Low BMI was identified as a risk factor particularly for lipodystrophy (total FM, trunk and limbs FM and PBF were strongly correlated with BMI) both in the total CHC group and in the CHC gender groups (especially in the female group). For the LM, the low total and trunk LM moderately correlated with low BMI.

Cigarette smoking was found to be a risk factor for low trunk and limb FM, PBF and total LM in the CHC males group.

We wondered if the antiviral therapy and then the type of this therapy might influence the body composition. In the male group, we found strong and very strong negative correlations between antiviral treatment and all the fat body composition parameters. Even if the LM in the CHC group was similar to that in the controls, we found strong and very strong negative correlations between all the lean tissue parameters and antiviral treatment in the male group.

These results confirm that the antiviral treatment may provoke not only reduced fat body mass (lipodystrophy), but also a grade of sarcopenia (reduced LM), particularly in males. These effects might be stronger in the CHC males, as males represented approximately 62% of all our CHC patients.

The relationship between NAFLD and CHC has been recognized and lately these features have been classified as HCADS [3, 18]. They are commonly encountered in patients with visceral obesity, insulin resistance and type 2 diabetes. The two metabolic diseases share common features (such as type 2 diabetes) and often they may overlap [3]. NAFLD has been proven to be associated with sarcopenia [21-23] and low BMD [24]. The mechanisms incriminated seem to be mitochondrial dysfunction with loss of muscle mass for the occurrence of sarcopenia [21-23] and insulin resistance and/or the accumulation of pro-inflammatory, pro-coagulant and pro-fibrogenic mediators for low BMD [24]. Corroborating our results with these data, we suggest that not only CHC but also antiviral treatment (peginterferon alpha 2a and ribavirin) may provoke sarcopenia and bone loss.

Peginterferon alpha 2a and ribavirin treatment was identified as a risk factor for reduced fat and lean body mass (lipodystrophy and sarcopenia) because it negatively correlated with the fat body parameters (total, trunk and limb FM, PBF) and lean body parameters (total, trunk and limb LM). The correlations were moderate and strong (also in the CHC male group).

Only PBF in the male group was found to be negatively and moderately correlated with fibrosis grade; the other body composition parameters presented weak rho coefficient values when associated with fibrosis. The same can be asserted regarding the total FM and HCV-RNA viral load in the CHC male group. These findings suggest that in larger groups of CHC patients stronger correlations might be identified.

Regarding bone density measurements, the total body DXA scan revealed that loss of BMD is generalized not only at the classical sites such as LS and hip, as compared with controls. The degree of bone demineralization was higher at the LS in patients < 50 years and at both LS and hip in patients ≥ 50 years. The prevalence of low BMD in our study was 36.66%, in accordance with other studies [30, 31]. Even if the mean BMI in CHC patients was ranged as overweight, low BMI was identified as being associated with low BMD at both total body and regional scans (LS and hip). This was found by other authors as well [30, 32]. Cigarette smoking was also correlated with low BMD (at total body, LS and hip) in CHC patients, similarly with other studies [30, 32-34]. Patients (especially males) with detectable HCV RNA expressed low BMD (at LS and hip), also in accordance with other studies [35, 36]. No correlations were found between fibrosis grade and low BMD, a

finding in accordance with some authors [30, 37] but different from other studies [38].

Furthermore, we demonstrated that antiviral treatment, especially peginterferon alpha 2a and ribavirin, represents a risk factor for low BMD at all sites scans. A similar finding was also reported by Solis-Herruzo et al. in patients with CHC, in whom peginterferon alpha and ribavirin therapy for 12 months induced bone loss in almost all patients [39]. However, this result is contradictory to that found by other authors [40, 41].

The impact of the nutritional status on the natural history of CHC was reported as malnutrition, which appears early in the progression of the disease [42]. Some authors assessed the nutritional status in patients with CHC and metabolic syndrome and they showed a high prevalence of malnutrition (10.5%) and, as independent predictors for malnutrition, presence of diabetes, fibrosis grade and interleukin 6 level [43]. A low-calorie diet for three months with a 10% decrease in BMI prior to antiviral therapy resulted in a better response to peginterferon alpha + ribavirin treatment [44].

