

# Prevalence of Risk of Osteopenia and Osteoporosis among Adult Women in Ankleshwar Region - A Cross Sectional Study

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**Abstract:** ***Introduction:** Osteoporosis is a condition in which the ratio of bone mass to its volume is decreased. It is defined as a systemic skeletal disease characterised by low bone mass and architectural deterioration of bone tissue with increase in susceptibility to fracture. Osteopenia is defined as T score between - 1 to - 2.5 hence, it is the stage not as severe as osteoporosis but are at risk if not taken care of. Many factors are responsible for the cause and similarly also have many managements that can be taken into consideration to overcome the possible causes if taken at the right time. Osteoporosis decreases the quality of life of a person and can be left unmanaged if an individual is not “thoroughly diagnosed” for the cause. **Method:** This study includes women from Ankleshwar region at Sardar Patel heart institute under the age group of 20 to 45 as many studies have concluded that adult women are also at risk of osteopenia due to many related factors. We took 100 samples of apparently healthy individuals and tested their BMD with the help of QUS densitometer. **Result:** It was found out that 57 females out of 100 were diagnosed with osteopenia, among which 41 out of 69 were aged 20 - 29 and rest 31 were from the age group of 30 - 45 and 16 were found having osteopenia. It was also ruled out that decrease in BMI can lead to increased chances of an individual to have osteopenia. **Conclusion:** Thus, the significant number of samples was found osteopenia among young population also. And if any preventive measures are not introduced to this population, then they may have to suffer from the complications regarding the same cause.*

**Keywords:** Osteoporosis, Osteopenia, Prevalence, Adult Women

## 1. Introduction

In India, fractures are now recognised as a significant cause of illness and mortality in the elderly. According to the 2001 census, there are around 163 million Indians over the age of 50; by 2015, this number is projected to rise to 230 million. Even conservative projections indicate that among them, 10% to 15% of men and 20% of women would have osteoporosis. Therefore, there would be about 25 million people who would be under the prevalence of osteoporosis. The number could rise to 50 million if research indicates that having less bone density increases the risk of fracture, as is projected. <sup>(1)</sup> there are high chances for young women to have osteopenia due to the changes in life style like decrease in physical activity, less exposure to external environment and decreased level of nutrients in diet. <sup>(14)</sup>

Osteoporosis is a condition in which the ratio of bone mass to its volume is decreased. <sup>(2)</sup> Osteoporosis, currently defined as a systemic skeletal disease characterised by low bone mass and micro - architectural deterioration of bone tissue with a consequent increase of bone fragility and susceptibility to fracture, is recognised as a major health problem. <sup>(3)</sup> The wrist, spine, and hip are where osteoporotic fractures happen most frequently. Morbidity is particularly adversely affected by hip fractures. <sup>(4)</sup> The peak mass reached during growth and early adulthood and the rate of subsequent bone loss define the bone mass in geriatric phase of life. <sup>(3)</sup>

Osteoporosis have many more risks other than bone fractures prevailing with its existence and no treatment will

be proved effective unless and until patient is “completely attained”. <sup>(5)</sup>

Unattaining a multifaceted strategy for managing osteoporosis, many patients go on a downhill spiral that inevitably results in chronic pain, physical decline, and lowered quality of life.

It is actually emphasised in the report of the 2000 National Institutes of Health Consensus Conference on Osteoporosis that one can no longer hold the notion that osteoporosis is age, gender, and race specific. The research also mentioned how osteoporosis has financial, physical, and psychosocial repercussions that have a big impact on the person suffering as well as their relatives and their surroundings.

For the one who suffers, osteoporosis can also lead to severe psychological problems. these reactions manifest in female patients with severe illness and spinal deformity. Anxiety and depression are two of the psychologic issues related to osteoporosis that are most frequently mentioned.

Pain, limited mobility, helplessness, and despair are among the many effects of that fracture when it occurs. Women who think that osteoporosis and associated fractures are a natural part of ageing are particularly vulnerable to anxiety. It was discovered that clinical osteoporosis and poor bone mineral density were strongly connected with worries of future fractures and the ensuing disability.

Depression is the second emotional response that is frequently linked to osteoporosis and inadequate bone

density. Additionally, there appears to be a direct correlation between depressive symptoms and osteoporosis.

Osteoporosis has detrimental effects that extend beyond the physical and psychological spheres. They also have an impact on how people live their social lives. Osteoporosis can make a person less capable of handling social roles, even when it is very moderate.

