Comparison of bone densitometry in alcoholic and non-alcoholic males above 50 years

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Abstract-
Title: The comparison of BMD in alcoholic and non-alcoholic males above 50 years of age using DEXA.

Background: DEXA scan is a gold standard procedure for the evaluation of bone health (BMD). It uses a low dose of ionizing radiation to calculate the bone mineral density. The BMD was measured from the lumbar spine from L1 to L4.

Objective: The aim of this study is to compare the BMD of alcoholic and non-alcoholic males above 50 years.

Method: 30 patient's data were collected prospectively and mean and percentage stats were used.

Result: Out of 30 patients, 12 patients were alcoholic and 18 patients were non-alcoholic. Result shows that out of 30 patients, 6(20%) patients have osteopenia,16(53.3%) patient have osteoporosis, and 8 (26.6%) patients have normal BMD. The alcoholic patients have low BMD compare to the non-alcoholic patients, also BMD decreases with the increase in age.

Conclusion: The study concluded that heavy alcohol intake may decrease the BMD. This study showed decreased bone mineral density in patients with heavy alcohol intake. The mean BMD of alcoholic patients was 0.739 g/cm2 and the mean BMD of non-alcoholic patients was 0.908 g/cm2. The lowest and highest Z-scores respectively of alcoholic patients were (-3.7) and (-1.5), lowest and highest Z-scores respectively of non-alcoholic patients were (-2.9) and (0). The lowest and highest T-scores respectively of alcoholic patients were (-4.4) and (-1.9), lowest and highest T-scores respectively of non-alcoholic patients were (-4) and (-0.4). The alcoholic patients have lower BMD,T-score, and Z-score comparison to the non-alcoholic patients. Dual-energy x-ray absorptiometry (DEXA) is an easy and effective method to detect low bone mass using T score according to WHO classification.

Introduction

Dual energy x-ray absorptiometry is a spectral imaging method for assessing bone mineral (BMD).Two X-ray beams are focused at the patient's bones, each with a distinct energy level. When soft tissue absorption is removed, the bone mineral density (BMD) is often calculated by looking how each beam is absorbed by bone.

Dual energy absorptiometry (DEXA) is the most widely used and researched bone density assessment method. In contrast to nuclear bone scan, which is sensitive to certain metabolic illness of bones during which bones are trying to mend from infections, fractures, or tumors, the DEXA scan is mainly used to diagnose and follow osteoporosis.[1]

Fig.1-showsDEXAequipment

1.1) **DEXA** scan A BMD test is quick & painless procedure that's patient lying on the x-ray table with his/her back, in order that the a part of the body will be scanned. No special preparations are needed for the procedure patient can eat or drink as common. Bone mineral density test compares patient bone density with the expected bone density of same age of person to match the bone density of the patient. The difference between patient and compare this with a healthy adult is thought as T-score. A z-score is defined as the difference between a patient's bone density measurement and that of someone of the same age. The difference is calculated as **standard deviation (SD).** [2]The classified T-score by WHO (world health organization)as follow-

• Above 1-SD **(standard deviation) is normal.**
• Between -1 & -2.5 **SD** is mildly reduced BMD.
• Below-2.5isdefined as osteoporosis.[2]

1.2) **Bone Density Measurement**
a) **T-score-** The lower the T-score, the weaker the bones are; T-score of value (-1.0) or more indicate average bone density. Low bone density or osteopenia is indicated by a T-score of value (-1.0) to (-2.5). When patient T-score is less than (-2.5) or lower, then patient have osteoporosis. [2]
b) **Z-score-** A z-score compares your bone density to that of a person of the same age and gender. An abnormally low z-score (below -2.0) could indicate that the patient has less bone mass (and is at a higher risk of losing bone more quickly) than someone in the same age group.[2]

1.3) **Osteoporosis**
Bones become brittle and fragile in this state, and fresh bone formation is hampered. A t-score of (-1 to -2.5) indicates that the patient has decreased bone mass, bit not

to extent that osteoporosis is diagnosed. The patient has osteoporosis if their t-score is less than (-2.5). The lower the number, the greater the risk of osteoporosis.[3]

1.4) **Osteopenia**
Osteopenia is a condition in which the bones become weak and brittle because old bone is rapidly absorbed, the body does not produce new bone in this state. If the T-score is between (-1.0) to (-2.5) then the patient has low bone density or osteopenia.

