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BONE MINERAL DENSITY ASSESSMENT IN CHRONIC LIVER DISEASE

General Medicine

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ABSTRACT

AIMS: The present study is aimed at Estimating the prevalence of osteoporosis, symptoms, etiology, factors influencing the osteoporosis in patients with Chronic liver Disease. To study the association of osteoporosis and severity of liver dysfunction.

Materials And Methods : A total of 50 patients were studied in the Department of Medicine, S.P. Medical Collage Bikaner admitted in medical wards, attending medical outdoor and gastroenterology outdoor from 1st of January 2018 to 31st December 2018.

Results: In present study, most common diagnosis was Chronic Liver Disease(CLD) where total 46(92%) cases were found followed by Portal Hypertension(PHTN) (60%), Ascites (68%), Alcohol (64%),Diabetes Mellitus(DM) (18%), Eso. varices (14%),Hypertension(HTN) (10%), HbsAg (8%), Alcoholic Liver Disease(ALD). Mean serum bilirubin total in normal group was 2.12±1.58, in osteopenia group it was 5.0±3.42 and in osteoporosis group it was 1.35±0.51 and this difference was found statistically significant ($p<0.01$). According to T score, out of 10 normal cases all had their T score $\geq$ -1.0, in osteopenia group 6 and 28 cases had their T score -1.0 to -2.5 respectively while in osteoporosis group all 6 cases had their T score>-2.5. Mean T score in normal group was 0.40±0.33, in osteopenia group it was -1.82±0.34 and in osteoporosis group it was -2.81±0.14 and on applying ANOVA test, the difference was found statistically highly significant ($p<0.001$).

Conclusion: we concluded that low BMD is highly prevalent in patients with CLD of variable aetiologies. Causes may be multifactorial. Early screening of osteoporosis in patients with liver cirrhosis will reduce the risk of morbidity and mortality. Attention needs to be drawn towards documentation and management of this metabolic disorder. Limitation of the study is small number of patients.

KEYWORDS

Osteopenia, T-score, Osteoporosis, CLD

INTRODUCTION

Literature database outlines Global Burden of Liver Disease estimates roughly 1.03 million deaths per year in the world wide and over a million deaths in 2010 by cirrhosis[1]. Prevalence in cirrhotic patients varies from 12 to 70% and the liver disease etiology osteoporosis is common among all cirrhotic patients regardless of the liver disease etiology[2]. Among the cirrhotic patients increased prevalence of osteopenia and osteoporosis has been demonstrated in patients with chronic liver disease of different etiologies in the recent times[3]. CLD is a major cause of morbidity and mortality worldwide. It involves haemodynamic and metabolic complications, such as liver failure, portal hypertension, encephalopathy, ascites, hepatorenal syndrome and gastrointestinal bleeding from oesophageal varices[4]. In addition to this, CLD also affects skeletal health and acts as an important risk factor for the development of osteoporosis and bone fractures. The association of chronic cholestatic diseases with poor bone health as a result of decreased BMD and increase in fragility fracture risk has been known since long time[5] but increased prevalence of osteopenia and osteoporosis has been demonstrated in patients with chronic liver disease of different aetiologies in the recent times[3,6-9]. Decreased vitamins D, treatment with corticosteroids contribute to worsening bone health. Per 100000 persons there are at least 2000 patients with chronic liver disease, of whom 20-420 have osteoporosis, and 60-880 experienced fractures and a previous fracture increases the risk for later fractures further[10].

MATERIALS AND METHODS

A total of 50 patients were studied in the Department of Medicine, S.P. Medical Collage Bikaner admitted in medical wards, attending medical outdoor and gastroenterology outdoor from 1st of January 2018 to 31st December 2018.

Severity of liver disease

Severity assessment of the liver disease in patients with cirrhosis was done by Child Pugh Score (CTP)[11] and Model for end-stage liver disease (MELD)[12] scores.

Bone mineral density measurement

All patients included in the study were subjected to bone mineral density measurement of hip joint by dual energy x-ray absorptiometry (DEXA) (Osteopromax of M-Tec Company).