Another type of social element that is impacted by long-term diseases like osteoporosis is social isolation. Social role loss and social isolation can happen simultaneously or as a result of one another. People with long lasting illnesses start to restrict their choice of activities as their anxiety about the future grows. This implies that maintaining patients' social roles while they are unwell with a chronic condition is crucial to their ongoing wellbeing and quality of life. <sup>(5)</sup>

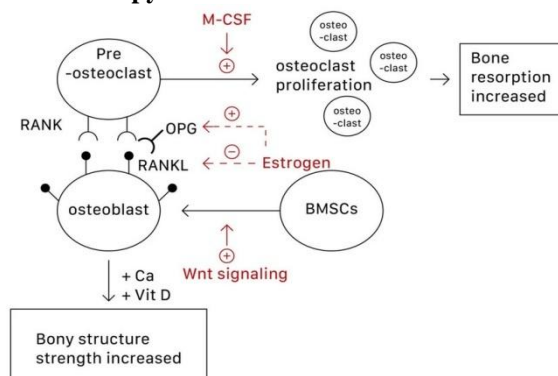
The main objective of osteoporosis treatment for patients is to effectively prevent fractures by minimising the loss of bone mass. In addition to pharmaceuticals, other methods of treating or preventing osteoporosis include dietary changes, physical activity, fall prevention techniques, and physical modalities. People who have osteoporosis can benefit from any one of these elements either separately or in combination. <sup>(6)</sup>

Osteopenia is defined by bone densitometry as a T score -1 to -2.5. WHO <sup>(7)</sup> The amount of bone health acquired during the stage of skeletal development essentially determines how much bone mineral density is present in the adult female skeleton. <sup>(2)</sup>

Women's bone mass density is influenced by various factors like genetical factors, physical activity, nutrition and hormones. <sup>(2)</sup> There is a 92 percent likelihood that women with other risk factors for low bone mass, like less body weight, menarche at or after the age of 15 and sedentary life style, would have low bone mass or develop osteoporosis in later life. <sup>(8)</sup> When skeletal structure's porosity is increased the chances of fracture are raised, the most common areas affected are hip, wrist and spine. <sup>(2)</sup>

"Premenopausal phase" is defined as the time between attainment of peak bone mass and the onset of menopause, or approximately age 20 to 50. <sup>(9)</sup>

### Hormonal therapy



**Figure 1:** Hormonal therapy for osteoporosis

The mechanisms by which osteoblasts and osteoclasts are created, function, and lead to osteoporosis. M-CSF can encourage osteoclast growth, and Wnt signalling can encourage BMSCs to differentiate into osteoblasts. Osteoclast genesis cannot be activated by the combination of RANKL and RANK since oestrogen can both enhance OPG secretion and reduce RANKL secretion. OPG, RANKL, or receptor activator of nuclear factor - B (NF - B) ligand, are acronyms for bone marrow stromal cells. <sup>(6)</sup>

### Pharmacological treatment

Women with simply low BMD and no additional risk factors are probably not in need of any medication. Those with low BMD due to secondary reasons, significantly low BMD, or fragility fractures may need to be treated with anti-resorptive drugs. <sup>(10)</sup>

### Nutritional therapy

A crucial component of human physiology is calcium. Calcium hydroxyapatite crystals strengthen bones by combining with the predominate type I collagen matrix in bone. Additionally, the interaction between vitamin D and the parathyroid hormone, which helps maintain calcium homeostasis between the blood and bones, can improve the intestinal absorption of calcium. <sup>(8)</sup>

### Lifestyle <sup>(6)</sup>

Bone health benefits include maintaining a healthy weight, quitting smoking, and engaging in regular weight-bearing activity. Compared to non-smokers, people with a history of smoking have an increased risk of fractures. Bone mass is decreased by low calcium intake, high in sodium consumption, and heavy alcohol and soda use.

### Fall prevention <sup>(6)</sup>

Complete management is required for fall prevention, including diet, prescription medication, lifestyle changes, activity regimens (exercise), and other factors. It is advised to use staircases, wall-mounted handrails, and bright lighting. They can effectively avoid sliding and falling outdoors, rubber soles with a reasonably high frictional force must be used.

