Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1469
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1469*
Original Research Article

FREQUENCY OF OSTEOPOROSIS IN CHRONIC LIVER DISEASE PATENTS

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(Received, 04th December 2024, Revised 29th December 2024, Published 30th December 2024)

Abstract: *Chronic liver disease (CLD) is a significant health concern often associated with systemic complications, including osteoporosis. Early detection of osteoporosis in CLD patients is critical for preventing fractures and improving quality of life.* ***Objective:*** *To determine the frequency of osteoporosis in patients with chronic liver disease (CLD).* ***Methods:*** *This cross-sectional study was carried over six months, from May 2024 to November 2024, and included 80 patients with confirmed CLD. Participants aged 30 to 60 years were recruited from outpatient and inpatient settings. Dual-energy X-ray absorptiometry (DEXA) was used to measure bone mineral density (BMD), which was then classified into normal or osteoporosis categories based on T-scores. Demographic and clinical data were collected through structured evaluations.* ***Results:*** *Mean age was 46.15 ± 9.46 years. Among the cohort, 20 patients (25.0%) had osteoporosis. Osteoporosis was associated with increasing age (p = 0.001), female gender (p = 0.004), lower BMI (p = 0.0001) and Child-Pugh Class (p = 0.02).* ***Conclusion:*** *Osteoporosis is a prevalent complication in CLD, associated with older age, female gender, lower BMI, and advanced disease severity.*

Keywords: Chronic Liver Disease, Osteoporosis, Body Mass Index, Child-Pugh Score, Bone Mineral Density

Introduction

Chronic liver diseases (CLD) and cirrhosis represent significant health challenges on a global scale (1). In 2017, the most common causes of CLD and cirrhosis worldwide were non-alcoholic fatty liver disease, with hepatitis B virus, hepatitis C virus, as well as alcohol liver disease following closely behind (1). In spite of the effective HBV vaccination initiatives in regions with high endemicity and the availability of potent anti-HBV and anti-HCV therapies, the age-standardized incidence of CLD and cirrhosis attributable to HBV and HCV has continued to increase, with rates of 9.0% and 10.2%, accordingly, over the past decade. Furthermore, the age-standardized incidence of chronic liver disease and cirrhosis attributed to non-alcoholic fatty liver disease, the primary cause of these conditions, rose by 23.5% during the same timeframe (1).

Osteoporosis is characterized by reduced bone mineral density due to changes in bone microstructure, and it ultimately increases the risk of low-impact, fragility fractures in patients. Fractures resulting from osteoporosis result in a notable decline in quality of life, contributing to higher rates of morbidity, mortality, as well as disability (2). More than half of postmenopausal white females are expected to have osteoporosis. The incidence of osteoporotic fractures in white men stands at 20%, while the mortality rate of one year for men suffering from a hip fracture is double that of their female counterparts. Black gender experience lower rates of osteoporosis contrasted to their white counterparts. The anticipated aging of the American population is expected to lead to a threefold increase in osteoporotic fractures (3-6).

The condition of osteoporosis in patients with CLD involves changes in bone mineral metabolism, which encompasses disturbances in calcium homeostasis, vitamin D metabolism, as well as the influence of hormones such as estrogen and testosterone (7-9). Moreover, liver dysfunction frequently results in the reduced synthesis of essential proteins like osteocalcin and modifies the activity of osteoblasts and osteoclasts, which are the cells that play crucial roles in bone formation along with resorption, respectively (10, 11).

The rationale for investigating osteoporosis in patients with CLD arises from the increasing awareness that this group faces a markedly elevated risk for BMD reduction and associated fractures, while osteoporosis frequently goes undiagnosed and inadequately treated. This study seeks to address the existing knowledge gap by investigating the frequency, and management of osteoporosis in patients with CLD. The goal is to provide evidence that can enhance clinical practice and ultimately alleviate the burden of bone-related complications in this at-risk group.

