ORIGINAL ARTICLE

GENDER AND AGE SPECIFIED PREVALENCE OF OSTEOPOROSIS AND OSTEOPENIA IN AN APPARENTLY HEALTHY PAKISTANI POPULATION

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ABSTRACT

Objective: It is a crucial to understand the pattern of Bone Mineral Density (BMD) in a population to prevent and manage the complication of osteoporosis along with diagnosis. The purpose of the study is to evaluate the factors causing osteoporosis in an apparently healthy population and examine the bone health status.

Methodology: A retrospective study was performed by examining the medical records in a Muneefa cardiac and general clinic for those subjects who had done with BMD measurements for preventive health checks-up. The BMD was measured by using a Sonost 3000(Ultrasound Bone Densiometer) from Osteosys CO. Ltd. Korea.

Results: About 161 subjects of aged 50.0±12.4 years (range: 20–70 years) were assessed, which included 93 male subjects which is 57.7% and 68 female subjects which is 42.23%. The evaluation of data revealed that 13.26% of the subjects fall under the category of Osteoporosis, in which 17.64% were female and 10.75% were male, while 22.98% subjects fall under the category of osteopenia in which 30.88% were female and 17.20% were male. Prevalence ratio of osteoporosis is higher in female subjects than male. According to the category of age - groups (20–29, 30–39, 40–49, 50–59, 60–69, and =70 years) in males osteoporosis rate were 30, 20, 20, 10, 10, and 10 percent respectively, while prevalence in females were8.33, 16.66, 8.33, 25, 25, and 16.66 percent respectively, at peripheral (radius) bone. Body mass index, and lifestyle including (smoking, physical activity, and diet) were correlated with BMD. In elderly patients' osteoporosis and osteopenia are common conditions that can seriously affect their quality of life.

Conclusion: Further prospective studies are required to elucidate the comparative importance of nutritional status, level of activity, medication usage, and other factors in the pathways that correlate age and gender specified illnesses to BMD.

Keywords: Bone mineral density, osteopenia, osteoporosis, body mass index, nutritional status

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INTRODUCTION

National Institute of Health has rendered Osteoporosis for the risk of fracture at high rate due to reduce strength of bone [1]. Bone mineral density >2.5 standard deviation (SD) is labeled asosteoporosis by the World Health Organization (WHO) [2]. Osteoporosis is a systemic skeletal

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disease which affects the bone density inducing weak boneby loss of its strength[3]. Among the older population, it considers as a crucial health problem which compromising the quality of life [3].

Early detection of osteoporosis is a key component of preventive measures which reduces the risk of bones fracture[4].

Osteoporosis is also considering as a silent disease which loss the structure of bone without showing any sign and symptoms[4].Each of Every 4 women and 8 men in their whole life are affected by osteoporosis[4]. As compared to male Females are more likely to experience Osteoporosis[4]. According to the data collection of WHO, worldwide about 9 million fractures occur yearly[1]. A recent Statistics revealed that, by the year 2050 osteoporosis would undoubtedly become a major factor which causes the fracture so that the rate and cost of fractures may increase by 50%, meanwhile greater than 87% for people aged 65-74 years [2]. In 2000, about 9 million fractures occurred, among them mostly fractures were caused by osteoporosis [5]. According to the statistics of 2017, worldwide the ratio of osteoporosis id around 75 million people[6].

At the age of menopause about 58.1% of females suffer from osteoporosis [1]. In Europe as per WHO, around 75 million people are affected by Osteoporosis [1]. In Saudi Arabia a conducted study acknowledge that, over 300 children were suffering from the deficiency of vitamin D [5]. Globally a major emerging health problem which creates different health issues is hypovitaminosis [5]. Among the population of Pakistan about 9.9 million people are suffering from osteoporosis and out of which 7.2 million are females. By the end of 2020 and 2050, it is thought to be that the prevalence of osteoporosis in Pakistan may reach around 11.3 million and 12.9 million [7]. As per the study statistical evaluation was carried out for the risk factors of causing osteoporosis in Pakistan, which found that, 72% people lead an inactive lifestyle, 83% population suffering from vitamin D deficiency and the ratioof smoking is about 22%-40%[8]. In Malaysia the prevalence of osteoporosis in 2005 was reported as 24.1%, which commence the particular cause of hip fracture [6].

