Assessment of Bone Mineral Density (BMD) among general population of District Khuzdar, Baluchistan Pakistan.

Lal Muhammad Kakar[1], Tariq Marri[2], Jamil Ahmed[3], Abdul Qahar Yasinzai[4], Anum Saleem[5], Sona Noor[6], Muhammad Muzzammil[7], Muheeb Khan Tareen[8], Helmand Khan Tareen.[9]

[1]Associate Professor Bolan University of Medical and Health Sciences (BUMHS) Quetta, Pakistan.
[2] Assistant professor Internal Medicine BUMHS
[3] Consultant Orthopaedic Surgeon BUMHS
[4-9] Medical students BUMHS

Authorship and contribution Declaration: Each author of this article fulfilled ALL 4 Criteria of Authorship:
1. Conception and design or acquisition of data, or analysis & interpretation of data.2) Drafting the manuscript or revising it critically for important intellectual content.3) Final approval of the version for publication.4) All authors agree to be responsible for all aspects of their research work.

Corresponding Author:
Lal Muhammad Kakar
Email:drlalkakar@gmail.com

ABSTRACT

Objective: To determine the frequency of osteoporosis and osteopenia among the general population of District Khuzdar, Baluchistan Pakistan**.**

Methods: This was a cross-sectional study and the data was collected on "World Osteoporosis Day" 20th October 2019 during an awareness session arranged by Shaheed Baz Muhammad Kakar Foundation at Baluchistan University of Information Technology, Engineering and Management Sciences Khuzdar Campus. The bone mineral density of all participants fulfilling the inclusion criteria was determined with DMS PEGASUS SMART Bone Densitometer. The T-scores were measured based on the readings of each individual and further characterized as Normal (+1 to -1 Standard Deviations), Osteopenia (-1 to -2.5 Standard Deviations), and Osteoporosis (<-2.5 SD).

Results: The total participants screened were 246 including 169(68.7%) males and 77(31.3%) females. The mean age was 37±7. Most(49.2%, n=121) participants were in the age range of 15 to 25 years. Majority (75.6%,n=186) of the participants had normal bone mineral density. Osteopenia was detected in 47(19.1%) and Osteoporosis in 13(5.3%) participants.

Conclusion: Majority of our study participants had normal bone mineral density. However, osteopenia and osteoporosis was detected in good proportion of our study sample. Proper treatment can prevent insufficiency fractures in this osteoporotic fraction of our population.

Key Words: Bone mineral density, Menopause, Osteopenia, Osteoporosis Yasinza

This article may be cited as: Kakar LM, Marri T, Ahmed J, Yasinzai AQ, Saleem A, Noor S, *et al*. Assessment of Bone Mineral Density(BMD) among general population of District Khuzdar, Baluchistan Pakistan.J Pak Orthop Assoc. 2020;32(1):

INTRODUCTION

Decrease bone mineral density resulting in weakening of bones and rendering them vulnerable to insufficiency fracture is called osteoporosis.[1] The World Health Organization(WHO) defines osteoporosis as the bone mineral density(BMD) that lies 2.5 standard deviation(SD) or more below the average T score of <-2.5 standard deviation.[2] Whereas, Osteopenia means a subpar bone density which is not as low as osteoporosis and WHO gives the T score -1 to -2.5 via the bone densitometry for the presentation of osteopenia.[3]

Risk factors for osteoporosis are many Important ones are cigarette smoking, low body weight, little or no physical activity, low ratio of calcium and vitamin D in daily diet, use of certain drugs, estrogen decline and excessive parathyroid hormone secretion.[4] However increased risk has also been found in individuals descending from Caucasian or Asian decent.[4] The cause of age-related osteoporosis is idiopathic. However, several studies suggest that increased level of parathyroid hormone can cause osteoporosis.[5]Additional causes include diseases of the gastro intestinal tract, biliary tract, kidney diseases (nephrolithiasis),tumors (multiple myeloma) and use of certain medications such as anti-seizure drugs.[6]

