

## Serum Marker Enzymes Activities in Cancer Patients

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### Abstract

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The aim of this study was to estimate the serum marker enzymes: alkaline phosphates (ALP), gamma glut amyl transpeptidase (GGT), lactate dehydrogenase (LDH), aspartate amino transferase transaminase (AST), and alanine amino transferase (ALT) levels from patients diagnosed with cancers (liver, prostate, colon, leukemia, uterine, cervical, breast and ovarian) and the control subjects (healthy individual) using established methods. A significant increase ( $p < 0.05$ ) was recorded in the serum activities of ALT, AST, ALT and GGT in both liver and colon cancer patients when compared with the control and among the cancer types. The evidence of associations between elevated activities of the marker enzymes and risk of developing cancer (especially liver and colon) as observed from this study could be used as tumor markers in the prognosis, diagnosis and management of malignancies..

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**Keywords:** Serum, Cancer, Marker, Enzyme, Patients

### Introduction

Cancer, known medically as a malignant neoplasm, is a broad group of diseases, all involving unregulated cell growth. There are over 200 different known cancers that afflict humans (Lee and Mary, 2009).

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Cancer cells are able to invade other tissues by spreading to other parts of the body through the blood lymph system (Croce, 2008). All cancer begins in cells, the body's basic unit of life. The body is made up of many types of cells. These cells grow and divide in an uncontrolled way to produce more cells as they are needed to keep the body healthy. When cells become old or damaged, they die and are replaced with new cells. Sometimes this orderly process goes wrong.

The genetic material (DNA) of a cell can become damaged or changed, producing mutations that affect normal cell growth division. When this happens, cells do not die when they should and new cells are formed when the body does not need them. The extra cells may form a mass of tissue called tumor. (Gupta *et. al.*, 1993). Cancer as a group of disease accounts for approximately 13% of all deaths each year with the most common being lung cancer (1.4 million deaths), stomach cancer (740,000 deaths), liver cancer (700,000 deaths), colon cancer (610,000 deaths) and breast cancer (460,000 deaths). This makes invasive cancer the leading cause of death in the developed world and the second leading cause of death in the developed world (Shetty *et. al.*, 2003).

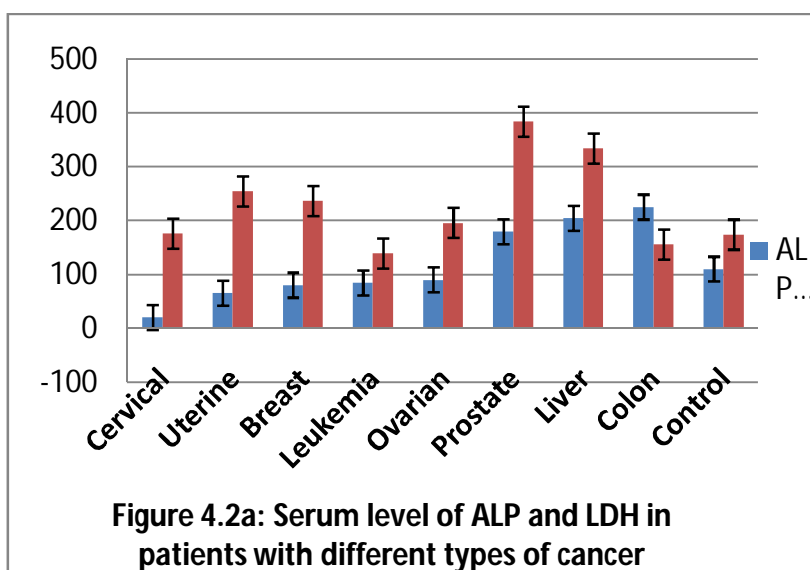
Early detection of cancer can be potentially cured through surgery especially, when the tumor is very small and has not metastasized. In view of this, there is need for simple biochemical investigations, for early detection such as the use of tumor markers which include prostate specific antigen (PSA), alkaline phosphatase (ALP), gamma glutamyl transpeptidase (GGT), human chorionic gonadotropin, lactate dehydrogenase (LDH) and alanine transaminase (ALT), aspartate amino transferase (AST). These markers could be used in population screening, diagnosis, prognosis and staging of cancer (Arun *et. al.*, (2008). However, this study has been undertaken to assess the clinical utility of some biochemical markers including GGT, ALP, AST, LDH and ALT in eight(8) different types of cancer .

