JOURNAL OF CURRENT TRENDS IN CLINICAL MEDICINE & LABORATORY BIOCHEMISTRY

ORIGINAL ARTICLE

Alkaline Phosphatase levels in Rheumatoid Arthritis and Osteoporosis in clinical practice

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ABSTRACT

Rheumatoid arthritis (RA) is an autoimmune disease that causes chronic inflammation of the joints. Osteoporosis is a major public health problem in India. In the clinical practice markers of bone resorption are excellent indices of disease activity in patients with osteoporosis due to menopause, immobulization or auto immune processes, pagets disease of bone or bone metastases. Markers of bone formation are excellent indices of disease activity in pagets disease, osteomalacia and rickets, osteoblastic bone metastases and to a lesser extent in renal osteodystropy. Alkaline phosphatase is a marker and it can be used in patients with osteoporosis and RA. An abnormality of the liver or particularly the bone isoform (bone specific Alkaline phosphatase) in serum can provide valuable diagnostic information. Many factors may cause increase of Alkaline phosphatase in serum. Most common are liver and metabolic bone diseases. Causes of high levels of bone Alkaline phosphatase include bone growth, healing fracture, acromegaly, osteogenic sarcoma or bone metastases, leukaemia, myelofibrosis. Our study will provide awareness in bone mineral calcium and in clinical practice to use the easy and the least expensive test to asses the disease activity and to prevent deformities and relieve symptoms of the long time disease patients. Alkaline phosphatase is used as a tumour marker for past many years and in future also.

KEY WORDS: Alkaline phosphatase, Bone disorders, Osteoporosis, Rheumatoid Arthritis, Biomarker.

Introduction

Biochemical marker of bone turnover is Alkaline phosphate provides clinically useful evidence of the normal and pathologic process that reflect bone cell activity on the skeleton. Standing the variety of biochemical markers that reflect the activity of osteoblasts and osteoclasts Alkaline phosphatase introduced in to clinical practice in 1929, was the first biochemical marker of bone turnover and it is still the best most widely used clinical marker in our study to aid in managing patients with a variety of skeletal disorders. We discussed those disorders.

Alkaline Phosphatase is found in the plasma membrane of Osteoblasts and in cells of the liver, kidney, intestine, spleen and placenta. Its function still not precisely known, but important role in osteoid formation and mineralization. In generally bone formation

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markers are measured in serum and reabsorption are measured in urine or serum. So in adults generally, about half of the ALP in the serum comes from bone [1], although there still is cross-reactivity of upto 20% between the bone liver enzymes[2]. Osteocalcin in the other large peptide, its fragments are released from the bone matrix during re-absorption assays for circulating Osteocalcin and its fragments reflect both bone formation and reabsorption [3].Osteoporosis is diagnosed on the basis of the mineral density. Osteoporesis is a major public health problem in the United States but now in India also.

The incidence of Osteoporosis and fractures is also increased in patients with Rheumatoid arthritis [4]. Influence of abnormalities in the bone formation and bone loss are not clear yet. Levels of the bone formation markers have been reported to be normal [5] elevated [6] or reduced [7]. Therefore in the present study we selected and studied 30 Rheumatoid arthritis patients and compared with normal controls.

Material and Methods

30 patients (15Male and 15 Female) were attended the Orthopaedic OP in the Sri Lakshmi Narayana Institute of Medical Sciences. 4ml of fasting blood sample were collected and centrifuged at 2000 rpm and serum was separated and 4ml of blood sample collected from 30 healthy volunteers. Concentration of Calcium and Alkaline Phosphatase was assayed.

Statistical analysis

P value < 0.05 is statistically significant. Comparison of correlation between control and patients collectively done by pearsion correlation. The statically analysis was done by SPSS 16.0 version.

Results

Results showed serum ALP levels were significantly increased in the patients with Rheumatoid arthritis when compared with controls (P<0.001), females were found noticeably increased levels than the males (P< 0.001) and above 50 years aged patients (n=10) were found increased levels compared with the less age (20-50) group patients (n=20).We found serum calcium levels were decreased in the Rheumatoid arthritis patients when compared with the controls (Table. 1).

Discussion

30 patients (15 male and 15 Female) were diagnosed clinically positive for RA factor. In our study females were more affected than males. Age ranged from 20 to 65 years mean age was 43 years. In our study above 50 years, 8 patients were there and are more affected than less age (<50 yrs) patients. Our study is supporting the general concept of this isoenzyme. That is normally elevated in growing children and adults over the age of fifty. Causes of high ALP levels because of this disease affects, the wrist and small joints of the hand and also other parts of the body besides the joints. People with Rheumatoid Arthritis may have fatigue, occasional fevers and a general sense of not feeling well [8].Previous studies reported, the concentrations of serum calcium and Phosphorus are usually reduced and the serum ALP activity was elevated[9]. So our reports also strengthening that the serum calcium levels were reduced and serum ALP were increased in these patients

The normal value of calcium 9-11mg/dl but in our study we found calcium levels were decreased with minimum of 7.8mg/dl and maximum of 8.2mg/dl and ALP normally high in adults 20-90 Iu/ lit and in children's 20-140 IU/lit. In our study we found minimum of 450 IU/lit and 493IU/lit is maximum range. But in our study we did not include the children, because adults have lower levels of ALP than children because children's bones are still growing (up to 14 yrs), during some growth

spurts, levels can be as high as 500 IU/lit [10]. Comparing with controls ALP levels were increased and calcium levels were decrease in these patients. An increase of ALP in serum can provide valuable diagnostic information.

Our study reports are correlating with patients signs and symptoms, then low serum calcium levels there may be muscle spasm in the hands, feet, throat and bone pains especially in the pelvis and legs. As bone softness, weight bearing may lead to bowing of the legs, compression of the vertebrate and flattering of the pelvis, weakened bones may break on slight injury. The incidence of Osteoporosis and fractures is also increased in patients with Rhematoid Arthritis [4, 11]. Many factors that may cause generalized Osteoporosis in inflammatory arthritis include circulating pro-inflammatory molecules, hormones alter calcium metabolism, and the effects of anti-rehumatic and anti-inflammatory drugs[12].

Here this disorder develops as consequence of vitamin D deficiency; abnormal Vitamin D metabolism or vitamin D resistance affects the calcium metabolism. So our results shown calcium levels were decreased. The insensitivity of Osteocalicin as an index of Osteoblastic activity is unexplained but could be related to the state of differentiation of the osteoblasts. Bone resorption markers are elevated in Vit-D deficiency [13].Serum ALP activity has been a useful marker of disease activity for many years, although, the new tumor markers except for serum Osteocalcin [14].

Conclusion

RA may begin at any age from infancy to the aged. The mean age of onset is about 43 years and the effect will be more in females comparing with males. Serum calcium is decreased and serum ALP is increased comparing with controls. Our study will provide awareness in bone mineral calcium and in clinical practice to use the easy and the least expensive test serum ALP activity, to asses the disease activity and to prevent deformities and relieve symptoms of the long time disease patients. i.e response to therapy. Our study concludes that Alkaline phosphatase used as a tumour marker for past many years can be used in future also.

Parameters	(M±SE) Patients (30)		Controls (30)		P value
	Male	Female	Male	Female	
Serum ALP	179.57±16.85	186.35±15.83	150.84±7.10	153.92±7.25	P<0.001
Serum Calcium	8.13±0.75	8.10±0.78	8.23±0.89	8.01±0.91	P<0.001

Table 1. Showing Alkaline Phosphatase and Calcium levels in patients and controls, Values are expressed in Mean ± SEM.

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