The levels of Testosterone and estrogen play a crucial role in maintenance of bone health hence the deficiency of either of these hormones can lead to poor bone health especially in menopausal women.[7] A higher prevalence of osteopenia and osteoporosis has been found in patients of chronic pancreatitis.[8]Certain ethnic regions like Iranian population older than 30 years have been found to have more osteoporosis than other Asian population.[9] Post-menopausal women with type 2 diabetes and post liver transplant patients for chronic liver disease are more prone to develop osteoporosis.[10,11]

The prevalence of osteoporosis in females in industrialized nations varies from 38% in Japan, 16% in United States, 15% in France and Germany and 9% in United Kingdom.[12] In Pakistan osteopenia have been detected in 45.8% and osteoporosis in 16.4% in Karachi.[13]

The objective of our study was to determine the frequency of osteoporosis and osteopenia among the general population of District Khuzdar, Baluchistan Pakistan**.** Most of the frequency studies in Pakistan had been conducted in urban areas and the targeted population was post-menopausal ladies. The city of Khuzdar being a small and remote area of Baluchistan about 301 km away from capital city Quetta. It has been devoid of such studies performed on its population hence this was the first time that a scientific observation was carried out in a comprehensive manner. We conducted this study in remote rural area and with a sample size covering all ages and gender. The results of our study would help us in in prioritizing screening, preventing and treatment strategies for osteoporotic people of this area in particular and for other rural areas of Pakistan in general.

METHODS

This was a cross-sectional study conducted in Khuzdar (town of Baluchistan) which is 301 kms away from the capital of province i.e. Quetta. The data was collected on "World Osteoporosis Day" 20th October 2019. During an awareness session where onsite bone density screening was performed on the general population attending the session at Baluchistan University of Information Technology, Engineering and Management Sciences Khuzdar Campus. Participants of either gender 15 years and above, inhabitants of Khuzdar and willing to participate in the study were included. Participants with osteomalasia, malignancy, hyperthyroidism, hyperparathyroidism and those taking medications affecting bone turnover were excluded from our screening.

The study protocols were approved by the Ethical Committee of Bolan University of Medical and Health Sciences. Informed written consent was taken from all participants of the study.

DMS PEGASUS SMART Bone Densitometer was used for BMD assessment. It uses Quantitative ultrasound (QUS) method on participant's right foot. The T-scores were measured based on the readings from each individual and further characterized as Normal (+1 to -1 Standard Deviations), Osteopenia (-1 to -2.5 Standard Deviations), and Osteoporosis (<-2.5 SD). The data was analysed with SPSS (version 22).Frequency and percentages were calculated for categorical variables while mean and standard deviation was calculated for continuous variables. Data presented in tables where necessary. We reported our study in accordance with Strengthening the Reporting of Observational Studies in Epidemoloy(STROBE) guidelines.[14]

RESULTS

The total number of participants in our study were 246.Males were 169(68.7%) and females 77(31.3%). The mean age was 37±7. Most (49.2%, n=121) participants were in the age range of 15 to 25 years. (Table I) Majority (75.6%,n=186) of the participants had normal bone mineral density. Osteopenia was detected in 47(19.1%) and Osteoporosis in 13(5.3%) participants as shown in table II.

Table I: Age stratification of our study participants.

	Frequency (N)	**Percentage (%)**
Age Groups of respondents	121	49.2%
15-25 years	44	17.9%
26-35 years	38	15.4%
36-45 years	26	10.6%
46-55 years	12	4.9%
56-65 years	5	2.0%
66-75 years		

Table II: The frequency and interpretation of T score of our study participants.

	Frequency (N)	**Percentage (%)**
T score Group		
+1 to -1 SD	186	75.6%
-1 to -2.5 SD	47	19.1%
<-2.5 SD	13	5.3%
Interpretation		

Healthy	186	75.6%
Osteopenia	47	19.1%
Osteoporosis	13	5.3%

The number of female participants above 45 years age were 16(20.7%). Osteopenia was present in 3(18.7%) and osteoporosis in 1(6.2%) participant while 12(75%) had normal BMD. All the ladies with osteopenia and osteoporosis were asymptomatic.