Dual-energy X-ray absorptiometry technology

A typical DEXA scan machine consists of a padded table on which the patient should lie and movable C-arm with an x-ray tube under the patient and a detector above the patient. The x-ray tube, which is below the patient generate photon beams of two different energy levels, for which is called “dual-energy” source. A collimator below the table controls the scatter of the photons and directs the photons towards the area of interest. The difference in attenuation that is the reduction in intensity of the two photon beams as they go through the body tissue of various composition and distinguishing bone from soft tissue and allows quantification of the bone mineral density. Denser and thicker tissue contains more electrons and will not allow many photons to pass through to the detector. A computer which is specially designed with its proprietary software designed by each manufacturer forms a complete DEXA scan. Radiation exposure to the patient is very minimal, usually of a similar magnitude to daily background radiation. Radiation which is scattered beyond the edge of the DEXA table is negligible. Shielding of the technologist or room is not necessary. But as a safety precaution, the technologist doing the DEXA scan should not sit within three feet of the table edge when the patient is being scanned. DEXA scan measures bone mineral content in grams and bone area in square

centimeter, then calculates "areal" BMD in g/cm^2 by dividing bone mineral content and bone area. T-score, the value used for diagnosis of osteoporosis, is calculated by subtracting the mean BMD of a young-adult reference population from the patient's BMD and dividing by the standard deviation (SD) of young adult population. Z-score, used to compare the patient's BMD to a population of peers, is calculated by subtracting the mean BMD of an age, ethnicity and sex matched reference population from the patient's BMD and dividing by the SD of the reference population. DEXA scan should be advised once a year and follow-up of patients on treatment for osteoporosis or osteopenia can be done with DEXA scan every 2 years[13].

According to the World Health Organization (WHO) criteria[14] Normal BMD is represented by a T score of more than -1. Osteopenia (low bone mass) is represented by a T score between-1 and -2.5. Osteoporosis is presented by a T score less than -2.5. Established osteoporosis is represented by a T score of less than -2.5 and a previous history of a fragility fracture.

Patients were divided into three groups on the basis of BMD: Group 1 had normal BMD, Group 2 had osteopenia and Group 3 had osteoporosis.

Site of measurement of bone mineral density

Most common site for measurement of bone mineral density was HIP and SPINE. Other sites of bone mineral density measurement include the peripheral site like calcaneum and wrist. WHO validated is DEXA scanning of the hip or spine.

RESULTS :

In present study out of total 50 cases in osteopenia group, 6 cases had their life style active while 7 cases had their life style working and 21 cases had sedentary life style. In osteoporosis group all 6 cases had their life style sedentary and this difference was found statistically significant ($p<0.01$). Most common diagnosis was CLD where total 46(92%) cases were found followed by PHTN (60%), Ascites (68%), Alcohol (64%), DM (18%), Eso. varices (14%), HTN (10%), HbsAg (8%), ALD, Melena and Severe anaemia (6% each), HSL, AKI, Acute DD, Hypoglycemia, Hemetemesis, LRTI, SAIO, MODS, Septicemia, Bleeding PV (2% each) was also found. Forty six cases were taking alcohol and out of them 9, 31 and 6 cases belonged to normal, osteopenia and osteoporosis group respectively, 49 cases were smokers and out of them 9, 34 and 6 cases belonged to normal, osteopenia and osteoporosis group respectively, 8 cases were diabetic and out of them 2 and 6 belonged to normal and osteopenia group while only 1 case had hypertension and belonged to normal BMD group.

Mean T score in normal group was 0.40±0.33, in osteopenia group it was -1.82±0.34 and in osteoporosis group it was -2.81±0.14 and on applying ANOVA test, the difference was found statistically highly significant ($p<0.001$).

Mean serum albumin in normal cases was 5.19±2.14, in osteopenia group it was 5.04±1.86 and in osteoporosis group it was 4.52±1.86 and the difference was found statistically insignificant ($p>0.05$)

Mean PTINR in normal cases was 1.40±0.29, in osteopenia group it was 1.53±0.47 and in osteoporosis group 1.27±0.27 and this difference was found statistically insignificant ($p>0.05$).

Mean vitamin D in normal cases was 31.82±4.48, in osteopenia group it was 15.88±2.40 and in osteoporosis group it was 8.72±0.84. On applying ANOVA test, the difference was found statistically highly significant ($p<0.001$).

In present study correlation of different parameters with BMI findings, Child pugh score had highly significant difference between normal, osteopenia and osteoporosis group, while serum bilirubin (D), SGOT, SGPT and serum creatinine had a significant difference in all three BMD group ($p<0.05$) while blood sugar, total protein, alkaline phosphatise and blood urea had insignificant difference between all 3 BMD groups ($p>0.05$).

