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# Contributing Factors to Osteoporosis and Osteopenia in Adults above 55 Years: A Case Study of Patients Visiting Federal Diagnostic Centre

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## Abstract

**Aim**: Screening can help in early detection of osteoporosis and osteopenia and help in recommending appropriate treatment thus reducing fracture-related morbidity and mortality. The aim of this study was to assess the contributing factors to osteoporosis and osteopenia among out-patients aged above 55 years.

**Methods:** The study employed randomized clinical trials (RCTs). The identified patients were screened using bone tests such as DXA, quantitative ultrasound, and the Bone Mineral Density (BMD) as the standard. This was measured using the Calcaneal Quantitative Ultra Sound (QUS). The study also used a structured questionnaire to identify the socio-demographic profile of the patients and clinical risk assessments for osteoporosis or fracture risk. The sample size was 250 out-patients aged above 55 years.

**Results:** The study found out that lower back pain and knee pain were the common musculoskeletal presentations. It was evident that osteoporosis and osteopenia was common in out-patients who had low exposure to sunlight (71%). The study found that major contributing factors to osteoporosis and osteopenia are advanced age, low bone mineral density score, hysterectomy, gender, and educational status.

**Conclusion:** The study conclude that people aged above 55 years are at high risk of suffering from osteoporosis and osteopenia.

**Recommendation:** The study recommend people above 55 years to undergo screening to facilitate early detection of osteoporosis and osteopenia. This will help them in getting appropriate and timely management of symptoms and improve their quality of life.

**Keywords:** *Osteoporosis, out-patients, osteopenia, screening.*

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## INTRODUCTION

Osteoporosis is a bone disease that develops when bone mineral density and bone mass decreases, or when the quality or structure of bone changes. This can lead to a decrease in bone strength that can increase the risk of fractures. The body constantly absorbs and replaces bone tissue but with osteoporosis, new bone creation doesn't keep up with old bone removal [1]. WHO defined osteoporosis as Bone Mineral Density 2.5 SD (standard deviation) below the mean bone mass of young normal adults. Normal BMD is T-score ≥-1; Osteopenia –T- score between -1 and -2.5 Osteoporosis – Tscore - 2.5; Severe osteoporosis – T-score- 2.5 with fractures [2]. Osteoporosis develops slowly over several years and is often only diagnosed when a fall or sudden impact causes a bone to break (fracture). Osteoporosis is a silent disease because patients typically do not have symptoms, and patients may not even know they have the disease until they break a bone. Osteoporosis is the major cause of fractures in postmenopausal women and in older men. Fractures can occur in any bone but happen most often in bones of the hip, vertebrae in the spine, and wrist.

Osteoporosis poses one of the major health problems associated with significant morbidity, mortality and socioeconomic burden Malhotra et al [2]. The greatest bone loss occurs in women during perimenopause and is associated with estrogen insufficiency, a condition of menopause. [3]. There have been several epidemiologic studies and surveys on the prevalence of osteoporosis and related risk factors in communities [4]. In Pakistan, the precise figures on the prevalence of osteoporosis are not available at present. However, in other studies, it is estimated that more than 61 million Pakistani have osteoporosis; of these, 80% patients are females [5] [6].

An age-dependent decline in Bone Mineral Density (BMD) was seen in both women and men over the age of 50 years and the normative database for BMD in Pakistani population using digital X-ray radiogrammetry was stated by Pande et al [7]. Aggarwal et al [3] has stated that Osteoporosis has numerous medical implications and a huge economic impact. Evaluation of BMD through absorptiometry is recommended. DEXA (dual energy X-ray absorptiometry) as the gold standard to assess BMD [3], Calcaneal Quantitative Ultrasound (QUS) devices can be used to examine the BMD and the T-score threshold that would be appropriate to identify people at risk of osteoporosis using QUS [8] Calcaneal-QUS technique could increase substantially the accessibility to a reliable bone osteoporosis risk evaluation [9].