DISCUSSION

Osteoporosis and low bones mass are major health problems throughout the world and is responsible for increased risk of fractures.[15] A total of 246 participants who were attending the awareness session of World Osteoporosis day were included in our study where their BMD was screened free of cost right at the venue. Our results showed that 13 (5.3%) participants had osteoporosis, and 47 (19.1%) were osteopenic.

Fatima et al[16] did a sceening study on female population of Quetta, the main city of Baluchistan and reported that 43 (12.9%) women with a mean age of 54 were osteoporotic and 145 (43.4%) were osteopenic. Another study in Lahore reported that 18.6% of the sample were Osteoporotic out of 660 participants, while 64.1% were osteopenic.[17] A Dual Energy Xray Absorptiometry (DEXA) screening study on postmenopausal ladies in Karachi documented osteoporosis in 52.5% and osteopenia in 29.5% ladies.[18] This study pointed out that elderly ladies with decrease physical activity, fractures and low calcium intake were more prone to developed osteoporosis**.** Sohail I and her colleagues[19] reported Osteopenia and osteoporosis in 66.7% of their sample size**.** Sayed SA and Khaliq A[20] screened 500 ladies in Karachi, Hyderabad and Sukker and noted that 56.8% ladies were osteopenic,25.8% osteoporotic and 17.4% were normal. These authors were of the opinion that adequate sunlight exposure, exercise and nutritional supplements can reduce the risk of osteoporosis.

To our knowledge our study was first of its kind carried out in the city of Khuzdar. When compared to prior studies done in other regions of Pakistan, we see a low ratio of osteoporosis and osteopenia among the inhabitants of Khuzdar. This was most probably due to the rural background, low socio economic status and increased physical activity i.e. rural area inhabitants usually have more sun exposure (more Vit. D) and more physical activity including walks and daily chores without urban facilities and technology. This observation was confirmed by other researchers as well.[21] However other possible explanations for this low frequency of osteoporosis and osteopenia in our study can be given. Our study population was limited to the participants of the session most of which were in younger age group while osteoporosis is generally common in elderly ladies. There is a high need for large scale studies in Khuzdar and other areas of the country in target population to document the frequency of osteoporosis and osteopenia in diverse population. One of the limitations of our study was that we were unable to calculate proper sample size for our study or register our study with a registration database. Furthermore we could not analyzed the possible risk factors for osteoporosis in our sample. The assessment was done using Ultrasound based bone mass densitometer. Participants with osteoporosis and osteopenia should have been screened with DEXA scan to further confirm their status before the initiation of curative therapy. Further studies are therefore recommended.

CONCLUSION

Majority of the participants had normal bone mineral density. However, osteopenia and osteoporosis was detected in good proportion of our study sample. Proper treatment can prevent insufficiency fractures in this osteoporotic fraction of our population. We would also suggest that since drugs treatment of osteoporosis is costly therefore their indiscriminate use without confirmed diagnosis of osteoporosis should be avoided. Osteoporosis awareness sessions in the community and widespread screening camps are advised.

ACKNOWLEDGMENTS

We acknowledge the assistance of Muhammad Samsoor Zarak, Hamiyal Sana, Zara Arshad and Saliha Kakar for providing us the literature support on behalf of Bolanians Research Forum. We also acknowledge Dr. Ehsanullah Kakar, VC of Baluchistan University of Engineering and Technology, Khuzdar, Baluchistan and Wilson Healthcare Pharma for the provision of Quantitative Ultrasound Machines.

