

Determination of calcium and Vitamin D Levels and Relationships of Osteoporosis in Adults and Older age –Libya

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Abstract: Vitamin D plays an important role in bone metabolism and maintaining bone health.

Recently, new evidence has revealed that vitamin D affects chronic diseases such as osteoporosis. Autoimmune diseases, cardiovascular diseases and certain cancers. The aim of this study was to evaluate the vitamin D status and the prevalence of vitamin D deficiency

Method: Three sample study included men and women and older. And 95 specimens with age range from 20 - 70 years. Serum 25(OH)D level was measured by ichromax II. Whili Blood samples from age and sex groups differential were obtained from various laboratories. Bone fracture samples. Collected Department of Fractures inside Central Teaching Hospital. Ajdabia-libya.

Results : The prevalence of vitamin D deficiency [25(OH)D < 20 ng/mL] was 24.1% and 28.7% in men and women, respectively. The prevalence of vitamin D deficiency increased with age in men, but not in women and it decreased. These results suggest that sun exposure, intake of vitamin D supplement, and regular physical activities. A relatively calcium was results near sometimes Ranging from 8.2% to 8.9% in men and women respectively . while was lower Ranging from 6.5% in men ,7.4% in women sometimes respectively. The arm fractures in males were less than that of women 32% for males and 43% for women, while fractures of the ankle in men were more, as well as fractures in the foot higher up to 39%, 42% of the patients,

Conclusion: In study. There were recommendations from the study to give information about calcium and vitamin D and make them aware of its importance. Also, patients with osteoporosis and at risk of vitamin D deficiency should stop taking blood for them once the disease is diagnosed with osteoporosis. Patients should be educated and examined to prevent vitamin D deficiency as well as osteoporosis, treat them with an appropriate dose of vitamin D and re-examine them with a blood test after three months of treatment..

Key word; Vitamin D , osteoporosis , fractures , ichromax II

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I. Introduction

Osteoporosis was defined as a “skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture Bone strength is characterized by both bone density and bone quality. Which also includes bone architecture, turnover, micro fractures, and mineralization.

Osteoarthritis is a bone disease, a term called abnormal deficiency Clear in bone density (i.e the amount of organic and inorganic bone) and its quality changes with progression Age Although it is widely believed that this disease affects mainly women, it is fragile Bones can also affect men. In addition to people with osteoporosis, there are many Also suffer from low bone density .

Osteoporosis affects more than 80 percent of them are women. The disease leads to loss of bone mass, causing bone weakness and fracture (fracture). It is often called a "silent thief" or "silent disease" because many women do not know that they are infected until the bones break. One in four women will develop osteoporosis in her life. Women have a higher risk of hip fracture associated with osteoporosis than breast and uterine cancer combined. Fractures related to osteoporosis occur for one in two women and one in four men over the age of 50.

Osteoporosis is a disease involving the bones. Bones are a support tissue of the body that are highly specialized. Bones provide structural support, protect vital organs, provide an environment for bone marrow, and act as a mineral reservoir for calcium. Bones are composed of osteoblasts and osteocytes (support cells), osteoclasts (remodeling cells), osteoid cells that are composed of a no mineral collagen matrix and no collagenous proteins, and inorganic mineral salts, such as calcium, that are found within the matrix.

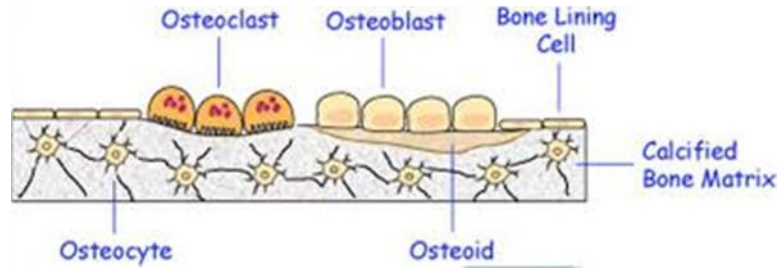


Figure1: Basic Bone biology

II. Bones shape in osteoporosis .

Osteoporosis is a bone disease which characterized by low bone mass as result of body loses too much bone and makes too little bone. This leads to increased bone fragility so increased susceptibility to fracture, especially in the hip, spine, wrist and shoulder. Osteoporosis means “porous bone.” Healthy bone looks like a honeycomb. Once osteoporosis happens, the holes and spaces in the honeycomb are much larger than in healthy bone. Though bones in osteoporosis have lost density, weaken and are more expected to break. see Figure 2: Bones shape in osteoporosis as compare to healthy case.