Osteoporotic fracture can affect the Quality and function of life due to disability and chronic pain[5]. Sometime Fractures due to Osteoporosis can become a dangerous; the most common site which can affect with the osteoporosis and can cause osteoporotic fracture is hip joint which may cause cardiovascular shock and even death[8]. Adaptable & non-adaptable risk factors are associated with primary Cause and secondary Causeof osteoporosis. Those risk factors which can adaptable include low calcium intake, low consumption of vitamin D, carbonated beverages, low body mass index (BMI), inactive lifestyle and prolong immobilization, whereas those risk factors which are non-adaptable include family history, aging and menopause[6]. Conventional clinical risk factors can even assessed risk of fracture without bone mineral density (BMD)[9]. Other than the aging the risk factors which can affect the health of children, adults, men and premenopausal women by causing osteoporosis are side effect of certain medications and lifestyle choices[1]. Decline level of estrogen in postmenopausal women also increases the risk of fracture associated with the bone loss[2].

BMD measurement is basically the evaluating tool for screening and diagnosis purpose that determined the bone strength [2]. Ultrasound Bone Densitometer technique is most frequently used to calculate the BMD. BMD can be explained by using T-scoremethod, labeled as the variance in number of standard deviations (SDs) from the mean BMD of a customarily distributed on an adult reference population, it is stated as a negative number. No more than 1 SD below this value is normal bone, and 1 to 2.5 SD below average is osteopenia [2]. BMD greater than 2.5 SD below average is severe osteoporosis[2]. BMD is basically used as a tool for assessment and diagnostic classification of osteoporosis; it should not be applicable for male under 50 years and for premenopausal women[2]. At the Age of 18 the peak bone mass can be measured which leads to minor change in entire bone mass between 30 year of age and menopause[4].

Dietary intake of calcium in an adequate amount and physical activities can prevent the occurrence ofosteoporosis[7]. A study found that osteoporosis may occur due to the 50% less intake of daily calcium as per the daily recommendation intake by WHO[7]. In the prevention of osteoporosis proper daily recommended Calcium intake which is 1300mg during the teen year and weight bearing exercises play a very important role [4]. A sound Knowledge related to the risk factors of the osteoporosis play an important role in the identification, prevention and the management of osteoporosis. As it is not only restricted to older person, it could be suspected in all age groups. In developing countries peoples have not profound awareness regarding osteoporosis, so it is necessary to provide the awareness of regarding the risk factors and prevention of osteoporosis especially among the group age of adolescent which is the age of peak bone density formation. For the diagnosis, prevention, management and complication of osteoporosis in later life, to understand the BMD pattern in a population is very crucial. On prevalence of Osteoporosis/ Osteopenia there is not enough data available in healthy Pakistani population. In apparently healthy Pakistani population we commencedstudy to evaluate theage and gender specified frequency of Osteoporosis/ Osteopenia; and the finding of study will become baseline information for further awarenessprograms to defeat the causes and occurrence of Osteoporosis/ Osteopenia among healthy population of Pakistani.

METHODOLOGY

A cross sectional investigation was conducted in which retrospective data were collected ina Muneefa cardiac and general clinic Karachi, Pakistan after requisite approvals from the concerned Doctor. In this retrospective study, requirements for informed concerned was waived off because there was no direct contact with the subject. During this study any intervention or therapy was not performed, so that the research had no risks to the subjects. Subject ID number was used to identify the subject, and the subject names and identity were remained anonymous and were not revealed in any way throughout or after this database study. Hence, subject data has been maintained confidentially. During this study the medical records was reviewed for those healthy male and female individuals, who had willingly chosen the measurements of BMD during visited the hospital for their general health check-up. The sampling was done by consecutive method to collect the data.