Methodology

This cross-sectional study was carried out over six months, from May 2024 to November 2024 at medicine OPD of Mardan Medical Complex, Mardan, and included 80 patients diagnosed with chronic liver disease after taking approval from the hospital. Patients aged between 30 and 60

years with confirmed chronic liver disease such as Hepatitis B and C were included. Patients with concurrent malignancies, prolonged immobilization, or a history of chronic steroid use, as these factors could independently influence bone mineral density were not included.

Data collection involved a structured assessment of demographic, clinical, and laboratory parameters. A detailed history and physical examination were conducted, focusing on factors such as age, gender, socioeconomic status, comorbidities (diabetes and hypertension), and etiology of chronic liver disease. Disease severity was classified using the Child-Pugh scoring system. Bone mineral density was assessed using dual-energy X-ray absorptiometry (DEXA), which is considered the gold standard for diagnosing osteoporosis. Based on the T-scores, patients were categorized as having normal bone density or osteoporosis.

Data were recorded on pre-designed proformas and analyzed with SPSS 25. We used Chi Square test to for association of osteoporosis with various factors keeping P value significant at < 0.05.

Results

The mean age was 46.15± 9.46 years. The mean BMI was recorded as 22.32± 3.30 kg/m². Among the participants, 38 (47.5%) were aged between 30 to 45 years, while 42 (52.5%) were between 46 to 60 years. Males constituted 46 (57.5%) of the cohort, while females accounted for 34 (42.5%). Socioeconomic status and education status are presented in table no 1.

In terms of comorbidities, diabetes was observed in 14 patients (17.5%), while hypertension was present in 25 (31.2%). Chronic liver disease etiology showed a predominance of hepatitis C, affecting 57 patients (71.2%), compared to 23 (28.8%) with hepatitis B. According to the Child-Pugh classification, 10 patients (12.5%) were in Class A, 30 (37.5%) in Class B, and 40 (50.0%) in Class C.

Osteoporosis was identified in 20 participants (25.0%), whereas 60 (75.0%) did not exhibit osteoporosis. The presence of osteoporosis showed a notable association with age (p = 0.001). Gender analysis indicated that osteoporosis was more prevalent in females (70.0%) than males (30.0%; p = 0.004). BMI distribution highlighted that patients with a BMI <18 kg/m² had the highest prevalence of osteoporosis (45.0%, p = 0.0001). Disease severity, as measured by the Child-Pugh score, showed notable associations; 75.0% of osteoporosis cases were in Class C (p = 0.02). There was no notable association between osteoporosis and the etiology of chronic liver disease (p = 0.19).

Table 1 Demographics

Demographics		N	%
Age distribution (Years)	30 to 45	38	47.5%
	46 to 60	42	52.5%
Gender	Male	46	57.5%
	Female	34	42.5%
Education status	Educated	36	45.0%
	Uneducated	44	55.0%
Socioeconomic status	Low (> 50K)	21	26.2%
	Middle (50K to 100K)	45	56.2%
	HIgh (> 100K)	14	17.5%

Table 2 Comorbidities

Comorbidities		N	%
Diabetes	Yes	14	17.5%
	No	66	82.5%
Hypertension	Yes	25	31.2%
	No	55	68.8%
Smoking	Yes	16	20.0%
	No	64	80.0%

Table 3 Clinical presentation

Clinical presentation		Count	Table N %
Etiology of chronic liver disease	Hepatitis B	23	28.8%
	Hepatitis C	57	71.2%
Child pugh	Class A	10	12.5%
	Class B	30	37.5%
	Class C	40	50.0%

Table 4 Frequency of osteoporosis

Osteoporosis	Frequency	Percent
Yes	20	25.0
No	60	75.0

[Citation: Kour, K., Khan, M.I., Sajjad, J., Khan, M.A., Riaz, N., Anjum, I.H. (2024). Frequency of osteoporosis in chronic liver disease patents. *Biol. Clin. Sci. Res. J.*, **2024***: 1469*. doi: https://doi.org/10.54112/bcsrj.v2024i1.1469]

