Original Article

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Physiology Section

A Comparative Study on Symptomatic and Asymptomatic Osteoporosis by Using the P-DEXA Technique

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ABSTRACT

Objective: We conducted a study to detect and compare the osteoporosis in symptomatic and asymptomatic adults by using the heel dexa technique.

Methods: We screened a total of 173 patients who attended a medical health camp which was conducted in southern Karnataka, India. Their ages ranged from 20 to 80 years. They were asked for the presenting complaints before testing for their heel bone mineral density(BMD) by using the p-dexa technique. The WHO equivalent for the heel BMD was used to classify the patients, based on their T-score. Osteoporosis was considered when the T-score was less than - 1.6. Osteopaenia was considered when the T-score was between -0.6 to -1.6. The T-scores which were above -0.6 were considered as normal. The statistical analysis was done by using the Chi square test for the data in frequency and percentage.

Results: 94 out of the 173 patients presented with one or more complaints which were related to the skeletal system, like pain in the neck, back, shoulder, legs and hip, generalized body pain, etc. Among the 94 patients who were symptomatic, 54 (58.75%) had osteopaenia, 19(18.92%) had osteoporosis and 21(22.33%) had a normal T-score. Among the 79 remaining patients who were asymptomatic, 25 (31.6%) had a normal T-score, 46 (58.2%) had osteopaenia and 8(10.2%) had osteoporosis. The frequency of the osteoporosis was significantly higher in the symptomatic individuals than in the asymptomatic individuals ($p<0.05$).

Conclusion: Our data suggests that P-dexa is a useful technique for detecting and comparing osteoporosis in both symptomatic as well as asymptomatic cases.

Key Words: Peripheral - dexa, Calcaneus, BMD (bone mineral density), Osteoporosis, Osteopaenia

INTRODUCTION

Osteoporosis is characterized by low bone mass and micro architectural deterioration of the bone tissue, with a consequent increase in the bone fragility and in the susceptibility to fracture [1]. Osteoporosis ranks as one of the five costliest diseases which are caused due to aging, after diabetes, hyperlipidaemia, hypertension and heart diseases. Approximately 2 million fractures due to osteoporosis occurred in 2005 at a cost of almost $17 billion 8. Among women who were aged age 50 and older, osteoporotic fractures are more common than stroke (373,000 per year), heart attack (345,000 per year), and breast cancer (213,000 per year) combined together. The individuals with osteoporosis usually have pain-related complaints; On the contrary, osteoporosis can be asymptomatic, and it can only be discovered by means of X-rays or lab analysis.

In the past decade, considerable effort has been expended in the development of methods for assessing the skeleton noninvasively, in order to provide an early detection and a precise monitoring of this disease. Since the definition of osteoporosis includes bone mass as a parameter, measurement of the bone mineral density (BMD) has become an essential element in the evaluation of patients who are at risk for osteoporosis [2]. Since its introduction in 1987, dual X-ray absorptiometry (DXA) has become the measurement technique which is most associated with the rapid growth in the clinical applications of bone densitometry [3, 4]. With its high precision, DXA is well suited for use in the diagnosis of osteoporosis, to aid decisions about the treatment of the patients and to monitor the patients. However, this method is costly and it is not readily available to all the patients, especially for screening [5]. On the other hand, the peripheral measurement techniques are attractive, because their equipment costs are substantially lower, their radiation exposure is small, and the devices require less space and sometimes are even portable [6]. Hence, this hospital based, cross sectional study was undertaken to detect and compare osteoporosis and osteopaenia in symptomatic and asymptomatic patients.by using the peripheral-dexa (p-dexa) scan.

MATERIALS AND METHODS

This was a hospital based, cross-sectional study which was done in the subjects who attended a health camp which was organized in the Orthopaedic Department, Kasturba Medical College, and Tejaswini hospital Mangalore, Karnataka, India. A prior informed consent for participation in this study was taken from the subjects.

STUDY SUBJECTS:

The bone mineral density (BMD) was measured in the 173 individuals who were aged between 19-80 years. Among them, 106 were females and 67 were males. They were unselected with regards to concomitant diseases and medication.

THE PERIPHERAL DUAL-ENERGY X- RAY ABSORPTIOMETRY (P-DEXA) PROCEDURE:

The current study involved the p-dexa (PIXI machine, Lunar Corporation) for the heel BMD testing. The subjects were made to sit on a chair and they were asked to place their ankles on the machine. After a jelly was applied to their ankles, two probes were

pressed gently onto the ankles to measure the BMD. The BMD value which was displayed on the machine screen was noted. The BMD values were reported as grams per square centimeter.

