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Risk Factors of Osteoporosis

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***Keywords*:**

DXA: Dual energy x-ray absorbtiometry.

BMD: bone mineral density.

BMI: body mass index

A R T I C L E I N F O

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ABSTRACT

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Background: Osteoporosis is a disease of bones that leads to an increased risk of fracture. It is characterized by bone thinning and decreased bone density, it occurs mainly in women and elderly people.

Aim: This study was carried out to assess the most common risk factors of osteoporosis in Mosul city.

Material & Methods:
To achieve the aim of the present study a case-control design was adopted. Data collection was carried out during the period from the first of June to the first of December 2013. The study subjects were 166 persons from both sexes and different age groups; 108 healthy person(control group) and 58 osteoporotic cases diagnosed by DEXA. A special questionnaire form was prepared for collecting data from both cases and controls.

Results:
The present study showed a significant association between age, sedentary life, and early menopause with osteoporosis.
Also some drugs (contraceptive pills, thyroxin, steroids, proton pump inhibitors, cytotoxics, B. blockers and & metformin and some diseases (DM,CVD,RA), these drugs and diseases exhibited high odd ratios but without significant association.

Conclusion:
The present study concluded that there is a significant association of age, sedentary life, and early menopause with osteoporosis, in addition to some drugs and diseases.

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Introduction:

Osteoporosis is a disease of bones that leads to an increased risk of fracture. In osteoporosis the bone mineral density (BMD) is reduced, bone microarchitecture deteriorates, and the amount and variety of proteins in bone is altered. Osteoporosis is defined by the World Health Organization (WHO) as a bone mineral density that is 2.5 standard deviations or more below the mean peak bone mass (average of young, healthy adults) as measured by DXA; the term "established osteoporosis" includes the presence of a fragility fracture. The disease may be classified as primary type 1, primary type 2, or secondary. The form of osteoporosis most common in women after menopause is referred to as primary type 1 or postmenopausal osteoporosis. Primary type 2 osteoporosis or senile osteoporosis occurs after age 75 and is seen in both females and males at a ratio of 2:1. Finally, secondary osteoporosis may arise at any age and affect men and women equally. This form of osteoporosis results from chronic predisposing medical problems or disease, or prolonged use of medications such as glucocorticoids[1,2].

Osteoporosis risks can be reduced with lifestyle changes and sometimes medication; in people with osteoporosis, treatment may involve both. Lifestyle change including diet and exercise, and preventing falls. Medication includes calcium, vitamin D, bisphosphonates and several others. Fall-prevention advice includes exercise to tone deambulatory muscles, proprioception-improvement exercises; equilibrium therapies may be included. Exercise with its anabolic effect, may at the same time stop or reverse osteoporosis[3,4].

Signs and symptoms:

Osteoporosis itself has no specific symptoms; its main consequence is the increased risk of bone fractures. Osteoporotic fractures are those that occur in situations where healthy people would not normally break a bone; they are therefore regarded as

fragility fractures. Typical fragility fractures occur in the vertebral column, rib, hip and wrist[5].

Risk factors:

Risk factors for osteoporosis can be split between non-modifiable and (potentially) modifiable. In addition, there are specific diseases and disorders in which osteoporosis is a recognized complication. Medication use is theoretically modifiable, although in many cases the use of medication that increases osteoporosis risk is unavoidable[6,7].

Diagnosis:

The diagnosis of osteoporosis can be made using conventional radiography and by measuring the bone mineral density (BMD).The most popular method of measuring BMD is dual energy x-ray absorptiometry (DXA or DEXA). In addition to the detection of abnormal BMD, the diagnosis of osteoporosis requires investigations into potentially modifiable underlying causes; this may be done with blood tests. Depending on the likelihood of an underlying problem, investigations for cancer with metastasis to the bone, multiple myeloma, Cushing's disease and other above-mentioned causes may be performed[8].