### Role of exercises in osteoporosis. <sup>(6)</sup>

Exercise: - Exercise can prevent or delay the onset of osteoporosis because the mechanical stress it produces can trigger certain bone tissue deformations that in turn activate osteoclasts and osteoblasts. Mechanical stress is converted to a signal that drives DNA synthesis and ultimately raises BMD. Exercises for coordination, balance, and muscle building are all highly advised. running, fast walking, and drop jumping, stimulate bone formation and raise BMD. Exercise with a high impulse stimulates bone tissue far more strongly than exercise with a low impulse. Additionally, resistance training can improve BMD. Intense resistance-aerobic exercise or progressive resistance exercise enhances BMD in women during or after menopause by 1%–4% year. In premenopausal women, high-resistance exercise is useful in enhancing bone integrity, fostering muscle performance, and increasing dynamic equilibrium. This form of training may be an effective, practical, and affordable strategy to prevent osteoporosis and osteoporotic fractures if done regularly. <sup>(11)</sup>

**Physical modalities**<sup>(6)</sup>

Low - Intensity Pulsed Ultrasound: - In order to apply a mechanical stimulus on biological tissues, ultrasound can be directed towards them. Low intensity ultrasound has the ability to control bone cells, promoting osteoblast development and activity while inhibiting osteoclast development and activity. a 200 s burst with a frequency of 1.5 MHz

Electrical modalities: - Direct current, inductive coupling, including pulsed electromagnetic fields and coupled magnetic fields, and capacitive coupling are the three types of electrical stimulation methods that have been approved for clinical use. Electrical potentials are produced when bone is mechanically stretched.

The conscience, compact, and accessible ultrasonic bone densitometer calculates a metric referred to as net time delay to provide a genuine measurement of bone mass density.<sup>(4)</sup>

The discrepancy among the travelling time of an ultrasonic wave through to the heel and a fictitious item with an equivalent heel thickness but only comprising soft tissue is known as the net time delay.<sup>(4)</sup>

This characteristic is equal to the bone mass value as determined by dual - energy X - ray absorptiometry (DXA) scanners since it is sensitive to the entire amount of bone present in the transmission channel. After the ultrasound waves have travelled through the heel, it analyses them and gives the user an evaluation of a value.<sup>(4)</sup>

It has accuracy that levels between 73% and 90%. DXA scanners, however, are up to 90% sensitive.

Although the gadget is less reputable than DXA, it is nevertheless a useful tool for detecting potential calcaneus fractures.<sup>(12)</sup>

For many reasons, ultrasonic waves have been suggested as a DXA substitute. These characteristics comprise no ionization, affordability, and ease of usage. Additionally, since ultrasound interacts with bone differently from electromagnetic waves because it is a mechanical wave, it may be able to offer additional components of bone strength, particularly its trabecular architecture.<sup>(4)</sup>

Osteoporosis avoidance, detection, and treatment of its problems in later life all depend on an awareness of the bone mineral density (BMD) in a community.<sup>(13)</sup>

As low bone mass is a significant predictor for post - menopausal osteoporosis, detecting premenopausal women population who are at higher chances for osteoporosis and associated fractures is possibly effective in minimizing the effect or occurrence of illness from this disease.<sup>(8)</sup>

**Aims and Objectives****Aim**

- The aim of this study is to introspect the potential risk for osteoporosis and osteopenia in adult woman.

**Objectives**

- To check bone mineral density in adult woman.
- To take account of adult population with the potential risk of osteopenia and osteoporosis.

**2. Methodology**

A Cross - sectional observational study was conducted using 100 females with an age limit of 20 - 45 years from Sardar Patel Institute Ankleshwar, Bharuch.

**Inclusion criteria:**

Adult woman with age group of between 20 to 45.

**Exclusion criteria:**

- Pregnant woman
- Woman above 45 years of age
- Woman with any other pathological conditions (Diagnosed Already)
- Women who are already diagnosed with osteoporosis.

