ORIGINAL ARTICLE

PREVALENCE OF OSTEOPENIA AND OSTEOPOROSIS IN WOMEN USING DUAL ENERGY X-RAY ABSORPTIOMETRY SCAN

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Background: There is lack of official scientific data on prevalence osteopenia and osteoporosis for all age groups of females around the globe which keeps the health authorities from taking adequate measures to prevent the community from microfracture and reporting to the emergency department with fractures of femur neck, spine and radius. Our objective was to calculate the prevalence of osteopenia and osteoporosis in pre-menopausal and postmenopausal women of Pakistan using Dual Energy X-ray Absorptiometry (DXA) Scan. **Methodology:** This cross-sectional study was conducted at Dow University of Health Sciences, Karachi. Women aged 25–85 years were randomly selected and divided into pre-menopausal (Group I) and postmenopausal (Group II) using proformas filled from patients' history. Each group was subdivided into normal (pre A, post A), osteopenic (pre B, post B) and osteoporotic (pre C, post C) groups by DXA Scan. Number of females in each subgroup were divided by total number of females in each group and multiplied by hundred to get the point prevalence in percentage. **Results:** In pre-menopausal Group I, prevalence of osteopenia and osteoporosis was 12.9% and 43.5% respectively, while 43.5% women were normal. In postmenopausal Group II prevalence of osteopenia was 42.6% and osteoporosis was 29.2%, while 28% were normal. **Conclusion:** Osteopenia is equally prevalent in women of Pakistan irrespective of menopausal status whereas osteoporosis is found to be more prevalent in postmenopausal compared to pre-menopausal women.

Keywords: Osteopenia, Osteoporosis, DXA Scan, Pre-menopausal, Postmenopausal, Menopause

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INTRODUCTION

Prevalence of a disease is a measure of number of cases present in a given time and location which directly affects the measures taken for the prevention, cure, diagnosis, treatment and rehabilitation strategies.[1] Osteoporosis is a systemic skeletal disorder which is characterized by decrease in bone strength thereby increasing risk of fragility fractures[2] which result specifically on minimal trauma where a normal person will not break a bone leading to pain, disability and dependence on others.[3]

Osteopenia and osteoporosis being major public health problems worldwide show low bone mass and density thereby increasing morbidity and mortality rate in underdeveloped as well as developed countries.[4] Osteoporotic fractures represent a significant economic burden on not only the individuals but the healthcare system. Osteoporosis is a multi-factorial disease with modifiable and non-modifiable risk factors. Factors that are generally non-modifiable are age, sex, genetic background, and other under lying illnesses. Modifiable factors are dependent on lifestyle.[5] Though studies show low prevalence of smoking in Pakistani females, alternatives of tobacco intake are very common.[6,7] Therefore, improving mass education may significantly influence personal habits thereby reducing suffering and alleviating the economic burden on healthcare system.[5]

Data regarding screening, diagnosis and treatment of osteoporosis and fragility fractures is not only sparse in our part of the world but also in developed countries where osteoporosis is well recognized which needs more vigilant approach towards this problem.[3,8] The gold standard for diagnosis of Osteopenia and Osteoporosis is Bone Mineral Density, measured by Dual Energy X-ray Absorptiometry (DXA) scan. Its high cost limits its use for screening, diagnosis and research studies leaving a vacuum for reliable data.[3,8]

World over osteoporosis is less common in Blacks and more in Whites and Asians. Nearly 1.5 million Osteoporotic fragility fractures occur annually leading to disability or death. In population over 50 years of age, it is estimated that fractures related to osteoporosis are so common as one in every eight men and one in every two women.[9] Even though there is high prevalence of osteopenia and osteoporosis in Pakistan, not much information is available regarding the prevalence of the disease.[3] The epidemiological data is lacking owing to the paucity of official and published data. Not only this, DXA Scan machines availability only in big cities limits the facility.[3] The objective of this study was to calculate the prevalence of osteopenia and osteoporosis in pre-menopausal and postmenopausal women of Pakistan using Dual Energy X-ray Absorptiometry (DXA) Scan.