1.5) **Justification**
There is much more way to know the BMD but DEXA Scan is the simplest and simply available scan. BMD tests are very safe; they use an awfully low dose of X-ray. A significant disadvantage of DEXA scans is that there is an absence of standardization in bone and soft tissue measurement. Hence in a very rural setting with the majority of patients belonging to low social economic groups, DEXA scan remains a preferred, relatively cheaper ,and valuable technique.

Aim and Objective:-
Aim: The goal of this study is to use a DEXA scan to compare the bone mineral density of alcoholics and non-alcoholics over the age of 50.

Objectives: -
 ➢ To obtain measurements of bone mineral density using DEXA scan in adult male subjects above 50 years of age.
 ➢ The purpose of this study is to see if there is a link between alcohol consumption and bone mineral density (BMD).

Method and material-

•   Study type- This quantitative prospective study was carried out to assess the comparison of the BMD of alcoholic and non-alcoholic patients above 50 years of age, who visited the radiology department of SGT Hospital and Research Institute, Gurugram, Haryana.

•   Study design- 30 patients were selected according to pre-decided inclusion criteria and exclusion criteria of the study. History and symptoms were elucidated from the patient prior to the scan. BMD test performed using DEXA.

•   Sample size- 30 patients were included in this study.

•   Study area- This study was conducted in Radiology Department of SGT Hospital and Research institute, Gurugram (Haryana).

•   Sample collection duration-01 November 2020 to 31March 2021.

•   Selection criteria

i.   Inclusion criteria

a)   All male patients' above50 years of age.

b)   Both IPD &OPD patients.

ii.   Exclusion criteria

a)   Female patients.

b)   Patients with known   co- morbidities like diabetes, hyper/hypothyroidism, hyperparathyroidism etc.

c)   Patients on long term steroid.

d)   Patients with known or suspected malignancy.

e)   Patients on chemotherapy/radiotherapy.

•   Statistical analysis - The data was compiled and statistically analysis was done using SPSS software.

•   Setting and resources-The study was conducted in the department of Radio diagnosis SGT Hospital on patients referred from other departments for the purpose of DEXA scan.

Methodology-

The following instrument was used in this study.

DEXASCANNER   (HOLOGIC DISCOVERYQDRSERIES)

The current DEXA system has a radiation dose as low as 0.001 mSv, which is less than a normal chest or dental x-ray. For this study, the lumbar spine was scanned.

Lumbar spine-The patient needs to lie supine with their hips and knee flexed on a supportive cushion. A PA film is taken and should display the spine as straight as possible. Bone mineral density measurement was obtained from L1 to L4 vertebral body.
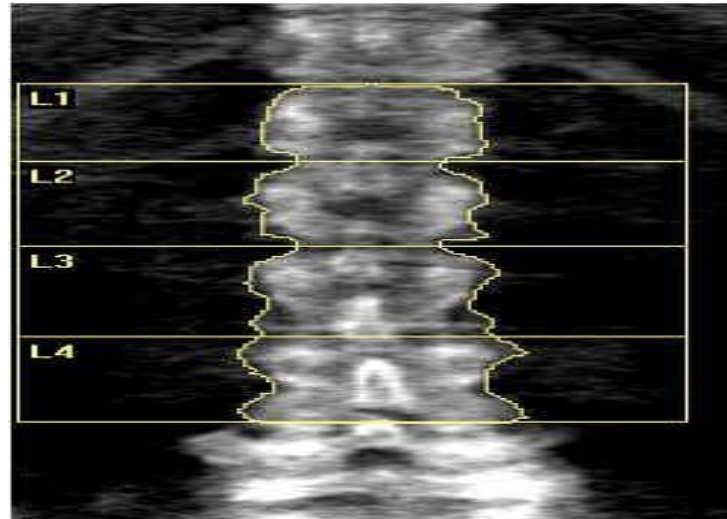