**Data collection tool:**

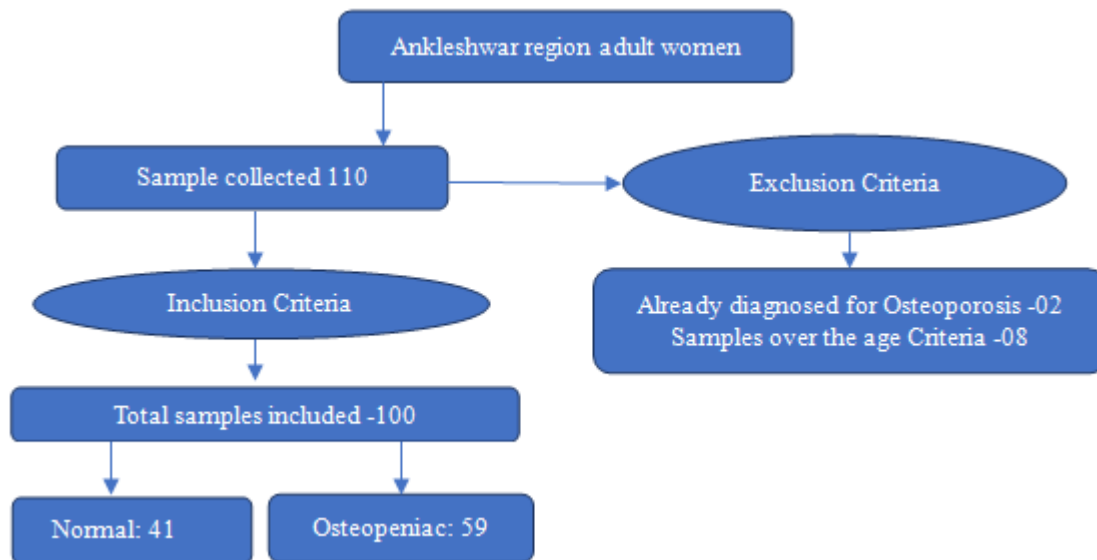
Ultrasound Bone Densitometry

**3. Procedure**

To pursue the intended result the procedure followed for the research is as follows. We collected the various articles from the varied sources and got to know that the low bone mass is very much prevalent since long time and hence to alleviate the same cause many interventions are made in action. So, after reviewing the literature we decided to check for the prevalence of low bone mineral density in adult women. The main motive for selecting such population was, early diagnosis of risk can help avoid the possible future consequences of major loss.

The device used for the process is Ultrasound Bone Densitometer. Women who were in their adult phase and from Ankleshwar region were included in the study. The data is collected on the basis of Inclusion and Exclusion Criteria.

Data analysis is done on the basis of the T - score obtained from the result of ultrasound bone densitometer. According to the T - score population is divided into category of normal, osteopenic and osteoporotic and further the data is analyzed based on statistical counting of the acquired results.



#### 4. Data Analysis and Result

In above presented study maximum number of samples were collected from the age group of 20 - 24 yrs. followed by 25 - 29, 30 - 34, 40 - 45 and 35 - 39. The mean age of the population was 27.82 and mean BMI of the population was 21.38.

Statistical analysis was done with the help of SPSS version 23.0. Continuous variables were described using mean and standard deviation. Categorical data were analysed by using frequency analysis and compared by using chi - square test.  $P < 0.05$  was considered statistically significant.

43% of women were found normal according to WHO T score criteria, rest 59% were diagnosed with osteopenia. Among the age group of 20 - 24 out of 40 samples 24 were having osteopenia, in 25 - 29, 17 out of 29 were diagnosed for the cause, from 30 - 34 the number was 6 out of the total number of 12, from 35 - 39 it was 5 out of 9 and last from 40 - 45 highest proportion of 7 out of 10 were found having osteopenia.

**Table 1:** Bone Mass Density (BMD) distribution according to age

Age group	Normal	Osteopenia	Total
20 - 24	16	24	40
25 - 29	12	17	29
30 - 34	06	06	12
35 - 39	04	05	09
40 - 45	03	07	10