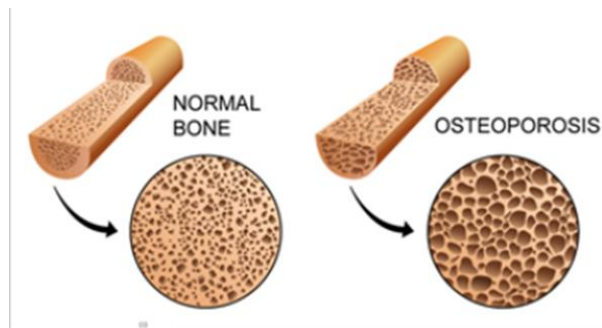


Figure 2: Bones shape in osteoporosis as compare to healthy case

Figure3 :Bone Mass versus Age

Calcium. Bone is composed primarily of calcium and phosphate, therefore calcium is important for achieving peak bone mass and maintaining that bone for the remainder of life (45), (46).Estimates of calcium intake necessary to prevent a negative calcium balance have been set from 550 mg per day (47).

Calcium ions on the surface of bone can interact with ions in body fluids and act like a large ion exchanger. These properties are important in relation to the role of bone as a reserve of calcium to help maintain a constant concentration of blood calcium (50).

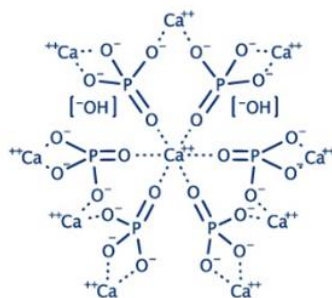


Figure 3: Structure of calcium in the skeleton- calcium phosphate (hydroxyapatite).

Table1. Calcium Dietary Intake Recommendations. Source: (52).

Age Group	RDA (mg)	Upper Intake (mg)
Infants 0-6 months	200	1000
Infants 6-12 months	260	1500
Children 1-3 years	700	2500
Children 4-8 years	1000	2500
Children 9-18 years (includes pregnant or lactating women)	1300	3000
Adults 19-50 years (includes pregnant or lactating women)	1000	2500

Vitamin D is a group of fat-soluble secosteroids responsible for increasing intestinal absorption of calcium, magnesium, and phosphate, and multiple other biological effects (12). In humans, the most important compounds in this group are vitamin D3 (also known as cholecalciferol) and vitamin D2 (ergocalciferol)



Figure 4: vitamin D2 (ergocalciferol) I & vitamin D3 (cholecalciferol) II

Table2: Vitamin D Dietary Intake Recommendations

Age Group	RDA (mg)	Upper Intake (mg)
Infants 0-6 months	200	1000
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III. Materials & Method

3.1 Collection of Sample.

Three sample size study of 95 specimens with age range from 20 - 70 years and belonging to both genders was conducted on “serum calcium and vitamin D . Blood samples from age and sex groups differential were obtained from various laboratories in the Ajdabia regional. It was analyzed to find the vitamin D and calcium concentrations by using analysers. the study was carried out from oct to Dec 2019. Bone fracture samples. Collected on a field visit to the Department of Fractures inside. Central Teaching Hospital, Ajdabiya.

3.2 Preparation of Sample (vitamin D) .

Serum specimens may be collected by using regular red-top or serum-separator Vacuainers. Add 50,30 µL sample (Human/serum) using transport pipetting sample mixing tube containing releasing buffer mix well by pipette. Insert the sample mixing tube into tube block at 35°c for 5min. added 100µl of detection buffer using transport pipette to the sample mixing tub containing releasing buffer and inserting tube block again at 35c° for 5 min .Take out 75µL using pipette and lode the sample mixture on test cartridge. Finally, Insert the test cartridge in chrome devise.

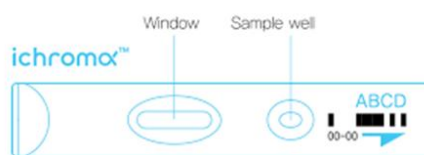


Fig5: Test cartridge



Figure6 : detection buffer & releasing buffer



Figure7 : plastic serum blood tube

3.3 Instrument.

3.3.1 Ichroma II

IchromaII is an automatic or semiautomatic in-vitro diagnostic device that measures the concentration of analytes, contained in blood, urine, or other samples, in quantitative or semi-quantitative ways. Boditech Med Inc. from South Korea. show was use instrument IchromaII analyzer and Chamber Incubator.