Fig.2- shows lumbar spine

Procedure -On a flat x-ray table, the patient had to lay on his/her back. During the scan
, patient must remain completely still in order for the images to be clear. A professional in taking x-ray images usually performs the scan. A huge scanning arm will be passed over the patient's body during the scan to measure the bone mineral density in the skeleton's middle. A narrow beam of low dose x-ray will be passed through the part of the body being studied as the scanning arm moves slowly over the patient's body. This is frequently dose to look for weak bones and hips in the lower spine and hip (neck of femur). Tissue such as fat and bone absorb some of the x-rays that pass through the patient's body. The number of x-rays that have gone through the patient's body is measured by x-ray detectors inside the scanning arm. The scan usually takes around10 to 15 minutes.

Result and Discussion -

A total no. of 30 patients was selected in which 12 patients were alcoholic and 18 patients were non-alcoholic. The result shows that total 30 patient is selected in which 6

patients have osteopenia, 16 patients have osteoporosis and 8 patients are normal.
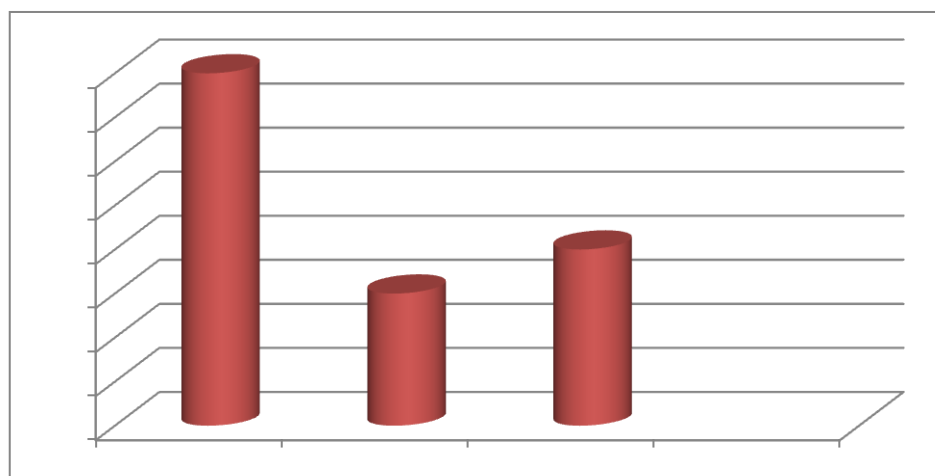
1.1   Patients classification-
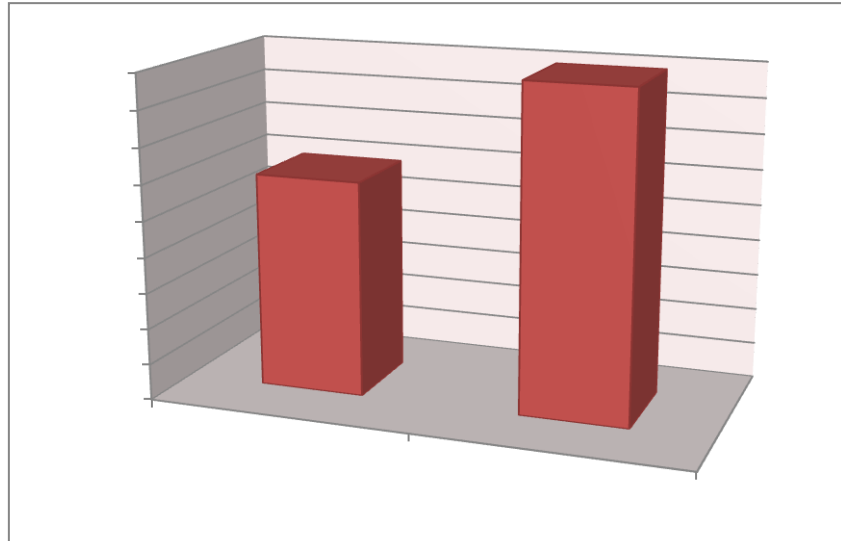
Graph No.1- shows patients classification