Elderly people are at a high risk of osteoporosis, hence Vitamin D and Calcium supplements are recommended for fracture prevention [10]. This can be administered either alone or together, but prevention of fractures in previously mobile elderly has to be evaluated further. Osteoporotic fractures in Pakistan occur commonly in both sexes, and may occur at a younger age than in the West. Recently published data have clearly demonstrated widespread vitamin D deficiency across Pakistan, at all ages and in both sexes, particularly in the urban areas. Poor sunlight exposure, skin pigmentation and a vitamin D deficient diet are some obvious causes for this finding [2]. However, the high prevalence of vitamin D deficiency is a major factor in the low BMD and poor bone health of Pakistanis. Healthy lifestyle (diet, exercise and sunlight exposure) can have a major positive impact on the bone metabolism and bone health of Pakistanis. These public health measures are recommended for the population at large as they are efficacious, safe and cost-effective. The peak bone mass of the population can be increased significantly by appropriate and timely intervention in children.

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## MATERIALS AND METHODS

The study employed randomized clinical trials (RCTs). The identified patients were screened using bone tests such as DXA, quantitative ultrasound, and the Bone Mineral Density (BMD) as the standard. This was measured using the Calcaneal Quantitative Ultra Sound (QUS). The study also used a structured questionnaire to identify the socio-demographic profile of the patients and clinical risk assessments for osteoporosis or fracture risk. The sample size was 250 out-patients aged above 55 years. The study was conducted in department of physical medicine in Federal Diagnostic Centre, Rawalpindi, Pakistan. After taking informed consent both males and females above 55 years of age presenting with various conditions of non-autoimmune musculoskeletal pains were included in the study. Patients who had diseases of kidney & liver, chronic mal-absorptive conditions, thyroid and parathyroid disorders, malignancies, CNS disorders, patients already on calcium supplements and on glucocorticoids were excluded. The Bone Mineral Density t-score was recorded using Calcaneal QUS. A pre designed pretested questionnaire was used to record the scores and demographic information. Data were analyzed using SPSS version 22. Paired t- test, Wilcoxin signed rank test, chi-square tests were used to analyze the data.

## RESULTS

Out of the 250 patients studied, 116 patients (t-score ≤-2.5) had Osteoporosis. 88 patients (t score between -1 and -2.5) had Osteopenia, and the rest of 46 patients (t score ≥- 1) had normal Bone Mineral Density (BMD).