Data Collection:The data were recorded on the basis of sex, age(years),height (cm), weight (Kg), body mass index (BMI: Kg/m^2), history of alcohol consumption, smoking, exercise status and dietary intake (Vegetarian/non-vegetarian diet). Bone screening measurements of subjects had performed byusing a (Sonost 3000 Ultrasound Bone Densitometer) from Osteosis CO. Ltd. Korea, during general health check-ups. The BQI values and T scores of peripheral radial bone were collected.

Statistical analysis: Percentage system and mean± SEM were used to present the Data. To evaluate the association between BMD with age, sex and other parameters Percentage distribution and level of significance was calculated. By using WHO classification bone status analysis was evaluated based on T score: Normal BMD (T score = -1), Osteopenia (T score<-1 and > -2.5), and osteoporosis (T score < -2.5).

RESULTS

We studied 161 subjects (age, 50.0 ± 12.4 years, range, 20–70 years), categorized into 2 groups based on sex. Study population included 68 female (42.23%) and 93 males (57.7%). (Table 1) Baseline feature:The pattern attributes of the examination population stratified by sex are exhibited in table 1. In males, height and weight were higher than in females. In males (4.30 percent and 55.91 percent respectively) alcohol consumption and smoking were also higher as compared to females (2.94 percent and 8.80 percent respectively). Women reported 39.70% of physical activity which was comparatively higher than males that is 34.40%.Non-vegetarian dietary intakes werefound to be 75% in females and 3.11%in males, indicating that non-vegetarian diet was higher in females. Vegetarian diet found to bemuch higher in male which was

68.81% ascompared to females which was 25%. *Bone Mineral Density Status:*Level of BMD status in table 2 demonstrates the consequences of BMD estimations and the extent of subjects who had osteoporosis, osteopenia, and normal BMD at radial side in absolute populace.

Table 1: Baseline Characteristics of Study Participants

Variable	Total population		Females		Males		P-value
Demographic characteristics							
Age,Y	50.0 ± 13.6		49.2 ± 12.2		50.8 ± 11.9		0.045
Height, cm	170 ± 10		170 ± 10		160 ± 10		0.003*
Weight, Kg	76.4 ± 12.6		74.6 ± 12.1		72.2 ± 11.4		
Body Mass Index, Kg/m^2	25.3± 3.6		25.1 ± 3.6		25.5 ± 3.6		
Life style characteristics, n (%)							
Non- Smokers	103	63.97%	62	91.17%	41	44.08%	0.005*
Smokers	58	36.02%	6	8.80%	52	55.91%	
No Alcohol consumption	155	96.27%	66	97.05%	89	95.69%	<0.001*
Alcohol consumption Present	6	3.72%	2	2.94%	4	4.30%	
No Exercise	102	63.35%	41	60.29%	61	65.59%	0.002*
Exercise Present	59	35.97%	27	39.70%	32	34.40%	
Vegetarian Diet	46	28.57%	17	25%	29	3.11%	0.001*
Non-Vegetarian Diet	115	71.42%	51	75%	64	68.81%	

Values are presented as Mean ± Standard deviation or number (%)

Table 2: Percentage distribution of osteopenia and osteoporosis in total population

Condition	Total population
Normal	102 (63.35%)
Osteopenia	37 (22.98%)
Osteoporosis	22 (13.66%)

Table 3: Age wise distribution of prevalence of osteoporosis (%) and osteopenia (%) at radial site in both the sexes

Gender	Condition	Age, Years							P-value
		Total Population	20–29	30–39	40–49	50–59	60–69	70	
Female	**Normal**	35 (51.47%)	5 (14.28%)	8 (22.85%)	3 (8.57%)	8 (22.85%)	5 (14.28%)	6 (17.14%)	<0.001*
	Osteopenia	21 (30.88%)	2 (9.52%)	4 (19.04%)	2 (9.52%)	5 (23.80%)	5 (23.80%)	3 (14.28%)	
	Osteoporosis	12 (17.64%)	1 (8.33%)	2 (16.66%)	1 (8.33%)	3 (25%)	3 (25%)	2 (16.66%)	
Male	**Normal**	67 (72.04%)	9 (13.43%)	13 (19.40%)	13 (19.40%)	13 (19.40%)	8 (11.94)	11 (16.41%)	0.018*
	Osteopenia	16 (17.20%)	0 (0%)	4 (25%)	4 (25%)	2 (12.5%)	4 (25%)	2 (12.5%)	
	Osteoporosis	10 (10.75%)	3 (30%)	2 (20%)	2 (20%)	1 (10%)	1 (10%)	1 (10%)	