Figure8: show was use Instrument Ichroma II analyser

3.3.2 cobas Integra400

The blood chemistry analyzer "cobas Integra400" analyzes sugar, turkey sugar, kidney function analysis, liver function analysis, complete blood lipid analysis, calcium analysis, blood salts analysis, blood drug level analysis, drug detection and abuse analysis.



Figure9: cobas Integra400" analyses

IV. Results and Discussion

4.1 Vitamin D

Figure 1 show The percentage of 25(OH)Vitamin D values (<20nmol/L, 28.7nmol/L). Participants age ranged from 20 to 65 years. The prevalence rates of prevalence by age ranged from (18.3% to 24.1%) in males and (19.11% to 28.7%) in females (Figure .1). In both sexes, the prevalence was high between 20.29 years old. The percentage was 25(OH)Vitamin D (24.1%) for male and (28.7 %) for female at 20-29 years.

The vitamin D deficiency was low found in the age group >30 and >40 years. insufficiency (22.04%, 19.11%) for female, respectively. While was high as age advanced with highest frequency of vitamin D deficiency was found in the age group >50 and >60 years. and sufficiency (26.35%), (24.27%) for female.

In male, The 25-(OH) Vitamin D deficiency insufficiency increased with advance age until the age of 50 to 69 years. In male, (14.3%,18.3%) respectively while at age 30 to40 was upward (20.8%,22.5). Risk of inadequacy among females remained constant until age > 30 years.(28%). and male remained until age> 60 years.(24.27%).

Table 3. Serum 25OHD (nmol/L) percentile and age group .

Age Group	Serum 25OHD (nmol/L) percentile					
	Male			Female		
20-29	25.6	25.3	21.4	21	28.9	35.8
30-39	27.4	20.1	15.1	16.6	19.1	30.3
40-49	27.3	21.2	19.1	21.3	20	15.6
50-59	16.3	23.06	15.1	31	30	16.7
60-69	14.2	15.4	13.4	20.18	30.5	22

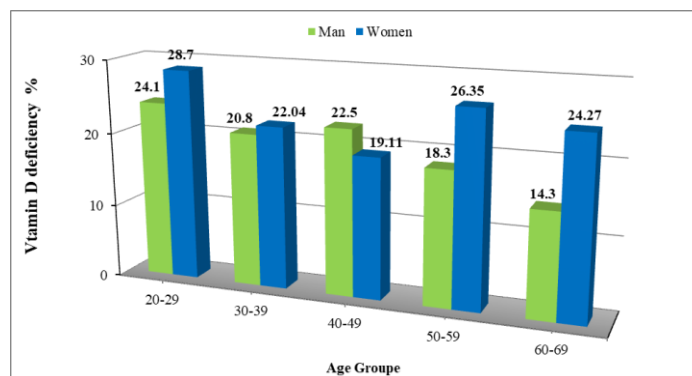


Figure 1: The prevalence of serum 25-hydroxy vitamin D of deficiency, by age and sex.

4.2 Calcium Analysis

Figure 2 the calcium deficiency shows that abnormality in serum calcium increases with age. This confirms the fact that elderly people experience loss of bone mass (osteoporosis) which intern affects the serum calcium level. Bone mineral content increases throughout childhood, peaks in adolescence , remains relatively constant in early/late adulthood , and declines in old age.

In female, calcium deficiency was at age 60 to 50 years. sufficient (8.1%, 8.9%). Whereas was as (7.8%) in the age group 40. and was high in the early age group for females at 20 to 30years with ratios (% 8.2 to 8.4%). The calcium deficiency.

The calcium deficiency was at the age of 60 to 50 years. Sufficient (8.1%, 8.9%). Whereas (7.8%) was in the 40 years. It was elevated in the early age group of females at the ages of 20 to 30 years (8.2% to 8.4%).

The percentage of calcium in male was high in the early age group to29, 20 years., (8.5%). After that, the percentage of calcium did not change at the age group 30 years., (3.8%). While was low as age advanced with highest frequency of calcium deficiency was found in the age group >50 years. and s>60 years. and insufficiency (7.8%), (6.5%) for male .respectively.