Patient type	No.of patient
Alcoholic	12
Non-alcoholic	18

Table no.1– shows patients' classification

In this study the 12 patients were alcoholic and 18 patients were non-alcoholic.
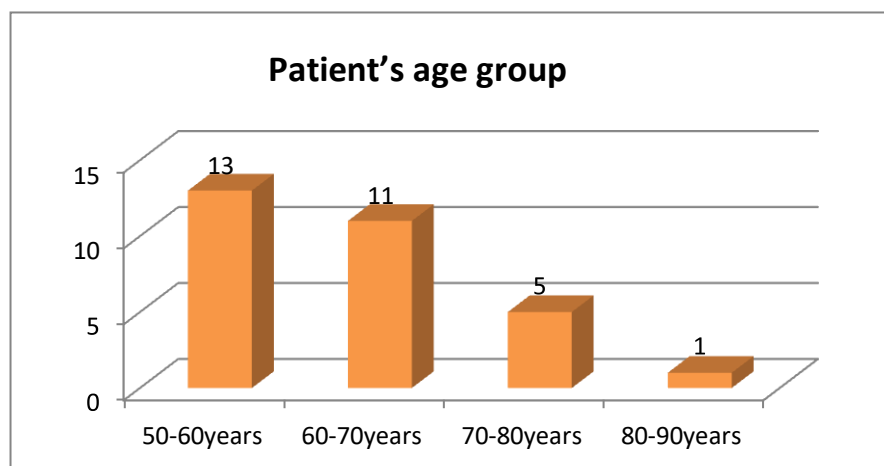
1.2   WHO classification-

Graph No.2- shows WHO classification

WHO classification	No.of patients
Osteoporosis	16
Osteopenia	6
Normal	8

Table No. 2 shows WHO classification

Among 30 patients, after the DEXA scan, 16 patients have osteoporosis most of the patients were alcoholic, 6 patients have osteopenia, and 8 patients have normal BMD.

1.3 Patients age group
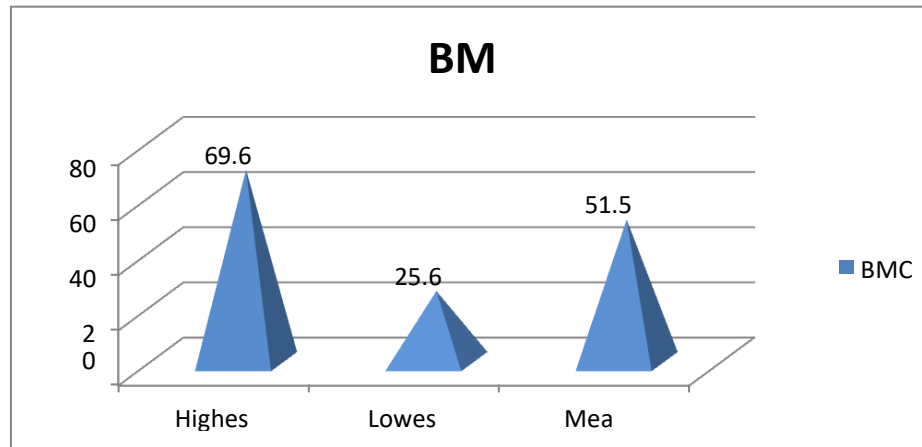

Graph No. 3- shows patient's age group

Age	No.of patient
50-60	**13**
60-70	**11**
70-80	**5**
80-90	**1**

Table No 3. – shows patient's age group

In this study the patients above 50 years of age were selected. The total no. of patients is 30, in which 50 to 60 age group patients are 13, 60-70 age group patients are 11, 70-80 age group patients are 5 and 80-90 age group patient is only 1.