Values are shown as the percentage of total subjects in each age group. The total prevalence rates are also shown in table 3. * $P < 0.05$ is statistically significant

Baseline feature:The pattern attributes of the examination population stratified by sex are exhibited in table 1. In males, height and weight were higher than in females. In males (4.30 percent and 55.91 percent respectively) alcohol consumption and smoking were also higher as compared to females (2.94 percent and 8.80 percent respectively). Women reported 39.70% of physical activity which was comparatively higher than males that is 34.40%.Non-vegetarian dietary intakes werefound to be 75% in females and 3.11%in males, indicating that non-vegetarian diet was higher in females. Vegetarian diet found to bemuch higher in male which was 68.81% ascompared to females which was 25%.

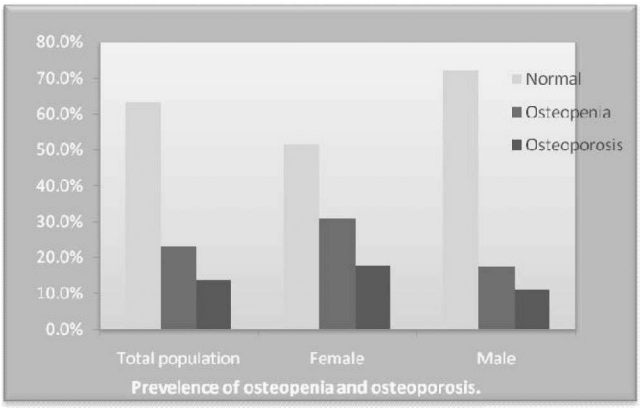

Figure 1: Percentage distribution of normal, osteopenia and osteoporosis cases by gender.

Within each bar-chart, the increasing color intensity means increased risk.

*Prevalence of Osteoporosis and Osteopenia:*In total population, table 2 shows the osteoporosis prevalence on the radial side was 13.66 percent; whereas on the similar side the osteopenia prevalence was accounted for as 22.98 percent. In females, osteopenia prevalence was 30.88 percent, while in males it was 17.20 percent. Osteoporosis prevalence was reported as 17.64 percent in females while 10.75 percent in males. *Correlation among age and BMD in both the sexes:* The participants were alienated into six age groups: 20–29, 30–39, 40–49, 50–59, 60–69, and =70 years. At radial side,the osteoporosis prevalence in the aforementioned distribution shows that osteoporosisprevalence declined with age in males while there was no particular pattern of predominance of osteoporosis in females with respect to age (Figure 2a-b).

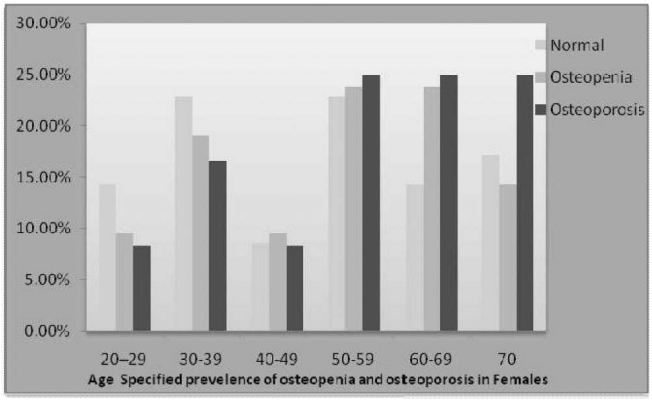

Figure 2a: Percentage distribution of femalesof normal, osteopenia, and osteoporosis cases by age groups.Within each bar-chart, the increasing color intensity means increased risk.

