

Sports Training and Serum Osteocalcin in Young Athletes of Manipur

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Abstract: The purpose of the study is to assess the effect of exercise on bone turnover by measuring serum osteocalcin level in young trained male and female athletes in Manipur and to assess the relationship between serum osteocalcin concentration with age, sex and types of sports of the participants. 50 young athletes (25 women and 25 men) ages ranging from 18 to 21 years were selected from Sports Authority of India, Manipur; the sedentary age-matched non-athletes (N=10) were selected from the general medical student population. Serum osteocalcin was estimated using EDMTM Osteocalcin(1-43/49) Specific ELISA Kit, Epitope Diagnostics, Inc. USA.

Significantly higher mean±SD serum osteocalcin concentration was seen in athletes (22.97±6.36) than non-athletes(11.68±5.60). On comparing the different age groups of athletes ranging from 18yrs to 21 yrs, no significant difference in serum osteocalcin was found. However, male athletes had significantly higher serum osteocalcin (26.07±5.29) than in female athletes(19.88±5.89). In hockey players (N=21) serum osteocalcin level was 26.41±5.40, runners(N=18) was 19.94±5.51 and in cyclist (N=11) it was 21.33±6.64.

Index Terms: Bone turnover, osteocalcin, osteoblast, sedentary age-matched

I. Introduction

A variety of biochemical assays that reflect the activity of osteoblasts (the boneforming cells) and osteoclasts (the bone-resorbing cells) have been developed for clinical use. They have helped increase our understanding of the bone remodeling cycle, the pathogenesis of skeletal disorders, and the response of these disorders to therapy.¹⁻⁴

Osteoblasts are mononuclear cells that attach to bone surfaces and form new bone, most commonly at sites that recently underwent resorption. Markers of bone formation are measured in serum. Some are enzymes or other proteins secreted by osteoblasts, others are byproducts of type I collagen deposition. They are- Total alkaline phosphatase, bone alkaline phosphatase, osteocalcin and procollagen type I propeptides. Whereas osteoclasts are multinucleated cells that resorb bone.⁵⁻⁸ Markers of bone resorption are measured in serum or urine. They are- Hydroxyproline, collagen cross-links, pyridinolines and cross-linked telopeptides.⁹⁻¹⁰

Physical activity has been suggested as one of the determinants of bone turnover and to prevent the involuntal age related bone loss. Comparisons between trained subjects and untrained controls have demonstrated the influence of exercise on bone turnover. The relatively new development of assays for circulating biochemical markers of bone turnover now allowing us to gain greater mechanistic insight into the effects of factors like exercise and maturation on bone development.¹¹⁻¹⁴

Although the majority of newly synthesized osteocalcin is deposited into bone matrix, a small amount can be detected in blood, and it is this characteristic that has led to its current clinical use as a specific index of osteoblastic activity. It is the most abundant and most widely studied of the non-collagenous proteins in bone. It is rapidly cleared from the circulation. Although clearance occurs predominantly in the kidney some metabolism is also seen in the liver but the degradation of the protein is clearly slower.¹⁵

As the result of previous workers have suggested that serum concentration of osteocalcin may be influenced by the following factors: demographic factors (age and sex);¹⁶ physiological and clinical factors (exercise, menopause, sample handling, diurnal and day-to-day variability, deficiency of vitamin k and vitamin D); disease states (osteomalacia, osteoporosis, Paget's disease of bone, hyper- and hypothyroidism, multiple myeloma, liver diseases and diabetes); drugs (glucocorticoids, anticonvulsants, heparin, oral contraceptive use and other drugs affecting bone mass); lifestyle factors (excessive alcohol consumption, vitamin K and D deficiency , and physical exercise).¹⁷

II. Methodology

A Cross sectional study was conducted in the Department of Physiology, RIMS. 50 young athletes (25 women and 25 men) ages ranging from 18 to 21 years were selected from Sports Authority of India, Manipur ;the sedentary age-matched non-athletes (N=10) were selected from the general medical student population. Study duration-March 2013 to February 2014 EXCLUSION CRITERIA: Previous history of bone disease, any systemic illnesses , taking drugs affecting bone mass, smokers, excessive alcohol users, abnormal menstruation and pregnancy. Serum osteocalcin was estimated using EDM™ Osteocalcin(1-43/49) Specific ELISA Kit, Epitope Diagnostics, Inc. USA. Stastical analysis: SPSS-16.0 software, independent T-test, one way ANOVA and p value <0.05 taken as significance. Ethical approval from Institutional Ethical Committee RIMS

III. Results

Table-1

Comparison Of Mean±sd For Age, Height, Weight,bmi And Serum Osteocalcin Between athletes And non-athletes

