ORIGINAL ARTICLE

Association of Bone Mineral Density Status with Ethnicity and Parity in females of Karachi

MADEEHA SADIQ[1], MUBINA LAKHANI[2], SANTOSH KUMAR SIDHWANI[3], ROSHEENA NABEEL KHAN[4], NABILA RASHEED[5], NUZHAT HASSAN[6]

[1,2]Assistant Professor, Department of Anatomy, Ziauddin University, Karachi
[3]Assistant Professor, Department of Anatomy, United Medical and Dental College, Karachi
[5]Assistant Professor, Department of Anatomy, RYK Medical and Dental College, Rahim Yar Khan
[6]Professor, Department of Anatomy, Ziauddin University, Karachi
Correspondence to Dr. Madeeha Sadiq, Email: madeeha.sadiq@zu.edu.pk, Cell: 0345-3105201

ABSTRACT

Aims: To assess the association of BMD (bone mineral density) with ethnicity and parity in females of Karachi, Pakistan.
Study design: Cross Sectional.
Place and duration of study: Department of Anatomy & Nuclear Medicine, Ziauddin Hospital, Clifton Campus, Karachi, Pakistan between March and August 2016.
Methods: 200 females aged 40 years and above were included. Average age was 60.7 years (±10.52). BMD assessment was done on DXA scans. Participants were interviewed to obtain baseline demographic characteristics. Statistical Package for Social Sciences (SPSS) version 20 was used to analyze data.
Results: No significant association was found between BMD and the different ethnicities or parity in our study population.
Conclusion: Bone mineral density is not affected by the number of pregnancies or ethnicity.
Keywords: bone mineral density, ethnicity, parity, Karachi.

INTRODUCTION

The word "osteoporosis" literally means "porous bones". It is defined as "decreased bone mass that is severe enough to significantly increase the risk of fractures"[1]. Osteoporosis is associated with an imbalance in skeletal turnover so that the level of bone resorption exceeds bone formation[2]. Radiologically, osteoporosis is considered as bone mass at least 2.5 standard deviations below mean peak bone mass in young adults and osteopenia as bone mass between 1 to 2.5 standard deviations below the mean[1].

The International Osteoporosis Foundation conducted an ultrasound based survey in Pakistan in 2009 and reported a 16% prevalence of Osteoporosis while that for Osteopenia was found to be 34% among the adult population aged 45 to 70[3]. A study conducted in Rawalpindi using DXA scanning reported the frequency of osteopenia to be 35% while that of osteoporosis to be 31.5% among adult Pakistanis[4].

Bone is a metabolically active tissue and bone turnover is a constant process. The rate of bone turnover affects the rates of bone deposition and resorption which in turn alter the BMD. This turnover rate and BMD is associated with BMI, age, menopausal status, ethnicity, endocrine diseases and other factors. Karachi is a city where people from diverse ethnic backgrounds reside[5]. the knowledge of differences in BMD among different ethnic populations in Pakistan is lacking. Despite Pakistan's high incidence of osteoporosis and osteopenia, there is a lack of data on the prevalence of osteoporosis-related fractures and the disease's burden[6]. Well known risk factors need to be addressed and clinical referrals should be made accordingly in high risk individuals. Studies on projections for hip fracture rates in men and women for 2050 in Asian countries suggests that the rates are increasing. Compared to 2018, in 2050 the hip fracture rates in both genders are projected to increase due to the demographic shift of asian populations towards an ageing population and increasing urbanisation of the population which tend to increase hip fracture rates[7].

In our study a sample of 200 females above 40 years of age were included. These females were both pre and postmenopausal and were recruited from the gynecology OPD. The objectives of our study were to study the determinants and predictors of bone mineral density in Pakistani women.

The objective of the study was to study the relationship of BMD with parity and ethnicity in Pakistani women.

METHODOLOGY

After receiving approval from Ziauddin University's Ethics Review Committee, this cross-sectional study was done in first half of 2017 at the Department of Nuclear Medicine, Ziauddin Hospital, Clifton Campus, Karachi. 200 females over the age of forty were recruited from Ziauddin Hospital's Gynecology OPD using a consecutive sampling technique. Patients with any prior diagnosis or treatment for osteoporosis, malignancies with bone metastases, or with a history of oophorectomy with or without hysterectomy, as well as pregnant females, were excluded.

All participants' height, weight, and BMI were measured after they gave their informed consent. All participants were questioned and given a questionnaire that included demographic information as well as risk factors for low BMD. The Hologic Discovery Wi (S/N 88577) DXA Scanner was used to do DXA scanning and calculate BMD. The hip, spine (L1 to L4), and 33 percent of the distal forearm (one third radius) were used to determine BMD. According to WHO standards, the lowest T score found for any of the three tested sites was used to diagnose low BMD. According to the guidelines of International Society for Clinical Densitometry (ISCD) criteria, participants were categorized as normal, osteopenic, or osteoporotic. T scores, which represent the standard deviations difference by which the measured BMD differs from the mean BMD of a comparable gender young adult, were used to categorize postmenopausal women.

