Tikrit University

College of Nursing

Basic Nursing Sciences

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Bio Chemistry

Total portion

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Total Protein and Albumin/Globulin (A/G) Ratio

What is a total protein and albumin/globulin (A/G) ratio test?

A total protein and albumin/globulin (A/G) ratio test measures the total amount of protein in your blood. There are two major types of protein in the blood:

Albumin, which helps keep blood from leaking out of blood vessels. It also helps move hormones, medicines, vitamins, and other important substances throughout the body. Albumin is made in the liver.

Globulins, which help fight infection and move nutrients throughout the body. Some globulins are made by the liver. Others are made by the immune system.

The test also compares the amount of albumin in your blood to the amount of globulin. The comparison is called the albumin/globulin (A/G) ratio.

If your total protein levels or A/G ratio results are not normal, it can be a sign of a serious health problem.

Other names: total serum protein, TP albumin/globulin ratio

Functions of plasma proteins

• Transport (Albumin, prealbumin, globulins)

• Maintain plasma oncotic pressure (Albumin)

• Defense (Immunoglobulins and complement)

• Clotting and fibrinolysis (Thrombin and plasmin)

Normal range of serum proteins:

Total protein: 64 - 83 g/l or 6.4 - 8.3 g/dl

Albumin: 35 - 52 g/l or 3.5 - 5.2 g/d

l Globulin: 20 - 35 g / l or 2.0 - 3.5 g/dl

Serum total protein level gives an approximate measure of all serum proteins (with the exception of fibrinogen as the analysis is on a clotted blood sample). Many diseases can affect the total concentration of proteins as well as affecting the ratios of protein fractions that comprise the total concentration. Abnormal serum protein levels may be primary (the cause is inherited) or secondary (the result of a wide range of diseases).

Pre-analytic causes of changed serum total protein level:

- The total serum protein, will be approximately 0.25 g/dl lower than total plasma proteins due to the fact that fibrinogen protein is found in plasma only and not in serum.
- In case of serum protein test, a prolonged application of a tourniquet may increase protein level due to hemoconcentration.
- The taking of blood from the arm into which an intra-venous infusion is flowing can cause dilutional hypoalbuminaemia.
- Plasma albumin concentrations may be 5-10 g/l lower in the recumbent than in the upright position because of the redistribution of body fluids.

Hyperproteinemia: It is a state of is an increase in the concentration of protein in the bloodstream

. Causes of hyperproteinemia:

1- Increased synthesis such as in infections like viral hepatitis B or C, or HIV.
2- Increased synthesis in some cancers such as multiple myeloma or certain types of lymphoma.

3- Dehydration that results from conditions like vomiting, diarrhea, excessive sweating, and diabetic acidosis.

Hypoproteinemia: It is a state of is a decrease in the concentration of protein in the bloodstream. Causes of hypoproteinemia:

1- Prolonged starvation.
2- Malnutrition and malabsorption such as in Celiac disease.

3- Decreased synthesis by the liver such as in liver cirrhosis or failure.

4- Increased loss of proteins as in kidney disease (e.g., nephrotic syndrome) or intestinal disease (protein-losing enteropathy).

5. excessive bleeding.

6. Extensive burns.

7. Catabolic states after injury or tissue damage.

8. Inflammatory conditions that are associated with hypoalbuminemia

What is it used for?

A total protein and A/G ratio test is often included as part of a comprehensive metabolic panel, a test that measures proteins and other substances in the blood. It may also be used to help diagnose kidney disease, liver disease, or nutritional problems.

Why do I need a total protein and A/G ratio test?

You may get this test as part of a comprehensive metabolic panel, which is often included in a routine checkup. You may also need this test if you have symptoms that indicate abnormal protein levels. These include:

Swelling in the feet, ankles, legs, and/or abdomen, which is caused by extra fluid in your tissues

- Fatigue
- Unexplained weight loss
- Loss of appetite
- Nausea and vomiting

Jaundice (yellowing of the skin or eyes). This is a common symptom of liver disease.

Blood in the urine, a common symptom of kidney disease

What happens during a total protein and A/G ratio test?

A health care professional will take a blood sample from a vein in your arm, using a small needle. After the needle is inserted, a small amount of blood will be collected into a test tube or vial. You may feel a little sting when the needle goes in or out. This usually takes less than five minutes.

Will I need to do anything to prepare for this test?

You don't need any special preparations for a total protein and A/G ratio test.

Are there any risks to this test?

There is very little risk to having a blood test. There may be slight pain or bruising at the spot where the needle was put in, but most symptoms go away quickly.

What do the results mean?

Your results will show whether you have normal, low, or high total protein levels. They will also show if you have a normal, low, or high albumin to globulin (A/G) ratio.

If your total protein levels were low, it may mean you have one of the following conditions:

- Liver disease
- Kidney disease

Malnutrition, a condition in which your body does not get the calories, vitamins, and/or minerals needed for good health

A malabsorption syndrome, a type of disorder in which your small intestine can't absorb enough nutrients from food. Malabsorption syndromes include celiac disease and Crohn's disease.

If your total protein levels were high, it may mean you have one of the following conditions:

An infection such as HIV or viral hepatitis

Multiple myeloma, a type of blood cancer

If your A/G ratio was low, it may be caused by:

An autoimmune disease, such as lupus

Liver disease, including cirrhosis

Kidney disease

If your A/G ratio was high, it may be caused by:

Certain types of genetic disorders

Leukemia

If you have questions about your results, talk to your health care provider.

Learn more about laboratory tests, references ranges, understanding results.

Is there anything else I need to know about a total protein and A/G ratio test?

In addition to total protein levels, your provider may order a separate blood test for albumin and/or a test for globulins. The globulins test is called serum electrophoresis. It is a blood test that measures the levels of four different types of globulins.

These results may show the following:

Low albumin levels may be a sign of:

Liver disease, including cirrhosis

Kidney disease

Malnutrition

Thyroid disease

High albumin levels may be a sign of:

Severe dehydration

Diarrhea

Low globulin levels may be a sign of:

Liver disease

Kidney disease

High globulin levels may be a sign of:

Certain types of blood cancers, such as multiple myeloma, Hodgkin disease, or leukemia

Hemolytic anemia

An autoimmune disease, such as lupus or rheumatoid arthritis

Tuberculosis

PRINCIPLE

Colorimetric method described by Gornall and al. The peptide bonds of proteins react with Cu2+ in alkaline solution to form a coloured complex which absorbance, proportional to the concentration of total protein in the specimen, is measured at 550 nm. The biuret reagent contains sodium potassium tartrate to complex cupric ions and maintains their solubility in alkaline solution.

MANUAL PROCEDURE

Procedure n°1 (without Specimen blank)

Let stand reagents and specimens at room temperature.

Pipette into well identified test tubes:	Blank	Standard	Assay
Reagent R1	1,02 mL	1 mL	1 mL
Reagent R2	1 Ml	1 mL	1 mL

Standard		20 µL	
Specimen 20 µL			20 µL
Mix well. Let stand for 10 minutes at room temperature. Record absorbance at 550 nm (530-570) against reagent blan			

CALCULATION

Calculate the result as follows:

Without specimen blank:

$$\text{Result} = \frac{\text{Abs (Assay)}}{\text{Abs (Standard)}} \times \text{Standard concentration}$$