METHODOLOGY

This cross-sectional study (Project No. RF 90) was conducted at Dow University of Health Sciences Karachi Pakistan after seeking approval from Institutional Review Board and Ethical Committee. The sample size of 174 subjects was calculated by OPEN EPI sample size calculator with 5% margin of error and 95% confidence interval. Consecutive sampling technique was used. Total numbers of female subjects randomly selected were 174. Female subjects of 25–85 years age were included in the study. Patients visiting Dow Radiology, their attendants, volunteers, patients from dental and orthopaedic OPD, Ojha Campus and patients from dental OPD Patel Hospital participated in the study. Women with endocrine disorders, menorrhagia, oligomenorrhea and polymenorrhea were not included. Pregnant and lactating women, patients on oral contraceptive pills and hormone replacement therapy, people addicted to beetle nut and pan chewing were excluded from the study.

All subjects interested to participate were asked to sign a consent form and information sheet. Simultaneously, a proforma regarding subject's history was filled. Patients were divided into pre-menopausal Group I and postmenopausal Group II. Group I included 85 women while Group II included 89 women. DXA Scan was then performed on the basis of which the women were subdivided into normal (pre A, post A), osteopenic (pre B, post B) and osteoporotic (pre C, post C) groups where pre A, B, C were pre-menopausal and post A, B, C were postmenopausal. DXA Scan uses the T-Scoring system label subjects as normal, osteopenic and osteoporotic. T-Score is the comparison of bone mineral density of a subject to that of young adult reference population. T-score -2.5 or below was defined as osteoporotic, T-score -1.0 or greater was normal and T-core between -1.0 and -2.5 was considered as osteopenia according to World Health Organization.[10]

Group pre A and pre B include 37 women each while pre C included 11 subjects. Group post A included 25, post B included 38 and post C included 26 women. The number of subjects in each subgroup were divided by total number of subjects in each group and multiplied by 100 to get the point prevalence in percentage. In order to calculate the prevalence, sample was randomly selected from the entire population. The random selection method increased the chances of the sample to be representative of the population. For the prevalence to be calculated the number of people in each group were divided by the total number of people in the sample. Point prevalence was then calculated in percentage which was the proportion of a population with osteopenia and osteoporosis at a specific point in time.

RESULTS

Table-1 shows the overall prevalence of osteopenia and osteoporosis in our subjects. Total female participants of the study were 174, out of whom 62 were normal, 75 were osteopenic, and 37 were osteoporotic. Prevalence of normal bone, osteopenia and osteoporosis was found to be 35.6%, 43.1%, and 21.2% respectively.

Subjects in normal (Pre A) group being 37 in number gave a prevalence of 43.5% normal females in this group. Osteopenic (Pre B) group included 37 females and prevalence of osteopenia came out to be 43.5% in this group. Whereas prevalence of osteoporosis came out to be 12.9% as osteoporotic (Pre C) group included 11 females.

Total numbers of females included in postmenopausal Group II were 89. Females in normal (Post A) group being 25 in number gave a prevalence of 28.1% normal females in this group. Osteopenic (Post B) group included 38 women and prevalence of osteopenia was 42.7% in this group. Prevalence of osteoporosis came out to be 29.2% as osteoporotic (Pre C) group included 26 females.

Wilcoxin Signed Rank Test was applied to test the differences between the groups. In pre-menopausal group, 37 (43.5%) subjects were normal while 25 (28.1%) were normal in postmenopausal group (p<0.001). The differences between prevalence of osteopenia in pre-menopausal and postmenopausal groups were not significant (p=0.317). In osteoporotic subgroups (Pre C *vs* Post C) the differences were significant (p<0.01).

Table-1: Comparison of DXA Scan status between Pre- and postmenopausal women [n (%)]

Parameter	Pre-menopausal	Postmenopausal	Z	*p*
Normal	37 (43.5)	25 (28.1)	-3.46	<0.001*
Osteopenia	37 (43.5)	38 (42.7)	-1.0	0.317
Osteoporosis	11 (12.9)	26 (29.2)	-3.87	<0.01*
Total	85	89		

*Significant

DISCUSSION

In several parts of the world the prevalence of osteoporosis has not yet been documented primarily because of scarcely available facility for DXA Scan which is the gold standard for measuring bone mineral density (BMD).[5,6] Even in Pakistan no such data is available which can truly portray the actual prevalence of osteopenia and osteoporosis in pre-menopausal and postmenopausal women of Pakistan which can be very helpful in controlling and preventing the disease.[6]

Highlighting the significance of DXA Scan Saima *et al*, concluded that the use of quantitative heel ultrasound (QUS) in their study limits the reliability of results as it does not measures the bone mineral density accurately and just gives a rough idea about bone health.[6] QUS is a technique that is cost-effective and estimates calcaneal BMD. The patients eventually have to undergo a DXA Scan before any medical intervention.[8]

