

FIRST SEMESTER (CLINICAL ENZYMOLOGY)

ALKALINE PHOSPHATASE (ALP)



Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Medical Laboratories

قسم تقنيات المختبرات الطبية

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Practical

تدريسي المادة : م. م احمد صبوري ساجت

INTRODUCTION

alkaline phosphatase blood test is a simple test to check the health of your bones, liver or other parts of your body.

Alkaline phosphatase (ALP) is a type of protein called an enzyme. It's made mostly in the **liver** and **bones**. But it's also found in the **kidneys** and **intestines**. During pregnancy, the organ that forms to help feed and give oxygen to the baby also makes ALP. That organ is called the **placenta**.

Types

There are two main types of alkaline phosphatase (ALP) blood tests.

Standard ALP test. This blood test shows the total amount of ALP from all parts of the body.

ALP isoenzyme test. Also called an ALP fractionation test, this blood test shows where the ALP is coming from, such as from the bones or liver. It may be done if a standard ALP test result comes back too high or too low. **The test may not be available at all medical centers.**

Bone ALP. The body's bone-forming cells make alkaline phosphatase. Levels of bone ALP may go up when bones are hurt, healing or growing.

Liver ALP. Liver cells, especially those that line the bile ducts, make ALP. Levels of ALP go up when the liver is sick or hurt.

Isoenzymes of ALP

Serum ALP activity arises from several isoenzymes differing in tissue origin, electrophoretic mobility, and heat stability.

- **Liver ALP:** Hepatocytes (bile canalicular membrane); elevated in cholestasis.
- **Bone ALP:** Osteoblasts; elevated in bone formation or destruction.
- **Intestinal ALP:** Intestinal mucosa; may increase postprandially.
- **Placental ALP:** Placenta; increases in pregnancy or certain cancers (Regan isoenzyme).
- **Germ-cell ALP:** Tumor marker for germ cell malignancies.

NORMAL RANGE

Results of a standard ALP blood test are given in units per liter (U/L). A healthy ALP range is as follows:

For **males** 19 and older: 40 to 129 U/L.

For **females** 17 and older: 40 to 104 U/L.

Children and **younger** teens often have higher ALP levels due to bone growth. ALP levels also go up during pregnancy.

There is no standard range for ALP isoenzyme test results in younger people. A healthy range for adults 18 and older is as follows:

Liver ALP isoenzyme: 15.8 to 71.9 U/L.

Bone ALP isoenzyme: 12 to 56.7 U/L.

Intestine ALP isoenzyme: Less than or equal to 12.6 U/L.

Causes of High ALP

Liver conditions that can cause high ALP include:



- Blocked bile ducts.
- Liver cancer or cancer that has spread to the liver.
- Liver damage due to medicines, herbs or supplements, called drug-induced liver disease.
- Liver disease, including cirrhosis and metabolic dysfunction-associated steatotic liver disease (MASLD), formerly called nonalcoholic fatty liver disease (NAFLD).
- A liver transplant complication called organ rejection.

Bone conditions that can cause high ALP include:

- Bone cancer.
- Bone disease such as Paget's disease of bone and osteomalacia.
- Broken bones that are healing.
- Cancer of the bone marrow, called myeloma.

Other things that can raise ALP levels are:

- Congestive heart failure.
- Crohn's disease and ulcerative colitis.
- Hodgkin lymphoma.
- Life-threatening organ failure due to an infection, also called sepsis.
- Overactive parathyroid gland, also called hyperparathyroidism.
- Serious bacterial infection inside the belly area, called an intra-abdominal infection.

ALP levels also go up during pregnancy, especially in the last three months. This is expected and usually not a concern.

Causes of Low ALP

Low ALP may be caused by:



- A lack of vitamins, minerals and protein that the body needs, called malnutrition.
- Too much vitamin D.
- Not enough zinc or magnesium.
- Hypophosphatasia, a rare genetic disease that affects bones and teeth
- Underactive thyroid, called hypothyroidism.

Clinical Case

A 45-year-old male with jaundice

ALP 560 U/L

GGT 420 U/L

bilirubin elevated

Any questions?

*Thank
You*