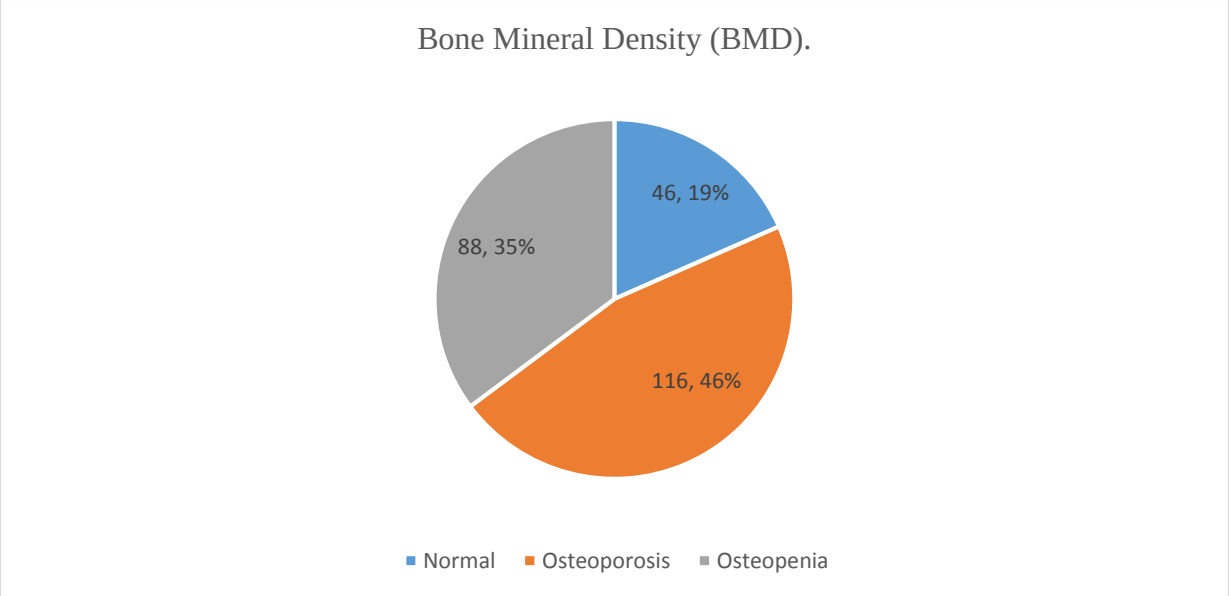


**Figure 1: Distribution of Bone Mineral Density (BMD).**

As summarized in figure 2, 140 out of 250 patient were aged between 55 and 65 years (56%), 70 were aged between 66 and 75 years (28%) and 40 were above 76 years of age (16%). Additionally, 166 were females (83%) and 84 were males (17%). Out of 166 females, 88 (53.01%) had osteoporosis, 54 (32.53%) had osteopenia while 24 (14.46%) had normal bones. Out of 84 males 29 (34.52%) had osteoporosis, 35 (41.67%) had osteopenia while 20 (23.81%) had normal bones as shown in table 1.

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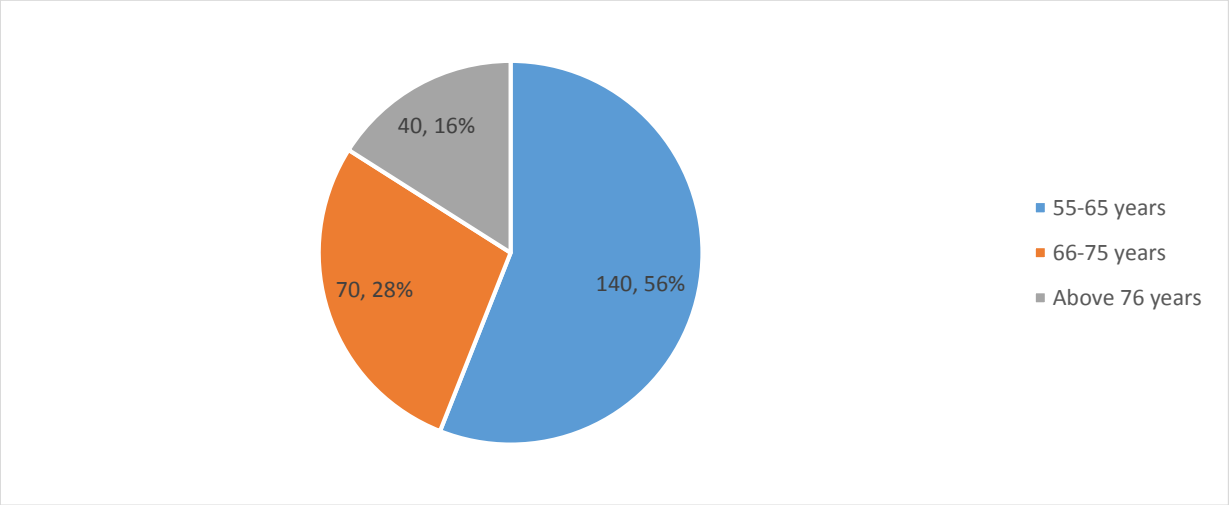


**Figure 2: Distribution of Bone Mineral Density (BMD).**

**Table 1: BMD distribution according to gender**

| Gender | Osteoporosis | Osteopenia | Normal | Total |
|---|---|---|---|---|
| Male | 29 (34.52%) | 35 (41.67%) | 20 (23.81%) | 84 |
| Female | 88(53.01%) | 54(32.53%) | 24(14.46%) | 166 |

When the respondents were asked about their occupation, the results were group as house wives, manual laborers or white color jobs. The health status was categorized as having normal bones, osteopenia or osteoporosis. As summarized in figure 3, out of the 250 respondents, 103 were house wives, 82 were manual laborers, and 65 patient who were in white collar jobs. On the house wives category, 57 (55.34%) had osteoporosis and 31(30.1%) had osteopenia and 15 (14.56%) had normal bones. Among 82 patient who were in manual labor jobs, 20 (24.39%) had osteoporosis, 19 (23.17%) had osteopenia and 43 (52.44%) had normal bones. Among the 65 were in white collar jobs, 29 (44.62%) had osteoporosis, and 24 (36.92%) had osteopenia while 12 (18.46%) had normal bones.