Treatment:

There are several medications used to treat osteoporosis, depending on gender. Medications themselves can be classified as antiresorptive or bone anabolic agents. Antiresorptive agents work primarily by reducing bone resorption, while bone anabolic agents build bone rather than inhibit resorption. Lifestyle changes are an important aspect of treatment. A major problem is gaining long-term adherence to therapy from patients with osteoporosis. Fifty percent of patients do not take their medications and most discontinue within 1 year[9].

Aim and specific objectives

The aim of the present study was to determine the risk factors which are responsible for the development of osteoporosis in Mosul city.

Patients and method

A case –control study was conducted

through the period from the first of June to the first of December 2013 at Ibn – Sina and Al-salam general hospitals in Mosul city. The study population consisted of two groups: cases and controls

Case definition: this group included adults from both sexes, attending the outpatient department at Ibn –Sina or Al-salam general hospitals and had been diagnosed by a specialist to have osteoporosis ,depending on DEXA scan result.

Control definition: This include healthy adult at the same age range, from both sexes ,and recruited from the same setting when they are attending the outpatient department.

During the study period 58 cases and 108 controls were collected. A randomize sample technique were used for study purposes.

Statistical analysis of data were carried out using the odd ratio (OR) & Chi square test (to calculate the P value).

OR = 1 : The exposure is not related to the disease

OR > 1 : The exposure is positively related to the disease

OR < 1 : The exposure is negatively related to the disease or protective

P value > 0.05 : not significant

P value < 0.05 : significant

Results

Table (1) shows the demographic determinants of the study population. About 43% of cases were above 65 years of age, & about 10% of cases were below 44 years of age. In contrast, only 9% of the control group were above 65 years of age, & about 26% were younger than 44 years.

Only those older than 65 years exhibited a significant causal association with osteoporosis (OR = 7.42, P value < 0.005). Those younger than 44 years of age showed a low OR(0.33) but with a statistically significant association (P value < 0.05).

According to sex, most of the study population were females (about 90% for cases & 89% for controls). Both sexes exhibited neither significant nor causal association with osteoporosis.

Table (1): Age & sex distribution of the study population& their association with osteoporosis

Age (years)	Cases		Control		OR	P value*
	No.	%	No.	%		
≤ 44	6	10.4	28	25.9	0.33	< 0.05
45 – 45	12	20.7	40	37	0.44	> 0.05
55 – 64	15	25.9	30	27.8	0.91	> 0.05
65 +	25	43.1	10	9.3	7.42	< 0.005
Total	58	100	108	100		
Sex	Cases		Control		OR	P value*
	No.	%	No.	%		
Male	6	10.4	12	11.1	0.92	> 0.05
Female	52	89.6	96	88.9	1.08	> 0.05
Total	58	100	108	100		

***X^2 test was used**

Table (2) shows nearly equal distribution of life style modes among cases, while about 69% of controls had an active life style & 31% had a sedentary life style. Active life style exhibited a low OR (0.4), and the association was statistically significant (P value < 0.05). Sedentary life style showed a good OR (2.5) & a significant association (P value < 0.05). BMI showed no significant association with osteoporosis (P value < 0.05).

Table (2): Association of life style & BMI with osteoporosis

Life style	Cases		Control		OR	P value*
	No.	%	No.	%		
Active	27	46.5	74	68.5	0.4	< 0.05
Sedentary	31	53.5	34	31.5	2.5	< 0.05
Total	58	100	108	100		
BMI	Cases		Control		OR	P value*
	No.	%	No.	%		
≥ 30	27	46.5	54	50	0.87	> 0.05
< 30	31	53.5	54	50	1.15	> 0.05
Total	58	100	108	100		

***X^2 test was used**

Table (3) shows only 17% of cases & 7% of controls were smokers. There was no significant association between smoking & osteoporosis.

Regarding calcium intake, more than half of the cases & controls were having good calcium intake, but the association of calcium intake with osteoporosis was not significant.