### 1.4   BMC(g)-

Graph No.4– shows the bone mineral content

BMC	TOTAL
Highest	69.62 g
Lowest	25.61 g
Mean	51.52 g

Graph No.4– shows the bone mineral content

Among all the 30 patients the highest BMC was 69.62 g, the lowest BMC was 25.61 g, and the mean BMC was 51.52 g. BMC is lower in the alcoholic patient than the non-alcoholic patients. A non-alcoholic patient has highest BMC that is 69.62g and an alcoholic patient has lowest BMC that is 25.61g.

### 1.5   MD (g/cm2)-
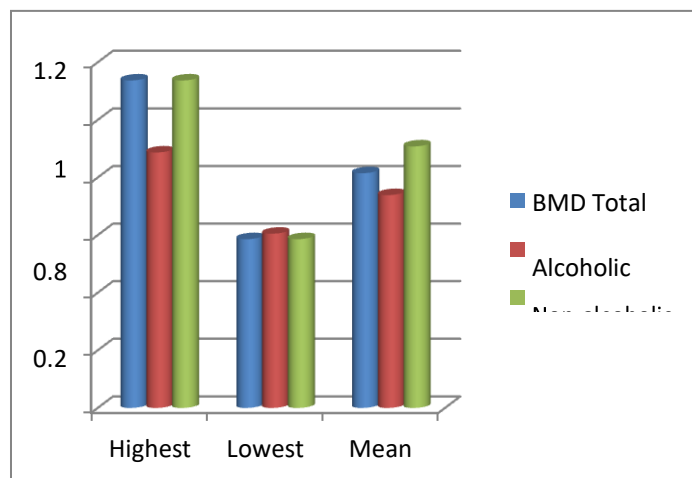
Graph No.5– shows patients BMD

BMD	Total	Alcoholic	Non-alcoholic
Highest	1.137 g/cm^2	0.887 g/cm^2	1.137 g/cm^2
Lowest	0.586 g/cm^2	0.605 g/cm^2	0.586 g/cm^2
Mean	0.815 g/cm^2	0.739 g/cm^2	0.908 g/cm^2

Table No.5 – shows patients BMD

Among the 30 patients the highest BMD was 1.137 g/cm2, the lowest BMD was 0.586 g/cm2and the mean BMD was 0.815 g/cm2. In the 12 alcoholic patients the highest BMD was 0.887 g/cm2, the lowest BMD was 0.605 g/cm2and the mean BMD was 0.739 g/cm2.In the 18 non-alcoholic patients the highest BMD was 1.137 g/cm2, the lowest BMD was 0.586 g/cm2and the mean BMD was 0.908g/cm2.

**1.6   T-Score-**
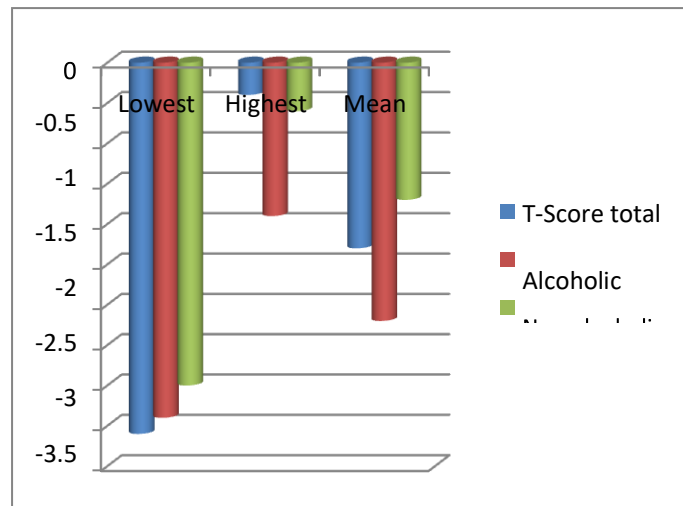
Graph No.6– shows patients T-score

T-score	Total	Alcoholic	Non-alcoholic
Lowest	-4.6	-4.4	-4
Highest	-0.4	-1.9	-0.4
Mean	-2.3	-3.2	-1.7

Table No .6– shows patients T-score

Among the 30 patients, the lowest T-score was (-4.4), the highest T-score was (-0.4), and the mean T-score was (-2.3).In the 12 alcoholic patients, the lowest T-score was (-4.4), the highest T-score was (-1.9) and the mean T-score was (-3.2).In the 18 non-alcoholic patients, the lowest T-score was(-4),the highest T-score was(-0.4) and the mean T-score was(-1.7).

