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anthropometric parameters as cancer malnutrition markers among 50 new breast cancer patients attending Tikur Anbesa Specialized Hospital, Addis Ababa with age and sex matched 50 healthy individuals as controls. Convenient sampling method was used to recruit patients. Patients with renal and liver failure and those who had surgery, those taking chemotherapy, radiotherapy and dialysis, or those using immunosuppressive medication were excluded from the study.

### **Blood sample and data collection procedures**

After the study participants had been asked for their consent, blood (5ml) was withdrawn from the study participants. The sample was collected by qualified professional nurses in the hospital.

In addition, the questionnaire was filled by face to face interview and some anthropometric indicators were also measured following standard procedures. Blood collected in appropriate tubes was allowed to stand for 30 minutes at room temperature to allow complete clotting and clot retraction. Samples were then centrifuged at 4000 rpm for 10 min to extract serum. The serum extracted was used to determine the levels of albumin, total protein, creatinine and urea. About 2ml of the blood was kept in EDTA coated tubes and hematological profiles were determined for all samples using a hematological analyzer. Safety precautions were taken while handling blood and disposing it.

### **Test procedures of Biochemical markers**

Serum albumin level was measured by the method of bromocresol green [12].

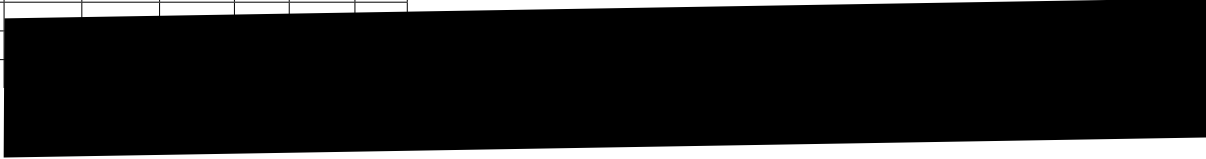
Total protein was determined by using an automatic chemistry analyzer. Measurement was performed by a Biuret reaction using a total protein reagent kit. Total serum globulins were determined by subtracting the values of albumin from total protein.

$$[\text{globulin (g/dl)}] = [\text{Total Protein (g/dl)}] - [\text{Albumin (g/dl)}].$$

Serum creatinine reacts with picric acid in alkaline solution



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low plasma albumin concentration is a reflection of poor diet or poor appetite that minimizes amino acids availability for plasma protein biosynthesis.

There was significantly higher serum globulin in the patient than the control group, which agrees with other works. In response to reduced levels of serum albumin in breast cancer patients, albumin to globulin ratio is lowered due to an increase in globulins; mainly immunoglobulin's synthesized by lymphocytes to compensate for the reduced serum albumin. Failure of lymphocytes to raise globulins to levels that is high enough to compensate for the reduced albumin may indicate advanced disease, where protein synthesis is reduced but protein catabolism is accelerated.

Significantly lower serum creatinine level was observed in the study group than the control group, which may be attributable to muscle mass wasting of breast cancer patients. A large proportion of the breast cancer patients in this study were stage III and above, which may have lost muscle mass as a result of increased breakdown of muscle protein to provide the essential amino acids required for protein synthesis and energy metabolism gluconeogenesis for the tumor cells [19,20]. In contrast to decreased protein synthesis in muscle cells, tumor cells exhibit increased protein synthesis in liver. Removal of specific amino acids by the tumor leads to a depression of host protein synthesis [21].

The condition of sarcopenia in an individual with otherwise normal body weight would result in a disproportionately low contribution of muscle derived metabolites. It is estimated that 20% or more of patients with cancer may have sarcopenia, i.e. significant loss of muscle mass,

12. Dumas BT, Watson WA, Biggs HG (1971) Albumin standards and the