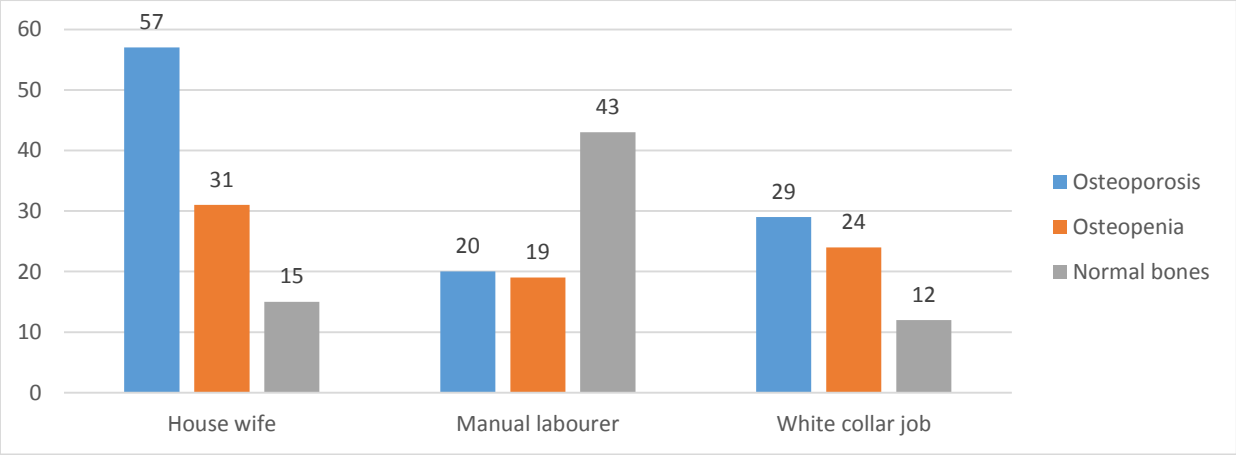


**Figure 3: Relationship between occupation and occurrence of osteoporosis and osteopenia**

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When the respondents were asked about their educational status, 130 respondents had attained education up to the Secondary School Certificate level, 66 respondents had attained education up to the Higher Secondary School Certificate level, 37 had attained education up to the undergraduate level, and 17 had attained education up to the graduate degree level. Among the 130 respondents who had attained education up to up to the Secondary School Certificate level, 57 (43.85%) had osteoporosis, 49(37.69%) had osteopenia and 24 (18.46%) had normal bones. Among the 66 respondents who had attained education up to the Higher Secondary School Certificate level, 31 (46.97%) had osteoporosis, 22(33.33%) had osteopenia, and 13 (19.7%) had normal bones. Among the 37 respondents who had attained education up to undergraduate degree level, 9 (24.32%) had osteoporosis, 11(29.73%) had osteopenia, and 17 (45.95%) had normal bones. Finally, among the 17 respondents who had attained education up to graduate degree level, 5 (29.41%) had osteoporosis, 5(29.41%) had osteopenia while 7 (41.18%) had normal bones.