Table (3): Association of smoking & calcium intake with osteoporosis

Smoking	Cases		Control		OR	P value*
	No.	%	No.	%		
Smoker	10	17.2	8	7.4	2.6	> 0.05
Non-smoker	48	82.8	100	92.6	0.38	> 0.05
Total	58	100	108	100		
Ca intake	Cases		Control		OR	P value*
	No.	%	No.	%		
Good	35	60.3	64	59.3	1.05	> 0.05
Low	23	39.7	44	40.7	0.96	> 0.05
Total	58	100	108	100		

X^2 test was used

Table (4) shows that some drugs exhibitd a good OR (C.C pills, thyroxin, steroids, PPI, cytotoxics, beta blockers, & metformin), but all the studied medications showed no significant association with osteoporosis.

Table (4): association of some drugs with osteoporosis

Drugs	Cases		Control		OR	Pvalue*
	No.	%	No.	%		
C.C pills	8	13.8	14	12.9	1.65	>0.05
Tegretol	1	1.7	2	1.8	0.93	>0.05
Thyroxin	2	3.4	2	1.8	1.9	>0.05
Cytotoxics	4	6.9	4	3.7	1.93	>0.05
Corticosteroids	8	13.8	8	7.4	2	>0.05
Heparin	-	-	2	1.8	-	-
PPI	6	10.4	6	5.6	1.96	>0.05
Aluminum antacids	1	1.7	2	1.8	0.93	>0.05
GnRH	-	-	2	1.8	-	-
Antidepressants	1	1.7	-	-	-	-
B-blockers	3	5.2	4	3.7	1.42	>0.05
Aspirin	3	5.2	-	-	-	>0.05
Diuretics	1	1.7	-	-	-	>0.05
Enalapril	2	3.4	4	3.7	0.93	>0.05
Daonil	4	6.9	10	9.3	0.73	>0.05
Metformin	3	5.2	2	1.8	2.9	>0.05

*X^2 test was used

Table (5) shows that some diseases exhibited high OR (diabetes mellitus, hypertension, CVD, rheumatoid arthritis), but all the studied diseases & conditions showed no significant association with osteoporosis.

Table (5): Association of some diseases with osteoporosis

Disease	Cases		Control		OR	P value*
	No.	%	No.	%		
Coeliac disease	1	1.7	-	-	-	-

Diabetes	**7**	**12.1**	**10**	**9.3**	**1.35**	**> 0.05**
Hypertension	**9**	**15.5**	**12**	**11.1**	**1.47**	**> 0.05**
Hyperthyroidism	**2**	**3.4**	**-**	**-**	**-**	**-**
CVD	**3**	**5.2**	**2**	**1.8**	**2.9**	**> 0.05**
Rheumatoid arthritis	**2**	**3.4**	**2**	**1.8**	**1.9**	**> 0.05**
Asthma	**3**	**5.2**	**-**	**-**	**-**	**-**
Malabsorption	**1**	**1.7**	**-**	**-**	**-**	**-**
Hyperparathyroidism	**1**	**1.7**	**-**	**-**	**-**	**-**
Hypothyroidism	**1**	**1.7**	**-**	**-**	**-**	**-**

X^2 test was used*

Table (6): regarding age of menopause, about 55% of cases & 42% of controls had their menopause before the age of 51 years. Early menopause (< 51 years of age) had a high OR (2.24) & a significant causal association with osteoporosis (P value < 0.05).

Women who had more than 5 breast fed babies constituted about 50% of cases & 29% of controls, this has resulted in a good OR (2.43) with statistically significant association with osteoporosis (P value < 0.05).

Regarding the number of pregnancies & cesarean sections there was no significant association with osteoporosis (P value > 0.05).