For premenopausal females, Z scores were employed. Normal ladies with a T score of -1 SD, osteopenic females with a T score of -1 to -2.5, and osteoporotic females with a T score of 2.5 SD were the three groups of postmenopausal women studied.

On the basis of Z score, premenopausal females were separated into two groups: normal BMD (Z score up to 1.9 SD) and low BMD (Z score -2 SD).
Statistical analysis: SPSS version 20 was used for data analysis. For defining the characteristics of sample, descriptive statistics (means, standard deviations, frequencies and percentages) were used. Mean and Standard Deviation were calculated for quantitative variables (age, menopausal age, height, weight, BMI, BMD and T-score for Hip, Spine, Forearm and Femoral neck). Frequencies and percentages were calculated for qualitative variables (BMD status, ethnicity, parity, menstrual status). Chi

square test was utilized to find association of BMD status with qualitative variables. P-value of <0.05 was considered significant.

RESULTS

Study Sample Characteristics: We enrolled a total of 200 females in our study. The mean age of our sample was 60.76 years, ranging from a minimum of 40 years to a maximum of 93 years. Mean height weight and BMI were found to be 155cm, 69 kg and 28.7kg/m^2 respectively (Table 1).

Table 1 :Base line Characteristics of Study Participants

Variables	Mean ± SD
Patients age (years)	60.76±10.52
Age at Menopause (years)	47.64±6.63
Height (cm)	155.02±6.33
Weight (kg)	69.25±15.32
BMI (kg/m^2)	28.74±5.79

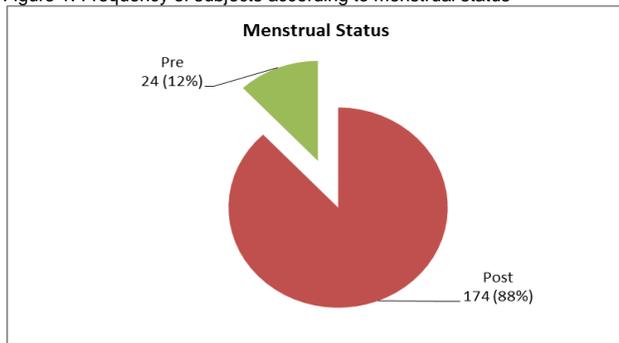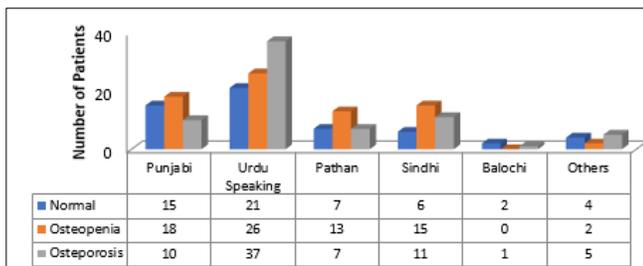Figure 1: Frequency of subjects according to menstrual status

Menstrual Status

Pre 24 (12%)
Post 174 (88%)

Table 2 : Frequency of study participants according to parity and ethnicity.

Variables		n
Parity	Parous females	178 (89)
	Nulliparous females	22 (11)
Ethnicity	Punjabi speaking	43 (21.5)
	Sindhi speaking	32 (16)
	Pashto speaking	27 (13.5)
	Balochi speaking	03 (1.5)
	Urdu Speaking	84 (42)
	Others	11 (5.5)

Figure 2: Frequency of different ethnic groups in study sample

	Punjabi	Urdu Speaking	Pathan	Sindhi	Balochi	Others
Normal	15	21	7	6	2	4
Osteopenia	18	26	13	15	0	2
Osteporosis	10	37	7	11	1	5

The sample comprised of 174 (87%) postmenopausal females and 26 (13%) premenopausal females (Figure 1). The mean menopausal age was 47.64±6.63 years. 178 females were parous having one or more child and 22 females were nulliparous. Our sample consisted of females belonging to different ethnic backgrounds, the greatest frequency was of Urdu Speaking population followed by Punjabi women. (Table 2, Figure 2)

Association of BMD with Ethnicity: Our sample comprised of females belonging to different ethnic groups (Figure 2). The greatest frequency was of Urdu Speaking females. (Table 2) No significant association was found between BMD categories and the different ethnicities. (Table 3)

Table 3 : Association of BMD with Ethnicity

Ethnicity	BMD		Total	P-value
	Normal	Low		
Sindhi speaking	6 (10.9)	26 (17.9)	32	
Punjabi speaking	15 (27.3)	28 (19.3)	43	
Urdu Speaking	21 (38.2)	63 (43.4)	84	0.364
Pashto speaking	07 (12.7)	20 (13.8)	27	
Balochi speaking	02 (3.6)	01 (0.7)	03	
Others	04 (7.3)	07 (4.8)	11	
Total	55	145	200	

P<0.05 is considered significant

Association of BMD with Parity: The following table shows that most of the females having low BMD (90.3%) were parous. However there was no statistically significant association between parity and BMD categories. (Table 4)

Table 4: Association of BMD with Parity

Parity	BMD		Total	P-value
	Normal	Low		
Yes	47 (85.5%)	131(90.3%)	178	
No	08(14.5%)	14(9.7%)	22	0.324
Total	55	145	200	

P<0.05 is considered significant

DISCUSSION

Association between parity and BMD has been studied in the past. Available literature points towards positive association[8,9], negative association[10] or no association[11]. between these two variables. Pakistani females undergo multiple pregnancies which effect their calcium homeostasis and bone structure. We found no effect of parity on BMD (p=0.324) (Table 4). A recent study done in Faisalabad concluded significant association between osteopenia and parity and marital status, however this study used QUS and not DXA for BMD assessment[12].