DISCUSSION

In present study Mean T score in normal group was 0.40±0.33, in osteopenia group it was -1.82±0.34 and in osteoporosis group it was -2.81±0.14 and the difference was found statistically highly significant ($p<0.001$).

Our observations comparable with Javed et al[15] showed that osteoporosis was more frequent in cirrhotic patients with long duration of liver disease (5 years and above) also comparable with Karoli et al[16] in which the prevalence of Hepatic Osteodystrophy (HO) in patients with CLD was studied. Out of 72 patients, 29.2% had normal BMD while low BMD was found in 70.8% of patients. Similar results were also observed by Turkeli et al[17] where they found that effects of cirrhosis on bone mineral density and+ bone metabolism. Osteopenia and osteoporosis are highly prevalent in individuals with liver cirrhosis. Diamond et al[18,19] found in their two separate studies that the prevalence of osteoporosis was 30%-48% in patients with chronic liver disease of different aetiologies.

According to life style, in normal cases, 1 case each had their life style active and working while remaining 8 cases had their life style sedentary. In osteopenia group, 7 cases had their life style active while 3 cases had their life style working and 24 cases had sedentary life style. In osteoporosis group 6 cases had their life style sedentary and this difference was also found statistically significant ($p<0.05$)

In present study, most common diagnosis was CLD where total 46(92%) cases were found followed by PHTN (60%), Ascites (68%), Alcohol (64%), DM (18%), Eso. varices (14%), HTN (10%), HbsAg (8%).

Our observations comparable with Javed et al[15] showed that osteoporosis was more frequent in cirrhotic patients with long duration of liver disease (5 years and above) also comparable with Karoli et al[46] in which the prevalence of Hepatic Osteodystrophy (HO) in patients with CLD was studied. Out of 72 patients, 29.2% had normal BMD while low BMD was found in 70.8% of patients.

In present study, 46 cases were taking alcohol and out of them 9, 31 and 6 cases belonged to normal, osteopenia and osteoporosis group respectively.

Peris et al[20] found duration of alcoholism was significantly higher in patients with age-matched BMD below 100% than in those with age-matched BMD above 100%. Choudhary et al[25] also reported that low BMD was present in 97% of patients with alcoholic cirrhosis and 93.7% with viral cirrhosis.

In present study mean serum bilirubin total in normal group was 2.12±1.58, in osteopenia group it was 5.0±3.42 and in osteoporosis group it was 1.35±0.51 and this difference was found statistically significant ($p<0.01$) and Child pugh score had highly significant difference between normal, osteopenia and osteoporosis group, while serum bilirubin (D), SGOT, SGPT and serum creatinine had a significant difference in all three BMD group ($p<0.05$).

Our observations comparable with Goubraim et al[21] study in which they found the level of liver failure is correlated with the risk of osteoporosis, and the progression of liver disease from grade A to grade C of the Child-Pugh classification is associated with an increase in bone loss[15].

Mean vitamin D in normal cases was 31.82±4.48, in osteopenia group it was 15.88±2.40 and in osteoporosis group it was 8.72±0.84. On applying ANOVA test, the difference was found statistically highly significant ($p<0.001$).

Our observations comparable with Goubraim et al[21] study in which they found, a high prevalence of vitamin D deficiency (95.6%) was associated with low BMD.

Similar results were also observed in Karoli et al[16] where the serum calcium, and 25(OH) Vitamin D level showed significant difference between normal BMD and low BMD and seems to be the important contributory factor.

CONCLUSION

We concluded that low BMD is highly prevalent in patients with CLD of variable aetiologies. Causes may be multifactorial. Early screening of osteoporosis in patients with liver cirrhosis will reduce the risk of morbidity and mortality. Attention needs to be drawn towards documentation and management of this metabolic disorder.

LIMITATIONS

Limitation of the study is small number of patients.