Total	80	100.0

Table 5 Association of risk factors with osteoporosis

Risk factors		Osteoporosis				P value
		Yes		No		
		N	%	N	%	
Age distribution (Years)	30 to 45	3	15.0%	35	58.3%	0.001
	46 to 60	17	85.0%	25	41.7%	
Gender	Male	6	30.0%	40	66.7%	0.004
	Female	14	70.0%	20	33.3%	
BMI distribution (Kg/m2)	< 18	9	45.0%	5	8.3%	0.0001
	18 to 24.9	6	30.0%	41	68.3%	
	> 24.9	5	25.0%	14	23.3%	
Etiology of chronic liver disease	Hepatitis B	8	40.0%	15	25.0%	0.19
	Hepatitis C	12	60.0%	45	75.0%	
Child pugh	Class A	0	0.0%	10	16.7%	0.02
	Class B	5	25.0%	25	41.7%	
	Class C	15	75.0%	25	41.7%	

Discussion

The present study highlights the significant burden of osteoporosis in patients with chronic liver disease (CLD) and identifies important demographic, clinical, and disease-specific factors associated with its occurrence. The mean age of 46.15 ± 9.46 years and mean BMI of 22.32 ± 3.30 kg/m² among the study participants provide a demographic baseline consistent with previous literature. The frequency of osteoporosis in this study was 25.0%. Similarly Javed M et al., showed that 26% patients in their study had osteoporosis (12).

The higher frequency of osteoporosis in females (70.0%) compared to males (30.0%) observed in this study corroborates findings in prior research. Ninkovic M et al. and Wariaghli G et al. also reported that osteoporosis is more common in females, particularly postmenopausal women, which may be attributed to hormonal changes that accelerate bone loss (13, 14). The role of BMI as a significant predictor of osteoporosis was evident in this study, with lower BMI (<18 kg/m²) being strongly associated with osteoporosis (p = 0.0001). This finding is supported by Yadav A et al., who emphasized the link between low BMI and increased fracture risk in CLD, especially in advanced disease stages (15).

Age emerged as a critical determinant of osteoporosis, with a notably higher frequency observed in participants aged 46 to 60 years (85.0% of cases, p = 0.001). This is consistent with evidence from Ninkovic M et al., suggesting that advancing age correlates with decreased bone mineral density (BMD) and increased fracture risk (13). The severity of liver disease, as measured by the Child-Pugh score, showed a strong association with osteoporosis in this study, with the majority of cases (75.0%) observed in Child-Pugh Class C (p = 0.02). This finding mirrors the conclusions of Ninkovic et al., who demonstrated a higher frequency of osteoporosis in patients with severe liver disease prior to liver transplantation (13). Similarly, Ahmed et al. reported that Child-Pugh Class C patients had a notably higher incidence of osteoporosis compared to Class B (16).

Interestingly, while hepatitis C was the predominant etiology of CLD in this cohort (71.2%), no notable association was found between the etiology of liver disease and osteoporosis (p = 0.19). Our finding is similar with the study by Javed M et al., which found no notable correlation between the etiology of CLD and osteoporosis (12). However, Wariaghli G et al., highlighted a higher frequency of osteoporosis in patients with cholestatic liver diseases compared to non-cholestatic etiologies (14).

Overall, the findings of this study reinforce the need for early identification and management of osteoporosis in CLD patients, particularly among those with advanced disease, lower BMI, and older age. These results underscore the importance of routine screening using gold-standard methods like DEXA scans and the implementation of targeted interventions to mitigate fracture risks and improve quality of life in this vulnerable population.

Conclusion

We conclude that osteoporosis is a notable complication in patients with chronic liver disease, with a frequency of 25.0% in our study cohort. The condition is strongly linked with advanced age, lower BMI, female gender, and higher Child-Pugh scores, indicating greater disease severity. These findings underscore the need for early screening and intervention strategies to address osteoporosis in high-risk patients, particularly those with advanced liver disease.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned. (IRBEC-TCHPSH-023232/23)

Consent for publication
Approved

Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Conception of Study
MUHAMMAD ARIF KHAN
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Review of manuscript

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