

## Increase in serum alkaline phosphatase due to fatty meal in undergraduate students of Khyber Medical University, Khyber Pakhtunkhwa

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### Abstract

**Objective:** To evaluate the effect of fatty meal on intestinal alkaline phosphatase.

**Methods:** The cross-sectional study was conducted at Khyber Medical University, Peshawar, Pakistan from March to April 2014 and comprised young healthy individuals 18-25 years of age. Whole blood samples were collected from the subjects in ethylenediaminetetraacetic acid anti-coagulated and plain serum tubes. For blood group analysis, blood group anti sera were used, while for serum alkaline phosphatase, a chemistry analyser was used. Alkaline phosphatase levels in the blood before and after breakfast were compared.

**Results:** Of the 177 subjects, there were 139(78.5%) men and 38(21.4%) women. Mean fasting alkaline phosphatase level was 144.22+/-75.57, while mean random value was 174.15+/-96.70 (p=0.001).

**Conclusion:** Serum alkaline phosphatase must be analysed in fasting state early in the morning.

**Keywords:** Intestinal ALP, ABO, Fatty meal. (JPMA 66: 378; 2016)

### Introduction

Alkaline phosphatase (ALP) is an ecto-enzyme in humans, which is attached through phosphatidyl inositol to the outer face of the plasma membrane.<sup>1</sup> Humans have three isoforms of alkaline phosphatase (IAP); intestinal, placental and tissue non-specific. IAP is further divided into two isoforms; a normal molecular weight isoform (NIAP) and a high molecular weight isoform (HIAP).<sup>2</sup>

Putkonen reported in 1930 that a person genetically could be secretor or non-secretor according to ABH blood group substances in body secretions.<sup>3</sup> The HIAP isoform of IAP is secreted in fasting only in the secretor's blood group, while NIAP isoform is secreted in both secretors and non-secretors after taking fatty meals. Only trace amount is present in the fasting serum.<sup>4</sup> Only NIAP isoform level is affected by fatty meal, while fatty meal has no effect on the activities of HIAP isoform. Increase in ALP activity was seen regardless of whether low- or high-fat meal was consumed. In B and O blood groups there were 8.8% and 5.2% increase in ALP activity if high-calorie meal was used compared to when low-calorie meal was used. In O and B blood group, fatty meal affects more ALP when blood is taken early morning in fasting state.<sup>5</sup>

Influence of diet on ALP has not yet been studied in Pakistani population. The current study, as such, was planned to evaluate the effect of fatty meal on intestinal NIAP.

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### Subjects and Methods

The cross-sectional study was conducted at Khyber Medical University, Peshawar, Pakistan from March to April 2014 and comprised young healthy individuals 18-25 years of age. Undergraduate students of BS Paramedical Sciences were enrolled through simple random sampling. Assuming the anticipated proportion to be 0.5 and absolute precision required as 0.07 and  $\alpha=0.05$ , sample size of 196 was calculated as:  $n = (Z_{1-\alpha/2} \times P \times q) / d^2$ .

After obtaining informed consent from all the subjects, whole blood samples were collected in ethylenediaminetetraacetic acid (EDTA) anti-coagulated and plain serum tubes. EDTA blood samples were used for blood grouping, and clotted blood for the analysis of serum ALP. For ALP, two types of samples were collected; one fasting sample and one random sample after breakfast. Every subject had one cup of tea with sugar and milk, one slice of bread and one fried egg in the breakfast comprising 342 kcal. For blood group analysis, blood group anti sera were used while for serum ALP, chemistry analyzer Hitachi 912 (Roche) was used.

For quantitative variables like age, laboratory tests like fasting and random ALP, mean and standard deviation values were calculated. For qualitative variables like gender and blood grouping, frequencies and percentages were calculated. ALP levels in the blood before breakfast and after breakfast were compared using paired sample t-Test. P value <0.05 was considered significant. For comparison of blood groups, analysis of variance (ANOVA) and post hoc tests were performed.

## Results

Against the sample size requirement of 196, we recruited 200 subjects, but the study was completed by 177(88.5%). Of them, 139(78.5%) were men and 38(21.4%) women. The subjects were divided into four blood groups A, B, O and AB (Table-1). The overall mean age was 21 years. Range: 18-25 years. Mean fasting ALP level was  $144.22 \pm 75.57$ , while mean random value was

**Table-1:** Gender distribution in blood groups Distribution in male and female individuals.

Blood Group	Male (Frequency %)	Female (Frequency %)
A	39(22.03%)	16(8.96%)
B	44(24.85%)	07(3.95%)
AB	15(8.4%)	06(3.36%)
O	41(23.16%)	09(5.08%)

**Table-2:** Mean, SD mean difference and % difference in fasting and random ALP values in ABO blood groups.

Blood Group	Mean Fasting ALP	Mean Random ALP	Mean Difference	% Difference
A	145	177	32	22.06
B	152	182	30	19.7
AB	143	179	36	25.17
O	137	168	31	22.62

ALP: Alkaline phosphatase.

$174.15 \pm 96.70$  ( $p=0.001$ ). Difference among the different blood groups was not significant ( $p=0.816$ ). The lowest mean fasting value of ALP was observed in blood group O and the highest in blood group B. Similarly, the lowest mean random value of ALP was seen in blood group O and the highest in blood group B (Table-2).

## Discussion

The study compared ALP values in fasting and random samples of different ABO blood groups in both genders. There was no study carried out before in Pakistani

population to check if diet can influence ALP value. It is important to know because random ALP is advised routinely by physicians for the diagnosis of obstructive jaundice, bone diseases and so many other disorders.

In the present study, iso-enzyme NIAP was targeted because it was raised in the secretor and the non-secretor evenly after taking fatty meal. In blood group A, 22.7% increase was seen in random samples; 19.7% in B, 25% in AB and 22.6% in blood group O after taking breakfast. Overall, 18.36% increase was observed in random samples than the normal upper limit in serum which is upto 147 IU/L. This increase was regardless of gender. A similar study was conducted in Japan on HIAP in secretors' blood groups. It compared low- and high-calorie fat meal in secretors' blood groups. ALP activity in B secretors was 8.8% higher due to high-calorie meal than low-calorie meal and 5.2% higher in O secretors.<sup>5</sup>

## Conclusion

The level of ALP increased 18.36% from upper normal range in random samples which can greatly affect a diagnosis. As NIAP is dependent on fatty meal and markedly increases after a fatty meal, it is therefore suggested that ALP activity analysis should be measured in the fasting state early in the morning.

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