INTERPRETATION OF THE T –SCORE:

The BMD values and the T-scores were noted from the PIXI LUNAR machine screen. It is a standard practise to relate the results to the normal values by using T-scores, which compares the individual results to those in a young population, that is matched for race and gender and skeletal site. The heel has a slower bone loss rate than other sites in the body such as the hip, spine, or the forearm. This means that the T-scores which are used from other skeletal sites may underestimate the BMD loss if the same standards are used to measure the heel. The World Health Organization (WHO) T-score for the hip, spine, and the forearm is defined as normal at greater than -1, low bone density (osteopenia) at a reading between -1 and -2.5, and osteoporosis at a T-score of less than -2.5. The WHO equivalent for the heel BMD includes >-0.6 for a normal T-score, -0.6 to -1.6 for osteopaenia, and less than -1.6 for osteoporosis 12,13.. Men and women who were found to have heel BMD T-scores of <-.6 (as suggested by the World Health Organization) were considered as osteopaenic, those with scores of <-1.6 were considered as osteoporotic and those with scores of > -0.6 were considered as normal [7].

The Chi-square test was applied when the data were in frequencies and for the data which could be reduced to proportions or percentages.

RESULTS

The age of the study group ranged from 19-80 years. The mean age of the study group was 47.3 years. The mean height of the study subjects was 159 centimeters and the mean weight was 59 kg. The BMD value ranged from 0.276 to 0.683gm/cm2 and the mean BMD value was 0.47 gm/cm2. The mean T score for the study group was -1.04. Based on the threshold T score for osteopaenia and osteoporosis, 48(27.74%) subjects were found to have T – scores which were within the normal range, 92(53.18%) subjects had osteopaenia and 33(19.07%) had osteoporosis.

The frequency distribution of the males and females in the different BMD subgroups was analyzed. There was a significant increase in the frequency distribution of the female subjects as compared to that in the males in all the subgroups of normal, osteopaenia and osteoporosis [Table/Fig-1].

Similarly, the frequency distribution of the different BMD subgroups namely, osteoporosis,osteopaenia and normal, was analyzed in symptomatic and asymptomatic individuals . There was a significant increase in the number of osteoporosis cases in the symptomatic individuals as compared to the number of osteoporosis cases in the asymptomatic individuals [Table/Fig-2].

	Males	Females	Total
Normal	22(45.83%)	26(54.17%)	48(27.74%)
Osteopenia	37(40.21%)	55(59.79%)	92(53.18%)
Osteoporosis	9(27.27%)	24(72.73%)	33(19.08%)

[Table/Fig-1]: Distribution of male and female in different BMD subgroups

	Normal	Osteopenia	Osteoporosis	Total
Symptomatic	21(22.33%)	54(58.75%)	19(18.92%)	94(54.34%)
Asymptomatic	25(31.6%)	46(58.2%)	8(10.2%)	79(45.66%)
Total	43	100	27	173

[Table/Fig-2]: Distribution of patients with skeletal complaints in BMD subgroups

DISCUSSION

Ivorra et al performed a study to find out the specificity and the sensitivity of the peripheral densitometer and the axial densitometer. According to the results of the axial densitometer (DXA), 29% of the women were osteoporotic, 47% were osteopaenic and 27% had normal levels of bone mass. Our study, by using the heel densitometer (DXA), found that 23.5% of the women were osteoporotic, 52% were osteopaenic and that 24.5% had normal levels of bone mass [9].

Sridhar [10] reported that 6% of the apparently healthy Indians who were <50 years of age had osteopaenia. In our series, 58.2% asymptomatic patients had osteopaenia and 10% had osteoporosis. These differences could be due to the selective screening of the cases. The difference in the frequency distribution of the symptomatic and the asymptomatic cases in different the BMD subgroups [Table/Fig-2] was significant ($p<0.05$), thus implying that skeletal complaints could be a clinical indicator of osteoporosis; however, in case of osteopaenia, this was not so.

H Rao [11] et al., conducted a clinical study on the bone mineral density by using a heel ultra-densitometer. The difference in the frequency distribution of the symptomatic and the asymptomatic cases in the different BMD subgroups was significant with respect to osteoporosis, but it was not so with osteopaenia. In our study also, it was significant in case of osteoporosis, thus implying that skeletal complaints can be an important indicator of underlying osteoporosis, but it was not so in case of osteopaenia [12,13].

CONCLUSION:

More osteoporosis cases were found among females than among the males. The patients who presented with one or more skeletal complaints had a higher incidence of underlying osteoporosis. The patients who did not present with complaints had almost an equal incidence of underlying osteopaenia as compared to the patients who did present with complaints. Heel dexa is a useful technique for detecting symptomatic as well as asymptomatic osteoporosis.

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