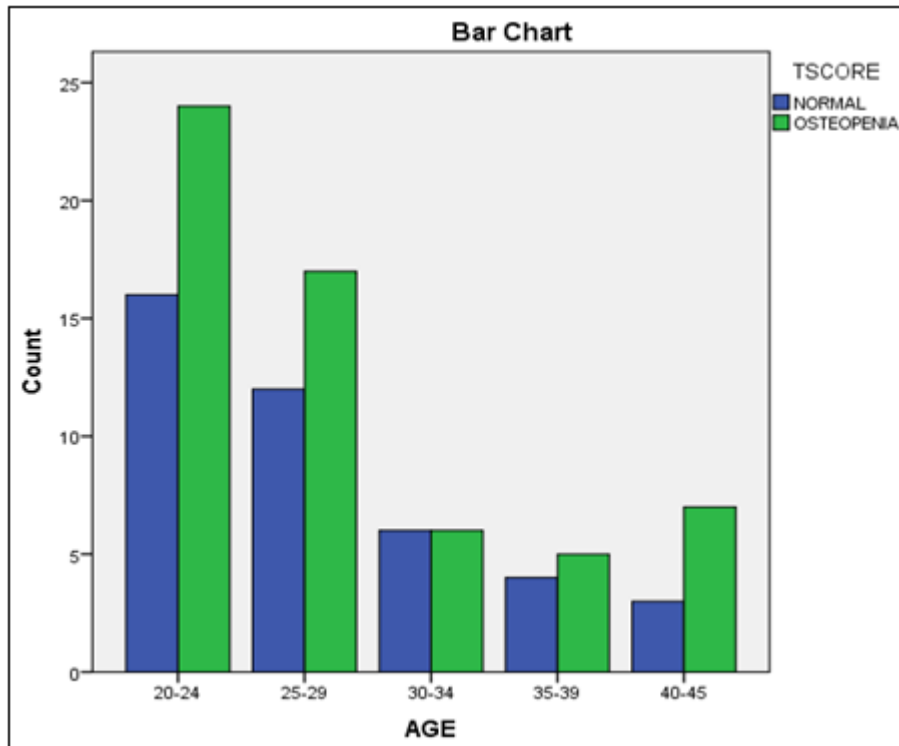
After considering the BMI of same individuals it was found out that all 33 samples that were underweight were osteopenic. 23 out of 53 normal individuals were suffering from osteopenia and 3 out of 14 preobese population were found osteopenic. Hence, it was ruled out that BMI of an individual can affect the bone health of any apparently healthy individual.

**Table 2:** BMI distribution

Age group	Under weight	normal	Over weight	Obese
20 - 24	14	22	04	-
24 - 29	10	16	03	-
30 - 34	03	05	04	-
35 - 39	02	04	03	-
40 - 45	04	06	-	-

**Table 3:** Chi - square test between age and T - Score (age\*T - score)

	Value	df	Asymptomatic significance
Pearson chi - square	.964a	4	.915
Likelihood ratio	.977	4	.913
N of valid cases	100		



Graph 1: Age\* T - score distribution

## 5. Discussion

From the reviewed literature we got to know that osteoporosis is leading cause for weak bone health and fractures in elderly women.

Various prevalent researches are done in different available study settings and criteria. However, all have stated that with increase in age the bone health is decreased especially in women. There may be numerous factors associated for the results found. However, we are not dealing with the concern of all the factors, we were focused mainly on the BMI and BMD of apparently healthy individuals. So, we conducted a survey through QUS bone densitometry on women aged from 20 - 45 years of age in ankleshwar locality. Hence, present study is to get an estimation about how many adult women in stated area have risk of osteoporosis in their post-menopausal age.

Total 110 samples were collected and keeping research criteria in mind 100 data sample of women between their age of attaining peak bone mass and menopause were considered for the further analysis. Hence according to the data analysis 59% out of 100 were found suffering from osteopenia. And two out of excluded 10 samples were found osteoporotic. Categorizing it in five parts in age group of 20 - 24, 60% of total 100% of samples collected in that age group were diagnosed with osteopenia, in individuals with 25 - 29 the percentage was 58.62%, in 30 - 34 it was 50%, among people aged 35 - 39 it was 55.55% and lastly among 40 - 45 the percentage was 70%.

So, it can be ruled out of that, there is significant young female population that is diagnosed with osteopenia and is at the high risk of osteoporosis in later life span.

Research done by Rabail Rani Soomro, Syed Imran Ahmed and Muhammad Khan published in 2017 also ruled out same result from Karachi population that there is significant frequency of osteopenia in adult population.<sup>(14)</sup>

## 6. Limitations

- Study includes a greater number of samples from young age comparatively.
- Individuals with Post - partum pregnancy were not excluded and they may show deflection from their normal bone mass and body mass index.
- All the samples were taken from only one setup.

## 7. Conclusion

The present study concludes that QUS is very easy approachable screening tool and utilizes WHO scoring criteria to provide results.

It has become very important to screen the possibilities for osteoporosis in adult women as it has been found out through the study results that there is a significant number of populations that is suffering from osteopenia. The study has comparatively more young population leading to the results obtained but if any further study in future takes place with equally distributed age group, the results may vary.

Hence, it is proved that reduction in bone mass is growing remarkably in young female population and may serve as a cause for frequent fractures and reduction in quality of life in older age if left undiagnosed.

## 8. Future Recommendations

- May add some advices for management if person was found having low bone mass.
- Can perform on larger area of populations in Gujarat.

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