Parameter s	Hockey Players (n=21)	Runners (n=18)	Cyclists (n=11)	Non-athletes(n=10)	P value
Age(Yrs)	18.90±1.22	19.33±0.97	19.82±1.16	18.80±0.78	NS
Height(cm)	158.45±4.30	161.14±6.23	157.85±4.36	161.40±5.31	NS
Weight(Kg)	53.09±6.77	56.89±5.43	54.61±5.98	56.60±8.28	NS
BMI(Kg/m ²)	21.23±1.66	21.86±1.04	21.83±1.43	21.87±3.57	NS
Osteocalcin (ng/ml)	26.41±5.40	19.94±5.51	21.33±6.64	11.68±5.60	0.000

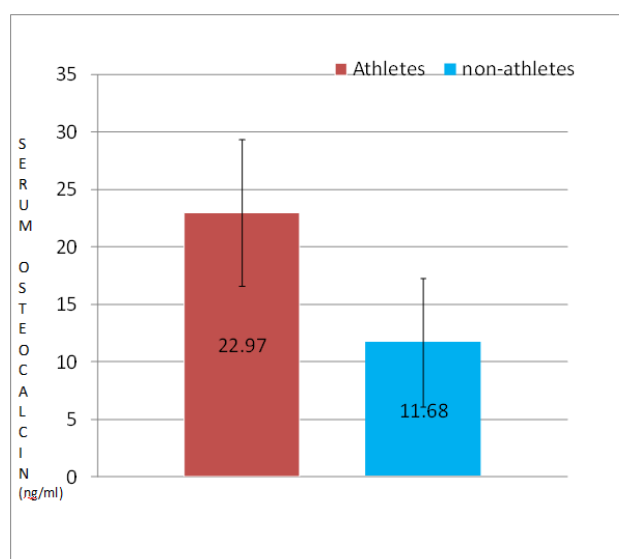
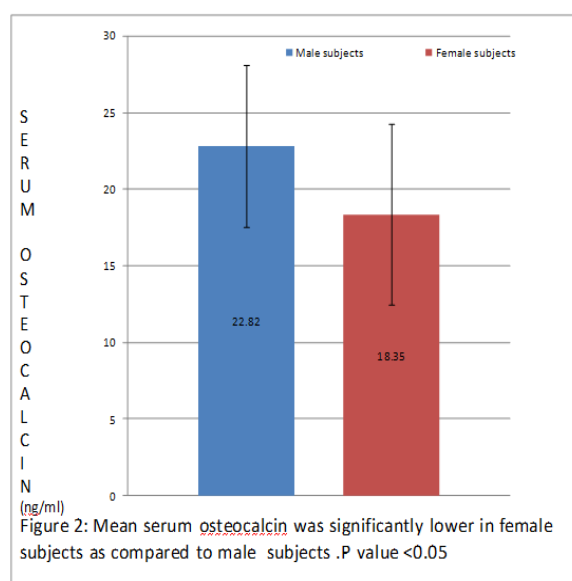
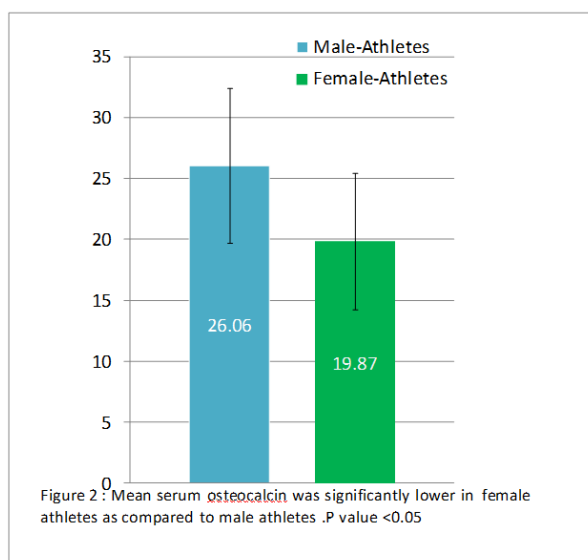


Figure 1 : Mean serum osteocalcin was significantly lower in non-athletes as compared to athletes .P value <0.05



IV. Conclusion

Significantly higher serum osteocalcin concentration was seen in athletes than non-athletes. In hockey players serum osteocalcin level was higher than runners and cyclist. However, male athletes had significantly higher serum osteocalcin than in female athletes. Serum osteocalcin was significantly lower in female subjects as compared to male subjects. The effect of physical activity on bone turnover markers in the growing skeleton has been poorly studied. The present study is particularly important because it examines and establishes certain effects of common physical activities on health. The present data also adds considerable support to the argument that exercise is extremely important and beneficial for high rate of bone turnover, reflected as elevated bone marker.

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