Limitations of the present study are the small size of the study groups, the cross-sectional design, the slight imbalance between the male and female group, the imbalance between patients treated with peginterferon alpha 2a and with peginterferon alpha 2b and also, the lack of HOMA (Homeostasis Model Assessment) evaluation of insulin resistance. We intend to enlarge our study groups in order to better evaluate the cause-and-effect association between CHC and the different metabolic changes. The impact of the antiviral treatment on the body composition parameters should be established prospectively, in larger groups of patients, before and during the therapy.

CONCLUSION

In our CHC patients, the fat body mass was lower than in controls, particularly in the trunk region, thus leading to an acquired troncular lipodystrophy. We identified several risk factors associated with the reduced FM: low BMI, cigarette smoking and treatment with peginterferon alpha 2a and ribavirin. Regarding the LM, we found strong (stronger in males) negative correlations with the antiviral treatment. The BMD was lower for both total body and specific regions as compared to controls. It was also correlated with low BMI, cigarette smoking and antiviral treatment.

The impact of these factors, especially of the antiviral treatment on body composition would be important in order to evaluate and to early address these metabolic complications. To the best our knowledge, this study is the first one comparing CHC patients to controls regarding soft tissue body composition changes.

Conflicts of interest: There is no conflict of interest with any financial organization regarding this study.

Authors' contributions: E.C.B.: study conception, acquisition of data, analysis and interpretation of data, manuscript drafting; C.E.C.T. and M.L.: study conception, acquisition and interpretation of data; C.M.O., D.O., M.B., A.O.A. and V.A.: acquisition and interpretation of data; D.A.I. and I.A.B.: interpretation of data and critical revision of the manuscript. All authors read and approved the final version of the manuscript.

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Modificările în compoziția corporală la pacienții cu hepatită cronică virală C

ABSTRACT / REZUMAT

Obiective: Cuantificarea modificărilor globale și regionale ale compoziției corporale a pacienților cu hepatită cronică C (CHC), compararea acestora cu un lot control și identificarea asocierilor dintre modificările compoziției corporale și CHC. După cunoștințele noastre, acesta este primul studiu care analizează modificările țesuturilor moi din compoziția corporală la pacienții cu CHC comparative cu un lot de control.
Metodă: Am evaluat 60 de pacienți cu CHC și 60 martori sănătoși prin DXA (Dual Energy X-Ray Absorptiometry). Parametrii compoziției corporale pentru țesuturile moi și pentru os au fost comparați la cele două grupuri (folosind testul Mann-Whitney). Acești parametri au fost corelați (folosind coeficientul de corelație Spearman - rho) cu o serie de variabile independente: vârstă, sex, IMC (indicele de masa corporală), fumat, durata bolii, încărcătura virală, gradul de fibroză, tipul de tratament și durata tratamentui pentru întreg grupul de pacienți cu CHC, dar și pentru subgrupurile acestuia, în funcție de sex. Masa totală adipoasă, masa adipoasă a trunchiului și procentul de adipozitate corporală au fost reduse la pacienții cu CHC comparativ cu lotul control.
Rezultate. Mai mulți factori de risc au fost asociați cu reducerea masei adipoase: IMC scăzut, fumatul și tratamentul cu peginterferon alfa-2a și ribavirină. Tratmentul cu peginterferon alfa 2a și ribavirină s-a corelat negativ cu parametrii compoziției corporale pentru țesutul slab (în special la grupul de bărbați cu CHC). Densitatea minerală osoasă (DMO) a fost mai mică comparativ cu lotul control și s-a corelat cu IMC scăzut, fumatul și tratamentul cu peginterferon alfa-2a și ribavirină.
Concluzii: Comparativ cu lotul martor, CHC induce un tip dobândit de lipodistrofie (în special în regiunea trunchiului), și de asemenea, reduce DMO. Pacienții cu IMC scăzut, fumători și tratați cu peginterferon alfa-2a plus ribavirină au prezentat o masă adipoasă și DMO scăzute.