Table (6): Association of some female characteristics with osteoporosis

Age of menopause	**Cases**		**Control**		**OR**	**P value***
	No.	**%**	**No.**	**%**		
≥ 51 years	**11**	**21.1**	**20**	**20.8**	**1.02**	**> 0.05**
< 51 years	**32**	**55.2**	**40**	**41.7**	**2.24**	**< 0.05**
Total	**43**	**76.3**	**60**	**62.5**		
Number of	**Cases**		**Control**		**OR**	**P value***

pregnancies	No.	%	No.	%		
0	5	9.6	14	14.6	0.62	> 0.05
1	-	-	-	-	-	-
≥ 2	47	90.4	82	85.4	1.6	> 0.05
Total	52	100	96	100		
Cesarean sections	Cases No.	%	Control No.	%	OR	P value*
Present	14	26.9	32	33.3	0.74	> 0.05
Absent	38	73.1	64	66.7	1.36	> 0.05
Total	52	100	96	100		
No. of breast fed babies	Cases No.	%	Control No.	%	OR	P value*
0	7	13.5	18	18.7	0.67	> 0.05
≤ 5	19	36.5	50	52.1	0.53	> 0.05
> 5	26	50	28	29.2	2.43	< 0.05
Total	52	100	96	100		

X^2 test was used*

Discussion

Osteoporosis is defined by the WHO as a bone mineral density that is 2.5 SD or more below the mean peak bone mass (average of young healthy adults) as measured by DEXA. The most important risk factor for osteoporosis is advanced age(in both men and women); estrogen deficiency following menopause or oopherectomy is correlated with a rapid reduction in bone mineral density, while in men a decrease in testosterone levels has a comparable (but less pronounced)

effect. Our study revealed a significant association of advanced age with osteoporosis, where about 43% of cases are above 65 years of age, and only 9% of control group are above 65 years of age[1,10].

Across section study was conducted in an obstetrics, gynecology setting during March- April 2007 in quetta, Pakistan, factors, that where significantly assonated with osteoporosis included age, parity, B.M.I, smoking (pack years) consumption of Calcium rich food/ week, education, socio economic status [11].

In a case control study bone mineral density high in Indian premenopausal women compared to post menopausal women, p value less than 0.01[12].

Also our study revealed the sedentary life style has a significant causal association with osteoporosis, while B.M.I showed no causal association with osteoporosis. In general Immobilization cause bone loss (following the use it or loss it rule) for example localized osteoporosis can occur after prolonged immobilization of fractured limb in cast[13].

Also the present study revealed only 17% of cases and 7% controls were smokers, although high OR (2.6) there's no significant association (P value more than 0.05) . And also revealed no association of calcium intake with osteoporosis.

In comparison, many studies in the world had a relationship between smoking and decrease bone density but the mechanism was not clear[14]. And there is unclear role of calcium in preventing and treating osteoporosis [10].

In comparison, a study in Korea showed that socioeconomic and dietary habits were more likely to prevent osteoporosis than reproductive life style [13].

Our study showed that some drugs exhibited good OR such as C.C pills, thyroxin, steroid, proton pump inhibitors, cytotoxic, beta blockers, metformin but all of them showed no significant causal association. Many studies in the world showed association of drugs with osteoporosis such as steroid because of using glucocorticoids

analogous to cushing induce bone loss [7]. L.thyroxin like thyrotoxicosis can induce bone loss [9]. Proton pump inhibitors which prevent production of gastric acid might interfere with calcium absorption. Also our study revealed high OR without significancy with some diseases (diabetes mellitus, Hyper tension & CVD & Rheumatoid arthritis). In other studies patients with rheumatoid arthritis were at high risk of osteoporosis, either because of the disease itself or due to other causes (e.g. corticoid drugs) [9-15].

Another study in Toronto-Canada revealed a markedly hyper incidence of osteoporosis was found in the diabetic subjects under 65 years of age than in the controls, whereas no difference was observed in the older age group[16].

In our study regarding age of menopause, early menopause (less than 51 years of age) had a significant causal association with osteoporosis and those women who had more than 5 breast fed babies has a significant association with osteoporosis.

Conclusions

The present study concluded that there's significant causal association of age, sedentary life, and early menopause with osteoporosis.

Also some drugs (contraceptive pills, thyroxin, steroids, proton pump inhibitors, cytotoxics, B. blockers and & metformin) and some diseases (DM,CVD,RA), these drugs and diseases exhibit high odds ratio but without significant association.

Recommendation

Further studies are needed to prove the association or not of some drugs such as B-blockers & metformin and some diseases as cardio vascular diseases with osteoporosis.

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