**1.7   Z-Score-**
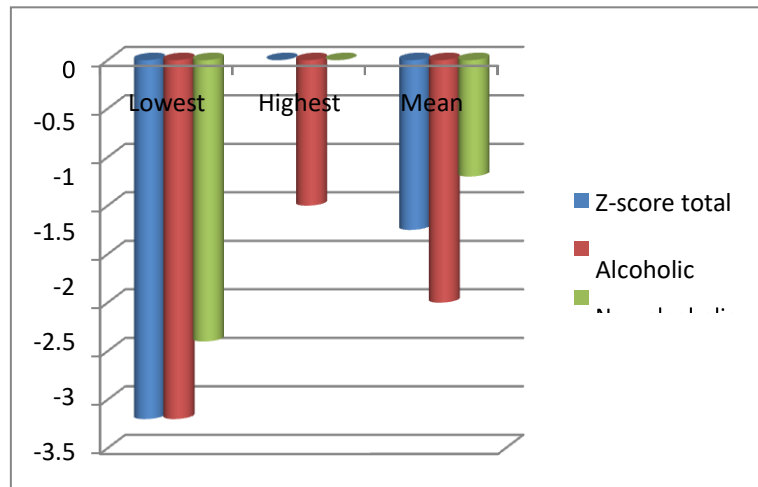
Graph No.7– shows patients Z-score

Z-score	Total	Alcoholic	Non-alcoholic
	-3.7	-3.7	-2.9
Highest	0	-1.5	0
Mean	-1.75	-2.5	-1.2

Table No.7– shows patients' Z-score

Among the 30 patients, the lowest z-score was (-3.7), the highest z-score was (0), and the mean z-score was (-1.75).In the 12 alcoholic patients, the lowest z-score was (-3.7), the highest z-score was (-1.5), and the mean z-score was (-2.5).In the 18 non-alcoholic patients, the lowest z-score was (-2.9), the highest z-score was(0), and the mean z-score was (-1.2).

1.8   BMI (body mass index)-
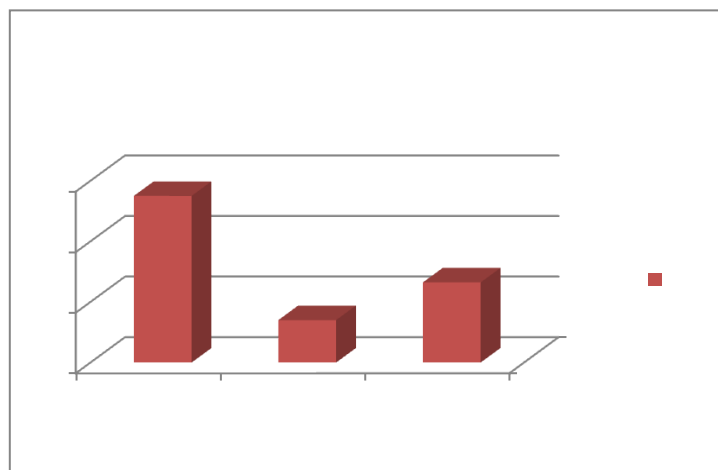
Graph No 8 – Shows patients BMI

BMI	Total
Highest	55
Lowest	14
Mean	26.44

Table No.8 – shows patients BMI

Among the 30 patients, the highest BMI was 55, the lowest BMI was 14 and the mean BMI was 26.44.