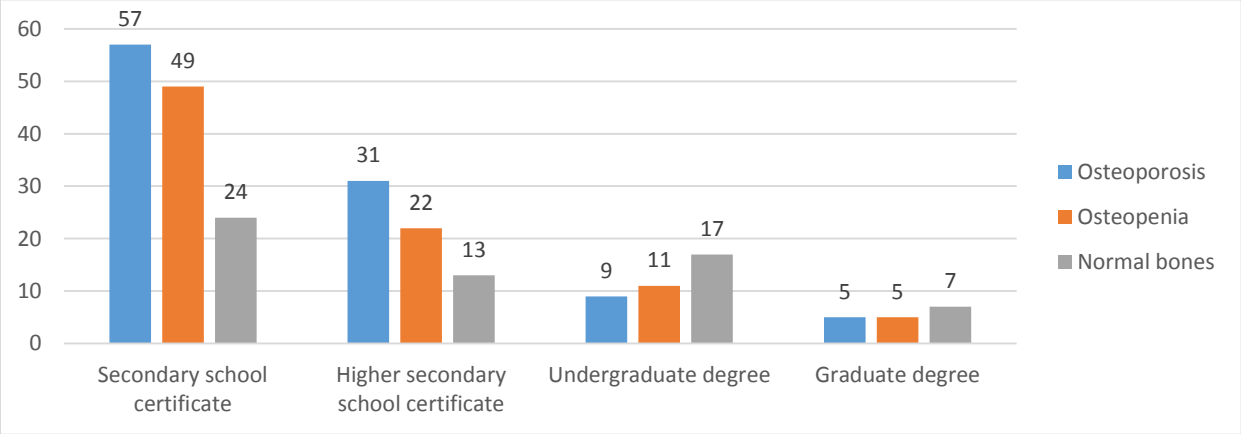


**Figure 4: Relationship between education level and occurrence of osteoporosis and osteopenia**

Female respondents were asked whether they had undergone hysterectomy. Out of the 166 respondents, 93 (56.02%) had undergone hysterectomy while 73 (43.98%) had not undergone a hysterectomy. Additionally, out of 93 who had undergone hysterectomy, 45(48.39%) had osteoporosis, 29(31.18%) had osteopenia and 19 (20.43%) had normal bones. Out of 73 who had not undergone hysterectomy, 32(43.84%) had osteoporosis, 23(31.51%) had osteopenia and 18 (24.65%) had normal bones as shown in figure 5.

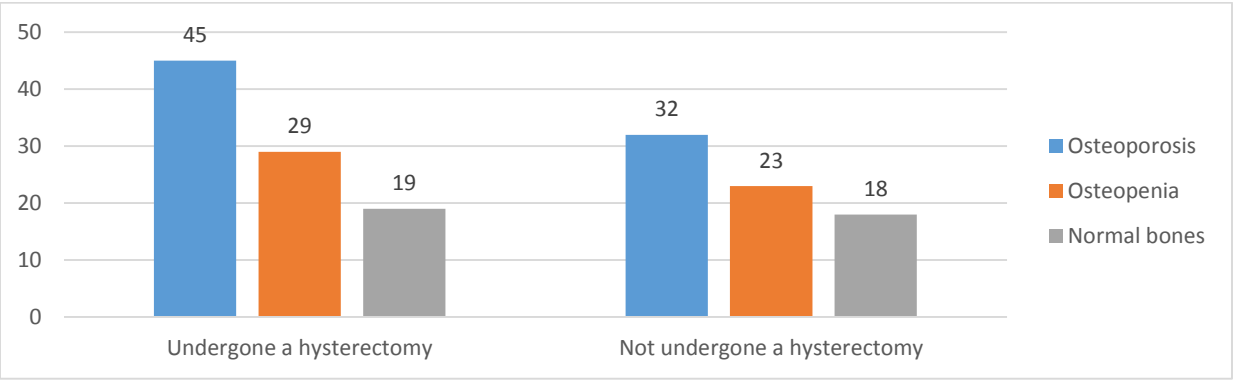


**Figure 5: Relationship between hysterectomy and occurrence of osteoporosis and osteopenia**

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The respondents were also asked about the duration of time they get exposed to sunlight per day. Out of the 250 respondents, 139 (55.6%) had daily exposure to sunlight for less than 2 hours while 111 (44.4%) had daily exposure to sunlight for more than 2 hours. Out of 139 respondents, 59(42.45%) had osteoporosis, 55(39.57%) had osteopenia and 25(17.99%) had normal bones. Out of 111 respondents, 41(36.94%) had osteoporosis, 32(28.83%) had osteopenia and 38(34.23%) had normal bones.