Ethnic differences in Bone Mineral Density are well documented. Asians have lower values in comparison to Caucasians and Americans. Genetic variations together with environmental factors are thought to be responsible for this[13,14]. Pakistan is a country inhabited by people belonging to different ethnic backgrounds. Few attempts have been made to study the BMD variability in different ethnic groups of Pakistan. Our results demonstrate no considerable difference among different ethnicities (p=0.364) (Table 3). This is similar to the observation by Uzma Akhlaque et al (p =0.714) who compared BMD in 400 males and females from Peshawar[15]. Similarly a study done in another tertiary care hospital of Karachi has reported no significant difference in BMD among different ethnic groups of Karachi[16].

These insignificant results may be due to unequal size of different ethnic groups in our sample. Similarly study participants in the study sample by Uzma et al. had unequal distribution. Future studies using equal percentage of Pakistan's ethnic populations may further clarify this association.

CONCLUSION

There is no significant difference of Bone Mineral Density associated with ethnic differences or differences in parity in females of Karachi population.

Conflict of interest: Nil

REFERENCES

1. Hoda SA, Hoda RS. Robbins and cotran pathologic basis of disease. Oxford University Press US; 2020.
2. Mescher AL. Junqueira's basic histology: text and atlas: McGraw-Hill Medical 13th ed. New York; 2013.
3. Mithal A, Bansal B, Kyer CS, Ebeling PJljoe, metabolism. The Asia-pacific regional audit-epidemiology, costs, and burden of osteoporosis in India 2013: a report of international osteoporosis foundation. 2014;18(4):449.

4. Akhlaque U, Ahmad K, Ahmad N, Waheed A, Akhtar NJP. Frequency of low bone mass in a cohort of mixed Pakistani population. 2015;65(3):323-7.
5. Iqbal T, Siddiqui NU, Madani MJJoH, Sciences S. Trends, Patterns and Impact of Migration in Karachi. 2018;9(2).
6. Khan AH, Jafri L, Ahmed S, Noordin SJAoM, Surgery. Osteoporosis and its perspective in Pakistan: A review of evidence and issues for addressing fragility fractures. 2018;29:19-25.
7. Cheung C-L, Ang SB, Chadha M, Chow ES-L, Chung Y-S, Hew FL, et al. An updated hip fracture projection in Asia: The Asian Federation of Osteoporosis Societies study. 2018;4(1):16-21.
8. Unaiza FNZA. Impact of Body Mass Index (BMI) and Parity upon Bone Mineral Density (BMD) Using DEXA in Pakistani Women. PJR. 2014;23(01).
9. Sadat-Ali M, Al-Habdan I, Al-Mulhim A-A, El-Hassan AY. Effect of parity on bone mineral density among postmenopausal Saudi Arabian women. Saudi medical journal. 2005;26(10):1588-90.
10. Allali F, Maaroufi H, El Aichaoui S, Khazani H, Saoud B, Benyahya B, et al. Influence of parity on bone mineral density and peripheral fracture risk in Moroccan postmenopausal women. Maturitas. 2007;57(4):392-8.
11. Carranza-Lira S, Mera J. Influence of number of pregnancies and total breast-feeding time on bone mineral density. International journal of fertility and women's medicine. 2001;47(4):169-71.
12. Zahid S, Hanif A, Faridi TA, Masood Z, John A, Noor SJTJ. Frequency Of Osteopenia And Its Association With Marital Status And Parity Among Female Population Aged 18-60 Years: Osteopenia And Parity. 2020.
13. Handa R, Kalla AA, Maalouf G. Osteoporosis in developing countries. Best Practice & Research Clinical Rheumatology. 2008;22(4):693-708.
14. Conradie M, Conradie MM, Kidd M, Hough S. Bone density in black and white South African women: contribution of ethnicity, body weight and lifestyle. Archives of osteoporosis. 2014;9(1):1-12.
15. Akhlaque U, Ahmad K, Ahmad N, Waheed A, Akhtar N. FREQUENCY OF LOW BONE MASS IN A COHORT OF MIXED PAKISTANI POPULATION. Pakistan Armed Forces Medical Journal. 2015;63(3):323-7.
16. Shaikh SA, Iqbal J, Faisal L, ul Islam Z, Ajmal RJRMJ. Difference in bone mineral density score on dual Xray absorptiometry scan among ethnic groups of Karachi, Pakistan. 2017;42(4):484-9.