Discussion-
Alcohol intake may relate to low bone density, light alcohol intake may increase bone mineral density. The mean BMD was 1.164 in this study. In men, consuming a lot of alcohol can lower their BMD. The BMD of light drinkers was greater in the total body (p<0.001,p=0.026, p=0.040), while the BMD of heavy drinkers was lower (p=0.031). In men, heavy alcohol use may be linked to poor bone health, whereas modest alcohol consumption May be linked to better BMD.[1]

In the above study, the patients with alcohol intake have low bone density compared to the non-alcoholic patients. The total mean BMD was 0.815 for alcoholic and non-alcoholic patients. The mean BMD of alcoholic patients was 0.739 g/cm2and the mean BMD of non-alcoholic patients was 0.908 g/cm2. Non-alcoholic patients have higher mean BMD than alcoholic patients. Alcoholic patients have a higher risk of fracture and among 12 alcoholic patients, 11 patients have osteoporosis, and only one patient has osteopenia. Age is also a factor that plays an important role in defining BMD. Hence, the intake of alcohol may have the worst effect on the BMD.

In another study, the BMD of light drinkers was higher than that of heavy drinkers and non-alcoholics. Heavy drinkers and non-alcoholic have a much higher risk of fracture rather than light drinkers. Those who drank alcohol; 2-3 times per week had increased BMD than that of the non-drinkers; BMD was lower in people who drank alcohol more than 4 times per week. The risk of osteoporosis was in heavy drinkers 1.70 and 1.68 in non-drinkers and less in light drinkers. The result was found that light alcohol consumption related to the increased BMD; non-drinkers and heavy drinkers have a higher risk for osteoporosis than light drinkers; which is 1.7 times greater. [5]

In another study the risk of osteopenia 54.5% and osteoporosis 34.1% in alcoholic patient, and in non-alcoholic risk was2% and 11.9% (p=o.001).The actual BMD in femur and T-score in the alcoholic were lower, no major differences were found in the lumbar spine. Bone density in lumbar and femur increased after 3 to 4 years of abstinence. BMD was lower in alcoholics than non-alcoholics, and the risk of osteopenia and osteoporosis was higher. Abstinence from alcohol improves bone density considerably. [11]

The BMD was calculated as an absolute value and T-score. WHO criteria were used to determine low BMD.

- Up to -1S. D Normal
- From-1S.Dto-2.5S.D Osteopenia
- Below-2.5 S.D– Osteoporosis

Out of 30 patients, 6 (20%) patients have osteopenia, 16 (53.3%) patients have osteoporosis, and 8 (26.6%) patients have normal BMD.

In above study shows that the alcoholic male patients have low bone density and have a higher risk of fracture and the non-alcoholic patients have slightly higher BMD than the alcoholic patients 16 patients have osteoporosis, and 6 patients have osteopenia. Heavy alcohol intake may decrease the BMD. Light intake of alcohol may increase bone health. [5]

Conclusion-
This study concluded that alcohol intake may decrease the BMD. This study showed the decreased bone mineral density in patient with alcohol intake. The BMD of the alcoholic patients was lower than the BMD of the non-alcoholic patients. From the present study it can be concluded that regular heavy consumption of alcohol decreases BMD. It was found that the alcoholic patients tend to have lower BMD as compare to non- alcoholic patient. Using T-score according to WHO categorization, DEXA was scan was done to calculate BMD.

The mean BMD of alcoholic patients was 0.739 g/cm2 and the mean BMD of non-alcoholic patients was 0.908 g/cm2.The lowest and highest Z-score respectively of alcoholic patients was (-3.7) and (-1.5), lowest and highest Z-score respectively of non-alcoholic patients was (-2.9) and (0). The lowest and highest T-score respectively of alcoholic patients was (-4.4) and (-1.9), lowest and highest T-score respectively of non-alcoholic patients was (-4) and (-0.4).

Non-alcoholic patients have higher mean BMD than the alcoholic patients. Low BMD can leads to higher risks of fracture as the study shows among 12 alcoholic patients 11 patients have osteoporosis and have lower T-score. Total 30 patients above 50 years of age were selected for the study as age can also be also a factor that plays an

important in defining the Body Mineral Density. Among 30 patients, 16 patients have osteoporosis, 6 patients have osteopenia and 08 patients were normal. The patients having osteoporosis were mostly alcoholic. Hence the above study shows that regular consumption of alcohol contributes to lower BMD which in turn increases risk of fracture and osteoporosis. DEXA is a simple and effective way to diagnose low bone mass using the WHO T-score classification.

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