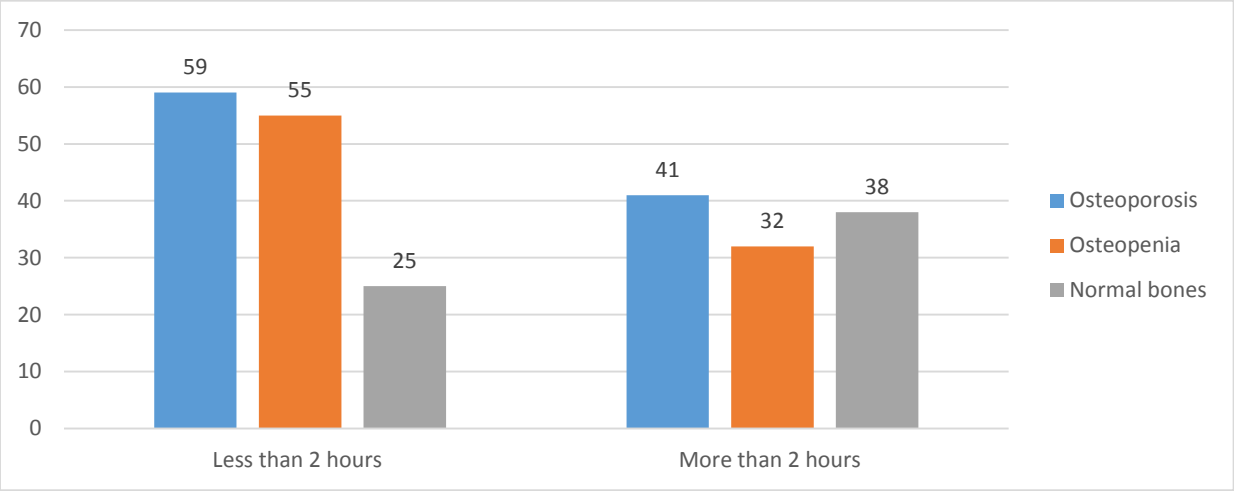


**Figure 6: Relationship between duration of exposure to sunlight and occurrence of osteoporosis and osteopenia**

The respondents were further asked about the intensity of their physical activities. Out of the 250 respondents, 135(54%) indicated that they have mild physical activities, 79(31.6%) indicated that they have moderate physical activities, and 36(14.4%) indicated that they have extreme physical activities. Out of 135 respondents, 62(45.93%) had osteoporosis, 58(42.96%) had osteopenia and 15(11.11%) had normal bones. Furthermore, out of 79 respondents, 37(46.84%) had osteoporosis, 28(35.44%) had osteopenia and 14(17.72%) had normal bones. Finally, out of 36 respondents, 9(25%) had osteoporosis, 8(22.22%) had osteopenia and 19(52.78%) had normal bones.

