



# **THE ROLE OF BONE RESORPTION MARKERS IN EARLY DETECTION OF OSTEOPOROSIS IN PERIMENOPAUSAL WOMEN OF MANGALORE**

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## **ABSTRACT**

*Bone resorption markers are known to predicting the rate of bone loss in postmenopausal women . Many studies have shown that there is an increase in the bone resorption markers after menopause. The objective of the study was to study the markers of bone resorption in early detection of osteoporosis in perimenopausal women.*

*A sample size of 150 individuals were chosen during a period of 2 years of which 50 were premenopausal women, 50 were postmenopausal women without fracture and 50 were postmenopausal with fracture. Early morning urine sample between 5am and 9 am was collected and taken after adding a preservative (HCL:5ml/l of urine). Urinary Hydroxyproline - (Modified Neuman Logan method) and Urinary calcium (arserazo method) were estimated. Results were expressed as mean SD and range values. ANOVA was used for multiple group comparisons. Relationship between variables was measured by Pearson's correlation co-efficient.*

*Our study showed that mean values of Urinary hydroxyproline increased in postmenopausal women with fracture and without fracture when compared to the premenopausal women. This indicates that in this group there is more bone resorption . We conclude that biochemical markers of bone resorption are valuable tools of detecting osteoporosis as they reflect the activity level of the entire skeleton. . Hence early detection and prevention of osteoporosis will go a long way in improving the public health of the population , especially women .*

**Key words:** Osteoporosis, Urinary Hydroxyproline (Hyp), Urinary Calcium (Ca).

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## 1. INTRODUCTION

Osteoporosis is a condition that is characterized by low mass and micro architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. Total bone loss in osteoporosis may exceed 30 to 40%. In women there is a 15 to 18% lifetime risk of hip fracture after the age of 50 yrs versus 6% risk in men<sup>1</sup>. Increasing evidence suggest that the risk of osteoporosis and fracture is associated with increase bone resorption and measured by markers of resorption ie Hydroxyproline (Hyp). It is released into circulation during collagen degradation and may be measured in urine by high performance liquid chromatography (HPLC)<sup>6</sup>.

**Objective of the Study:** To study the markers of bone resorption in early detection of osteoporosis in perimenopausal women.

## 2. MATERIALS AND METHODS

This study was conducted in women attending the department of Orthopedics at Father Muller Medical College Hospital, Mangalore from 2013- 2016. The study included 50 Pre-menopausal and 100 Postmenopausal women. They were divided into 3 groups

**Group 1 :** Healthy pre-menopausal women 50

**Group 2 :** Healthy women without history of fracture after menopause 50

**Group 3 :** Healthy women with history of recent fracture after menopause 50

### 2.1. Exclusion Criteria

1. Chronic illness like diabetes mellitus, renal insufficiency, malignancy, liver disease
2. On treatment with anticonvulsants , glucocorticoids & hormone replacement therapy ,
3. Immobilized patients and any pregnant women .

### 2.2. Method of sample collection

Urine sample: early morning urine sample between 5am and 9 am was collected and taken after adding a preservative (Hcl:5ml/l of urine).

### 2.3. Estimation of urinary calcium by Arsenazo method Principle<sup>2</sup>

At neutral pH calcium ions form with Arsenazo III a complex, the color intensity which is directly proportional to the concentration of calcium in the sample. This was estimated by using commercially available kit on an auto analyser CAFA 200 at a wavelength of 650nm.

### 2.4. Estimation of urinary Hydroxyproline by modified Neuman and Logan method<sup>3</sup>

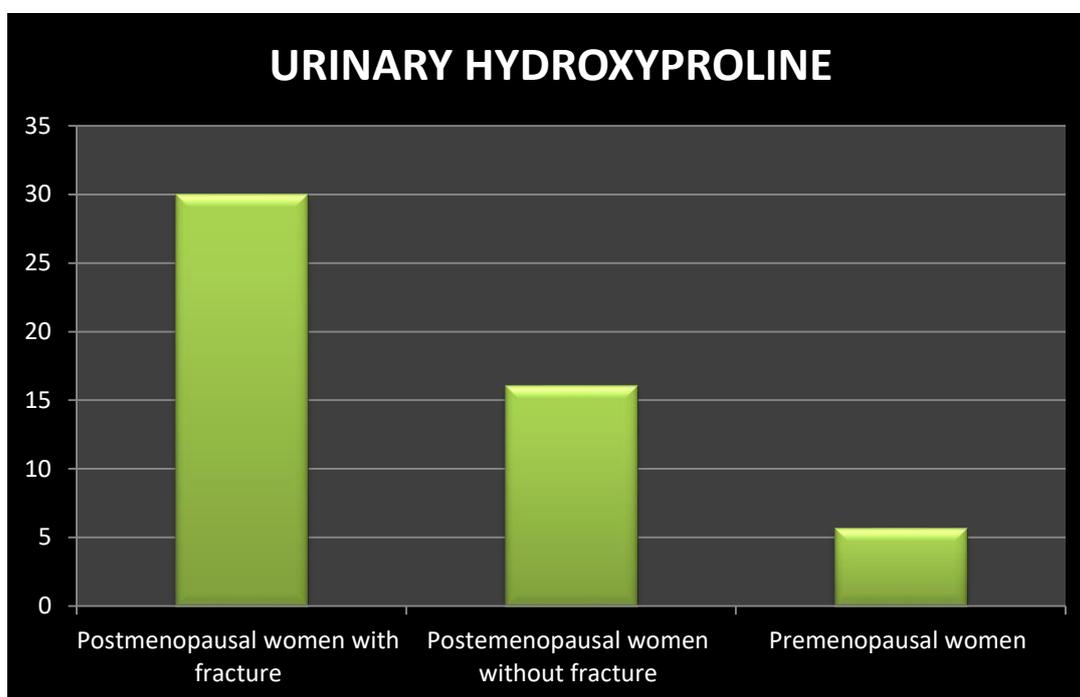
Hydroxyproline is treated with CuSO<sub>4</sub> and H<sub>2</sub>O<sub>2</sub> in an alkaline solution. This results in the formation of Apyrroline-4-carboxylic acid, which upon acidification is converted to pyrrole-