Conflict of Interests: None

Grants/Funding: None

REFERENCES

1. Cooper C, Melton LJ. Epidemiology of osteoporosis. Trends in Endocrinology & Metabolism, 1992.;3(6):224-229.
2. WHO.WHO scientific group on the assessment of osteoporosis at primary health care level Brussels: World Health Organization; 2004.
3. Karaguzel G, Holick MF. Diagnosis and treatment of osteopenia. Reviews in endocrine and metabolic disorders.2010;11(4):237-251.
4. Dontas I, Yiannakopoulo CS.Risk factors and prevention of osteoporosis-related fractures. J Musculoskelet Neuronal Interact.2007;7(3): 268-272.
5. Berlyne, GM., Ben-Ari J, Galinsky D, Hirsch M, Kushelevsky A, Shainkin R. The etiology of osteoporosis: the role of parathyroid hormone. JAMA.1974;229(14):1904-1905.
6. Fitzpatrick LA. Secondary causes of osteoporosis. in Mayo Clinic Proceedings. 2002. Elsevier.
7. Ebeling, P.R., Osteoporosis in men. New insights into aetiology, pathogenesis, prevention and management. Drugs & aging.1998;13(6):421-434.
8. Duggan, SN, Smyth ND, Murphy A, MacNaughton D, OKeefe SJ, Conlon KC. High prevalence of osteoporosis in patients with chronic pancreatitis: a systematic review and meta-analysis. Clinical Gastroenterology and Hepatology.2014;12(2):219-228.
9. Irani AD, Poorolajal J, Khalilian A, Esmailnasab N, Cheraghi Z. Prevalence of osteoporosis in Iran: A meta-analysis. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences.2013;18(9):759-765.
10. Al-Maatouq MA, El-Desouki MI, Othman SA. Prevalence of osteoporosis among postmenopausal females with diabetes mellitus. Saudi Medical Journal.2004;25(10):1423- 1427.
11. Ninkovic M, Love Sa, Tom B, Alexander GM, Compston JE, Alexander GJ. High prevalence of osteoporosis in patients with chronic liver disease prior to liver transplantation. Calcified Tissue International.2001;69(6):321-326.
12. Wade SW, Strader C, Fitzpatrick LA, Anthony MS,O Malley CD. Estimating prevalence of osteoporosis: examples from industrialized countries. Archives of Osteoporosis;2014. 9(1):182-186.
13. Habib S, Iqbal R, Shahid M, Habib A. Growing prevalence of osteoporosis in Pakistan: Call for action. J Pak Med Assoc.2015;65(2):230-1.
14. Vandenbroucke JP, von Elm E, Altman DG, Gotzsche PC, Mulrow CD Pocock SJ, Poole C, *et al*.Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and Elaboration. PLoS Med.2007;4(10):297-312.
15. Sozen TL, Ozısık M, Başaran NC. An overview and management of osteoporosis. Eur J Rheumatol. 2017;4(1): 46-50.
16. Fatima M, Kassi M, Rehman R, Kasi PM, Kassi M, Afghan A K, *et al*. Determining the risk factors and prevalence of osteoporosis using quantitative ultrasonography in Pakistani adult women. Singapore Medical Journal.2009;50(1):20-27.
17. Nagi D, Butt Z, Farooq F,Amar A.Frequency of osteoporosis in an ambulatory setting in Lahore using quantitative calcaneal ultrasound. J Pak Med Assoc. 2013;63:965-8.
18. Khokhar S, Hasan JA, Sarah Qazi S. Osteoporosis and its risk factors among menopausal women.Pak J Med Res.2014;53(2):42-5.
19. Sohail I, Hayat Z. Osteoporosis in healthy postmenopausal women. J Postgrad Med Inst. 2014;28(3):257-63.
20. Sayed SA, Khaliq A, Mahmood A. Evaluating the risk of osteoporosis through bone mass density. J Ayub Med Coll Abottabad.2016;28(4):730-3.
21. Durrani M, Nazli R, Qamar MA, Abubakar M, Shafiq M. Factors causing early osteoporosis in perimenopausal women.Pak J Physiol.2015;11(2):17-9.