It is estimated that almost 30% of postmenopausal women in the USA and Europe[11] are found to be osteoporotic, whereas, number of people with osteoporosis is estimated to be 15 million in Asia[12]. Worldwide, about 200 million people are affected with

osteoporosis. Osteoporotic fragility fracture are seen in around 40% of women and 20% of men with osteoporosis.[13]

Despite the grave situation, both osteopenia and osteoporosis are one of the ignored public health care problems. Mass education related to these problems is also suboptimal in Pakistan. Proper knowledge of the burden of the disease through research will help policy makers and healthcare providers to design better strategies. During the past years some hospital based studies showed prevalence of osteoporosis in which heel ultra sound is used though there is shortfall of data on bone mineral density using DXA Scan.[13]

Data available from studies from Pakistan depict 5.6–17.8% cases of osteoporosis in pre-menopausal women and 20–49.3% cases of osteoporosis in postmenopausal women.[6,14–23] Another study calculated the risk estimation of osteoporosis to be 75.3% and showed that the risk increases with increasing age. It was found to be 97% in women of 75–84 years of age and 55% in women of 45–54 years of age.[24]

Data on prevalence of osteopenia and osteoporosis is lacking in Pakistan and invariably all used heel ultrasound with the exception of one study in which DXA Scan was used and another study in which the BMD testing tool was not mentioned. The available data is from Karachi, Lahore, Peshawar, Quetta, Faisalabad, and Peshawar. There is no data available from rural areas so the burden of the disease in Pakistan is underestimated.[3] As there is lack of awareness, education, and healthcare facilities in the rural areas, it is presumed that the burden of osteopenia and osteoporosis is actually much higher than it is published.

The only study comparable to ours was the one conducted by Naeem *et al*[19] using DXA Scan in the city of Karachi, Pakistan. They focused on only postmenopausal women whereas our study considered both pre-menopausal and postmenopausal women. The current study found that in postmenopausal women, osteopenia is 42.6% in comparison to 44.8% reported by Naeem *et al*[19]. Prevalence of osteoporosis in postmenopausal women was 29.2% in our study as compared to Naeem *et al* which was 28.6%. Naeem *et al* found osteopenia more and osteoporosis less prevalent compared to our study. With small differences our results are nearly the same reported by Naeem *et al*[19].

Saima *et al*[6] worked on premenopausal and postmenopausal female subjects using Quantitative Heel Scan. They found that the prevalence of osteopenia in premenopausal women was 63.8% while osteoporosis was higher (49.3%) in postmenopausal women. Our study found the same results of osteopenia being more common in pre-menopausal women and osteoporosis being more common in postmenopausal females but prevalence of osteopenia in pre-menopausal women was 43.5% while that of osteoporosis in postmenopausal females came out to be 29.2%. This comparison of Quantitative Heel Scan verses DXA Scan results showed a difference of approximately 20%. Causes of alarmingly high prevalence of osteopenia in pre-menopausal women needs to be explored through surveys and necessary investigations to elaborate upon contributing risk factors though they may be modifiable or non-modifiable like Calcium and Vitamin D levels.

No study has worked out the significance between subgroups of pre-menopausal and postmenopausal groups. Our study suggests that prevalence in osteopenia in pre- and postmenopausal groups is insignificant which directs us to conclude that osteopenia is common in female population of Pakistan irrespective of their menopausal status.

Life expectancy in Pakistan is expected to increase from 46.6 years in 1960 to 72.4 years in 2023.[25] This is expected to increase the overall burden of osteoporosis in Pakistani population. If the prevalence of osteopenia and osteoporosis continues to increase, it may cause undesirable effects on the economy of our country through expenses on health of people vulnerable to bone fractures. Socioeconomic changes have resulted in sedentary lifestyle and modified eating habits. It is high time that the policy makers develop strategies to provide a cure to younger osteopenic women in turn reducing the burden of osteoporosis in older female population.

CONCLUSION

Only 43.5% of pre-menopausal and 28.1% postmenopausal women had normal bone density. Osteopenia was observed in majority of both pre- and postmenopausal women. Osteoporosis was more common in postmenopausal as compared to premenopausal women.

LIMITATIONS OF THE STUDY

As the data was collected from only one city (Karachi), it cannot be generalized to the whole female population of Pakistan. Also men were not included in the study. More studies are needed to portray a true picture of prevalence of osteopenia and osteoporosis in Pakistan.

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AAH: Drafting of work and revising it critically
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