2-carboxylic acid. The latter condenses with p-dimethylaminobenzaldehyde to give the coloured complex which is measured at 540 nm

### 3. RESULTS

**Table 1** Comparison of urinary hydroxyproline ( $\mu\text{g/ml}$ ) between premenopausal women, postmenopausal women without fracture and postmenopausal with fractures.

Age	N	Mean	Std Deviation	F	P
Postmenopausal women with fracture	50	30.02	$\pm 5.44$		
Postmenopausal women without fracture	50	16.10	$\pm 3.22$		
Premenopausal women	50	5.71	$\pm 2.58$	239.019	<0.001

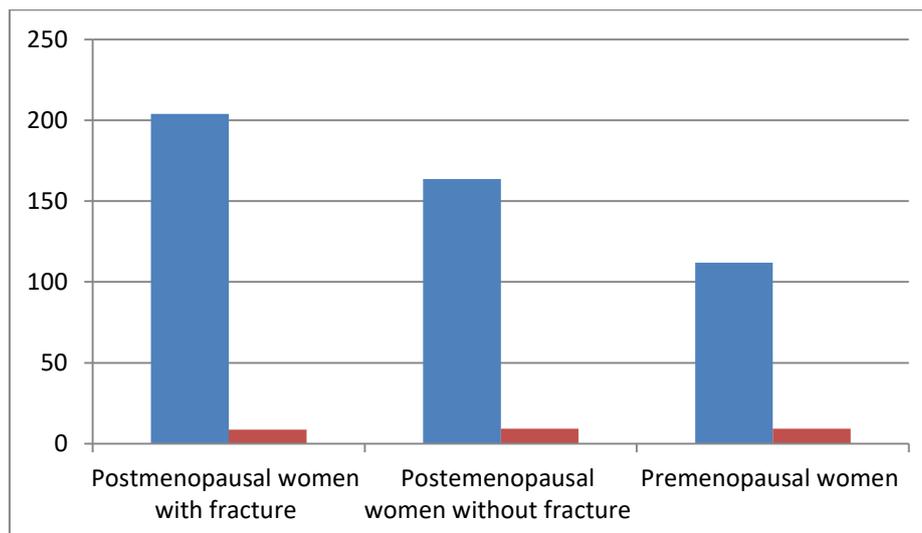


**Figure 1** Comparison of urinary hydroxyproline levels ( $\mu\text{g/ml}$ ) between premenopausal women, postmenopausal women without fractures and postmenopausal women with fractures

**Table 2** Comparison of urinary calcium ( $\text{mg/ml}$ ) between premenopausal women, postmenopausal women without fracture and postmenopausal with fractures

Age	N	Mean	Std Deviation	F	P
Postmenopausal women with fracture	50	203.92	$\pm 20.90$		
Postmenopausal women without fracture	50	163.72	$\pm 18.11$		
Premenopausal women	50	111.96	$\pm 9.27$	187.216	<0.001

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**Figure 2** Comparison of urinary calcium (mg/ml) between premenopausal women, postmenopausal women without fracture and postmenopausal with fractures

### 4. DISCUSSION

Osteoporosis is a condition that is characterized by low bone mass and micro architectural deterioration of bone tissue. Postmenopausal women are more for osteoporosis.

In postmenopausal women with osteoporosis, biochemical markers of bone formation decreases and biochemical markers of bone resorption increases. This is because there is more osteoclastic activity when compared to the osteoblastic activity after menopause.

This study was conducted to know the role of markers of bone resorption in early detection of osteoporosis. Urinary hydroxyproline was the main resorption marker that was measured. Around 10% of hydroxyproline released during bone resorption reaches the urine in free or peptide-bound forms. Urinary hydroxyproline has long served as the marker of bone resorption<sup>4</sup>. We found statistically highly significant increase in urinary hydroxyproline in late postmenopausal women with fractures when compared to early postmenopausal women and pre – menopausal women. In late postmenopausal women with established osteoporosis bone formation is less than bone resorption which is reflected in the form of low serum osteocalcin levels and high urinary hydroxyproline levels. Sachdeva. A, Seth.S, Khosla A.H<sup>1</sup> et al studied common biochemical markers of bone turnover in postmenopausal women. They observed statistically highly significant increase in excretion of hydroxyproline in postmenopausal women as compared to the premenopausal women. This increase was statistically highly significant. Their findings are similar to the findings in the present study.

### 5. SUMMARY & CONCLUSION

Osteoporosis is a condition that is characterized by low bone mass and micro architectural deterioration of bone tissue<sup>5</sup>. Postmenopausal women are more prone for osteoporosis. In this study, in postmenopausal women with or without fracture, urinary hydroxyproline level was found to be elevated when compared to the premenopausal group. This indicates that in this group there is more bone resorption after menopause. We conclude that biochemical markers of bone resorption are valuable tools of detecting osteoporosis as they reflect the activity level of the entire skeleton. Early detection and prevention of osteoporosis will go a long way in improving the public health of the population, especially women.

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