Table4. Serum calcium (nmol/L) percentile and age group.

. Serum calcium (nmol/L) percentile and age group.						
Age Group	Male			Female		
20-29	7.7	9.1	7.9	8.6	8.0	8.9
30-39	7.8	7.5	9.6	8.1	8.1	9.0
40-49	9.2	6.6	6.0	7.5	10	5.9
50-59	6.3	7.5	9.5	9.7	7.0	7.6
60-69	6.2	7.1	6	8.9	8.9	9.1

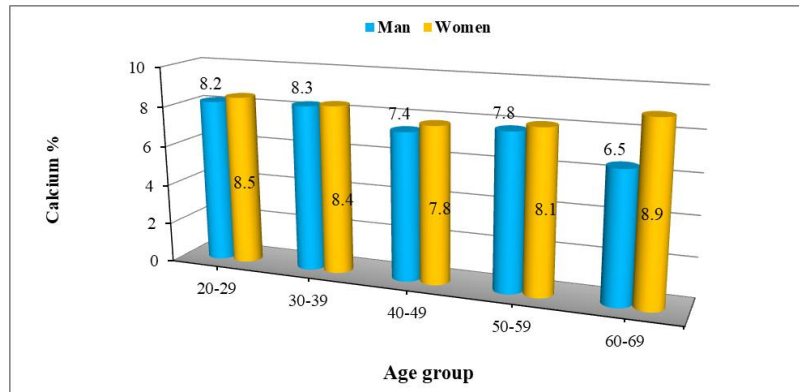


Figure 2. Bar chart showing the distribution of serum calcium by age and sex.

4.3 Bone Fractures

For male patients aged > 20 years , Ankle fractures were much more common than arm and foot fractures. Ankle fracture was slightly more common (42%) than foot fracture (39%) but arm fracture (32%) was low common than fractures as other.

A relatively higher rate of arm fractures was observed in the female (43%). As compared to the foot fractures were low (22%) . Ankle fractures accounted for (37%) and as were low for female as compared for male (47%).

The overall rate of fracture was higher in male ankle and foot than in women because of the nature of their daily activities . This is particularly true in the due to the traditional role of men as the breadwinners and women as housewives. However, this difference was obvious among both sex in arm fractures for female (43%) . while as were (32%) for male.

Table5. show no, of patients and location fractures.

Location of fracture	No. of patients		Sum. of patients
	Male	Female	M+F
arm	32	43	75
foot	39	22	61
Ankle	42	37	79

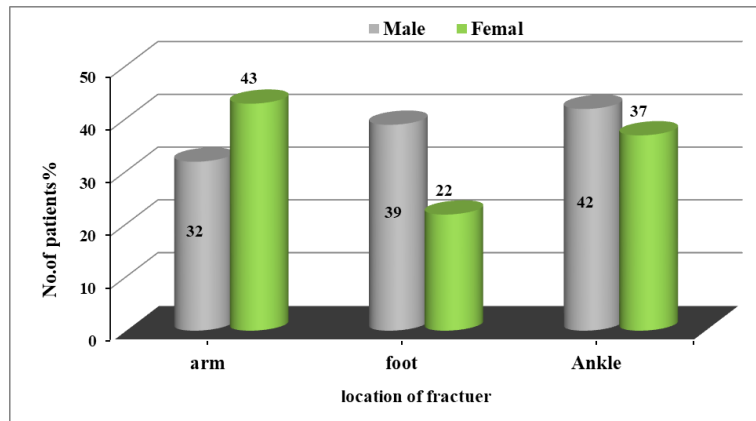


Figure3. shows the distribution of fractures locations in both male and female for No. of patients.

V. Conclusions

The analysis revealed that test scores. The vitamin D deficiency was low found in the age group >30 and >40 years. Insufficiency (22.04%, 19.11%) for female, respectively, while was relatively higher at age 30 to 40 was upward (20.8%,22.5) for male. But in both sexual increased with advance age until the age.

The calcium at the age of 60 to 50 years was low in both sexual where was 7.8%,6.5% respectively whenever advances was in age. The percentage of calcium in the age early group was high relatively 20 to 39 years.

The different in the location of the fracture, where the fractures of the arm in male was lower than that of women. 43 for male and 32 for women, whereas fractures in the ankle in men were more, as well as fractures in the foot higher up to 42, 39 of patients , and this is due to the normal of the work of the male and the responsibility in life.

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