Table 1 Distribution of cases according to life style

Life Style	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
Active	1	10.0	6	17.6	0	-	7	14.0
Sedentary	2	20.0	21	61.8	6	100	29	58.0
Working	7	70.0	7	20.6	0	-	14	28.0
Total	10		34		6		50	
x	14.322							
P	0.006							

Table 2 Distribution of cases according to final diagnosis

Diagnosis	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
CLD	10	100.0	31	91.2	5	83.3	46	92.0
PHTN	7	70.0	19	55.9	4	66.7	30	60.0
Ascites	7	70.0	21	61.8	6	100	34	68.0
Alcoholic	7	70.0	22	64.7	3	50.0	32	64.0
DM	1	10.0	7	20.6	1	16.7	9	18.0
Eso.varices	1	10.0	6	17.6	0	-	7	14.0
HTN	2	20.0	2	5.9	1	16.7	5	10.0
HbsAg	0	-	2	5.9	2	33.3	4	8.0
ALD	1	10.0	2	5.9	0	-	3	6.0
Melena	0	-	3	8.8	0	-	3	6.0
Severe Anaemia	1	10.0	2	5.9	0	-	3	6.0
HRS	0	-	0	-	1	16.7	1	2.0
AKI	0	-	1	2.9	0	-	1	2.0
Hypoglycemia	1	10.0	0	-	0	-	1	2.0
Hemetemesis	0	-	1	2.9	0	-	1	2.0
LRTI	0	-	1	2.9	0	-	1	2.0
SAIO	1	10.0	0	-	0	-	1	2.0
MODS	0	-	1	2.9	0	-	1	2.0
Septicemia	0	-	1	2.9	0	-	1	2.0
Bleeding PV	1	10.0	0	-	0	-	1	2.0

Table 3 Distribution of cases according to History

History of	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
Alcohol	9	90.0	31	91.2	6	100.0	46	92.0
Smoking	9	90.0	34	100	6	100	49	98.0
DM	2	20.0	6	17.6	0	-	8	16.0
HTN	1	10.0	0	-	0	-	1	2.0

Table 4 Distribution of cases according to serum bilirubin total

Serum Bilirubin (Total)	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
<2	7	70.0	2	5.9	6	100	15	30.0
2-3	0	-	14	41.2	0	-	14	28.0
>3	3	30.0	18	52.9	0	-	21	42.0
Total	10		34		6		50	
Mean age	2.12		5.00		1.35			
SD	1.58		3.42		0.51			
F	6.390							
P	0.004							

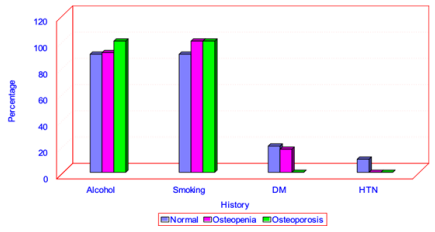
Table 5 Distribution of cases according to T-Score

T-Score	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
> -1.0	10	100.0	6	17.6	0	-	16	32.0
-1.0 to -2.5	0	-	28	82.4	0	-	28	56.0
> -2.5	0	-	0	-	6	100	6	12.0
Total	10		34		6		50	
Mean age	0.40		-1.82		-2.81			
SD	0.33		0.34		0.14			
F	235.687							
P	<0.001							

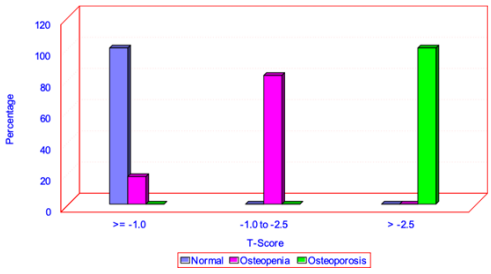
Table 6 Distribution of cases according to vitamin D

Vitamin D	BMD						Total	
	Normal		Osteopenia		Osteoporosis			
	No.	%	No.	%	No.	%	No.	%
<10	0	-	0	-	6	100.0	6	12.0
10-19	0	-	30	88.2	0	-	30	60.0
>19	10	100	4	11.8	0	-	14	28.0
Total	10		34		6		50	
Mean age	31.82		15.88		8.72			
SD	4.48		2.40		0.84			
F	162.234							
P	<0.001							

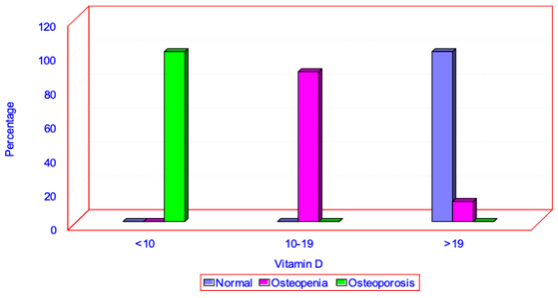
Distribution of cases according to History



Distribution of cases according to T-Score



Distribution of cases according to vitamin D



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