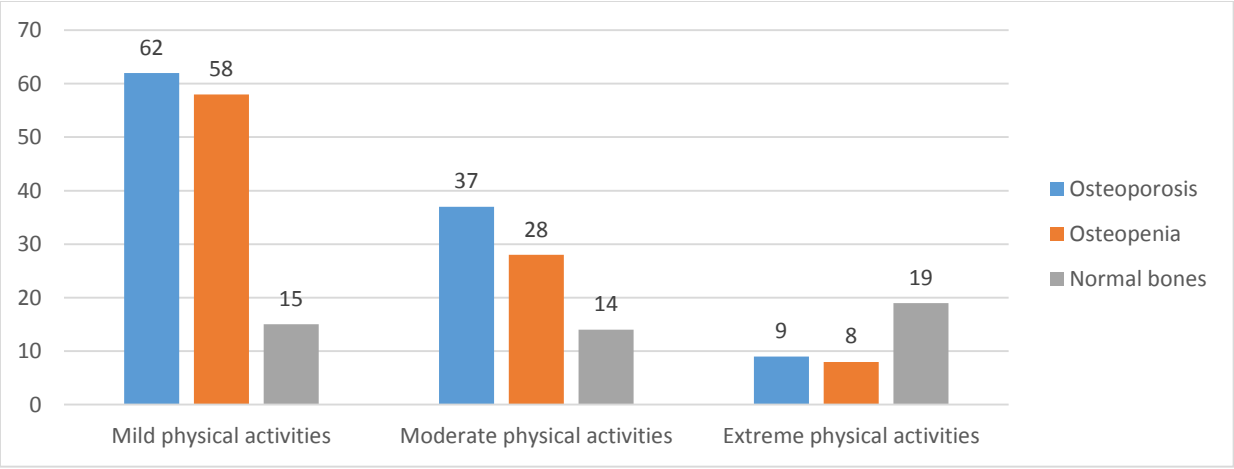


**Figure 7: Relationship between intensity of physical activities and occurrence of osteoporosis and osteopenia**

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The respondents were further asked about their musculoskeletal pain sites. Out of the 250 respondents, 130(52%) indicated that they had low back pain, 66(26.4%) indicated that they had knee pain, 37(14.8%) indicated that they had both low back pain and knee pain, and 17(6.8%) indicated that they had arm pain. Among the 130 respondents who had low back pain, 57 (43.85%) had osteoporosis, 49(37.69%) had osteopenia and 24 (18.46%) had normal bones. Among the 66 respondents who had knee pain, 31 (46.97%) had osteoporosis, 22(33.33%) had osteopenia, and 13 (19.7%) had normal bones. Among the 37 respondents who had both low back pain and knee pain, 17 (45.95%) had osteoporosis, 11(29.73%) had osteopenia, and 9 (24.32%) had normal bones. Finally, among the 17 respondents who had had arm pain, 7 (41.18%) had osteoporosis, 5(29.41%) had osteopenia while 5 (29.41%) had normal bones.

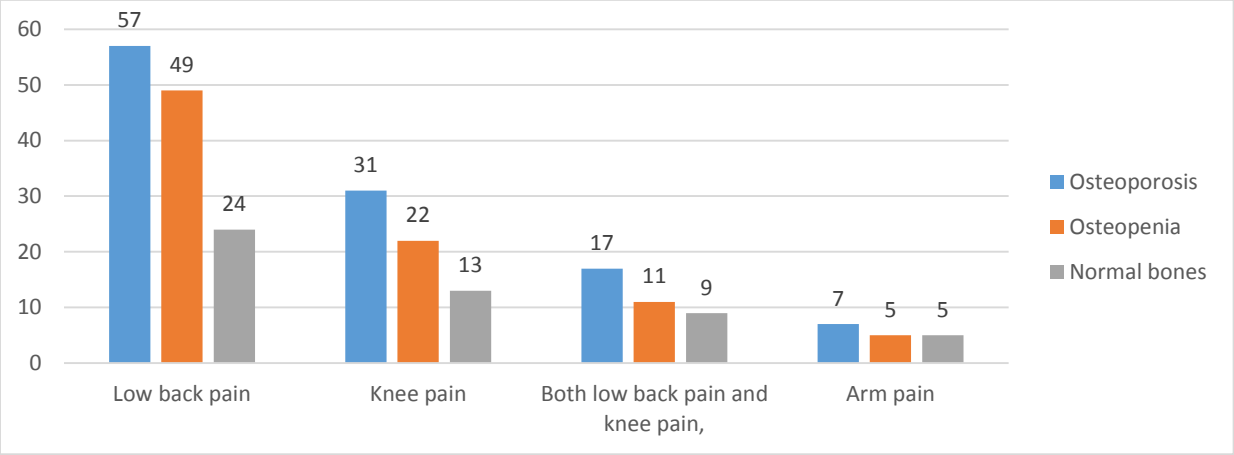


**Figure 8: The distribution of musculoskeletal pain sites and occurrence of osteoporosis and osteopenia**

## CONCLUSION

In this study, it was found that osteoporosis and osteopenia are highly prevalent in persons above 55 years presenting with various conditions of musculoskeletal pains. It was found that low back pain, and combined low back pain with knee pain were the common presentations. Majority of the population have very low exposure to sunlight (71%). It was found that Calcaneal QUS can be used as a baseline screening tool to assess BMD. Positive association was found between increased age, female gender, menopause, low educational status, hysterectomy status & low BMD Score.

## RECOMMENDATION

The study recommends people above 55 years to undergo screening to facilitate early detection of osteoporosis and osteopenia. This will help them in getting appropriate and timely management of symptoms and improve their quality of life.

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**Conflict of Interest**

The authors declare no conflict of interest.

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