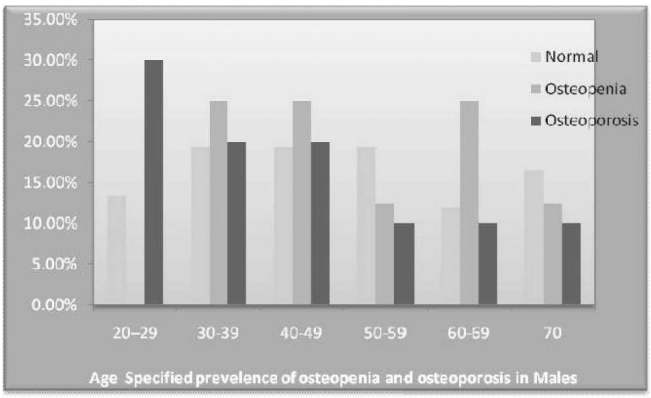

Figure 2b: Percentage distribution of males of normal, osteopenia, and osteoporosis casesby age groups**.** Within each bar-chart, the increasing color intensity means increased risk.

*Analysis of the percentage between BMD and age:*Based on percentage analysis, age in males was associated significantly and negatively with BMD on the radial side, though in females age BMD was associated significantly (p-value < 0.001) (Table 3).This remained significant after independently controlling BMI, weight and height, and life style factors for known risk factors for low BMD. (Table 3)

*Analysis of the percentage between BMD and other parameters:*Significant association with Low BMD

was seen with BMI, Weight and height. Increased BMI correlates positively with low BMD. Also on the radial side, physical activity, smoking, alcohol consumption were positively and significantly correlated with low BMD (all with P value <0.05).

DISCUSSION

Globally a major health issue which affects the millions of people is osteoporosis, osteoporosis as a disease is not only related age group of old people but also affects the all age groups. The frequencies of osteoporosis have been increasing rapidly during the past few years, because of the lack of its knowledge and awareness. For this concern, we conducted studyin males and females via multiple regression analysis along with variables that significantly associate with BMD.

Our analysis showed higher prevalence of osteoporosis and osteopenia in females than in male subject.The ratio of incidence of Osteopenia was present in 22.98% subjects whereas incidence osteoporosis was reported in 13.66% subjects, in apparently healthy urban population of Karachi, Pakistan. The study revealed almost similar prevalence of osteopenia and osteoporosis in females and males individuals with a slightly increase ration of both in female[10].

Our study also indicated that prevalence of osteoporosis declines with the increasing age in male subjects, but not in female subjects. The rate of osteoporosis in the age groups of 20–29, 30–39, 40–49, 50–59, 60–69, and =70 years were 12.5, 30, 20, 20, 10, 10, and 10 percentrespectively in male subjects, while prevalence in female subjects was 8.33, 16.66, 8.33, 25, 25, and 16.66percent respectively, at peripheral (radius) bone which diverge from another study conducted in New Delhi, India[11].

Physical activities, exercise and intake of healthy diet are the key pillars for fitness. Exercise is valuable for fitness, while physical activities can prevent the prevalence of several diseases and declines the incidence of fracture. Many studies determined that reduction in the BMD can effectively prevented by doing exercises at an early. So, it is a key factor for the individuals to encourage themselves and other ones to involve in different physical activities by changing their life style, as our study also revealed that these factors were positively and significantly associated with BMD, which is in line with widely reported literatures [12-15].

CONCLUSION

The above statistical data and study conclude that, the prevalence of osteoporosis and osteopenia are higher in femalesas compared to males in the healthy population of Pakistan. This incidence rate of osteoporosis may be due to inactive or comfortable lifestyle or low calcium diet.

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Author's Contribution:
ZA: study design manuscript writing and results analysis
FZ: data collection
RP: critical review
MH:data collection
AN:manuscript writing
MA: edited, review and approved the manuscript
SI:edited, review and approved the manuscript
UGF: data collection, review and approved the manuscript

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