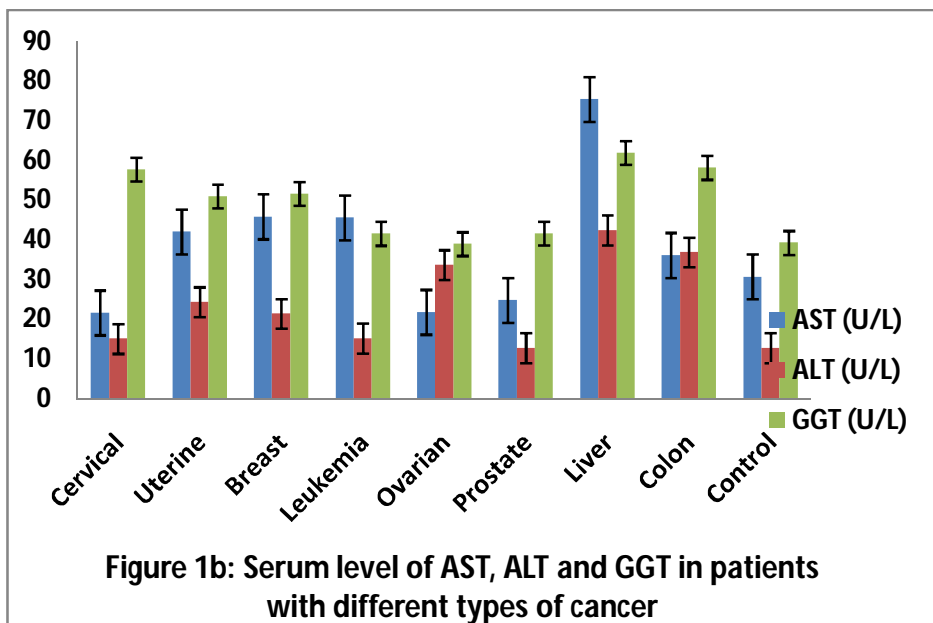
These could be easily assayed and are less expensive in the diagnosis and management of cancer. The enzymes are found in large amount in the liver and can be released when the liver is injured or inflamed (as in hepatitis), and in the case of heart or skeletal muscle damage (Arun *et. al.*, 2008).

## Materials and Methods

A total of 700 freshly diagnosed cancer patients (8 different cancer types) and 300 control subjects (healthy individual) were examined in this study. 10ml each of their blood samples was collected with the help of medical personnels in three University Teaching Hospitals in Nigeria. The blood sample was incubated at 37°C for 10 minutes after which it was centrifuged at 10,000 revolutions per minute (10,000rpm) for ten (10) minutes and the serum layer was removed and stored at 4°C prior analysis. The enzymes activities were determined spectopho to metrically using established method. Statistical analysis was done using Duncan Multiple Range Test and ANOVA.

## Results





## Discussion

Marker enzymes such as ALP, LDH, GGT and AST could be used for the detection of risk, population screening, diagnosis, staging and prognosis staging and prognosis of some diseases. (Sharma and Ray 2000). Figures 1a and b show the activities of these marker enzymes in cancer patients. Alkaline phosphatase (ALP) comprises a group of enzymes that catalyze the hydrolysis of phosphate esters in an alkaline environment, generating organic radical and inorganic phosphates (Kher *et al.*, 1997). From this study, serum ALP (U/L) revealed no significant difference ( $P < 0.05$ ) in ovarian cancer ( $90.68 \pm 4.79$ ), leukemia ( $85.17 \pm 2.27$ ), breast cancer patients ( $80.92 \pm 2.58$ ) and uterine cancer patients ( $65.81 \pm 2.06$ ) when compared with the control subjects ( $110.72 \pm 5.23$ ), however a significant increase was observed in prostate cancer patients ( $180.49 \pm 9.94$ ), liver cancer patients ( $205.06 \pm 15.82$ ) and colon cancer patients ( $225.87 \pm 18.57$ ) when compared with the control subjects and among the cancer patients.

This is in agreement with the findings of was if *et. al.*, (2005) and Philips *et. al.*, (2004) who reported increase in the activates of ALP in colorectal and liver cancer. This study also revealed elevated levels in other types of cancer. This increase in the serum activity of ALP may be an indicator of metastatic disease (Halliwell 2002). ALT and AST are enzymes in the liver that rearrange the building blocks of proteins. The enzymes are released from damaged liver cells. AST activity from this study showed no significant difference ( $P < 0.05$ ) in cervical, ovarian and prostate cancer patients and ALT activity also showed no significant difference ( $P < 0.05$ ) in cervical, leukemia and prostate cancer patients (Figure1b).

However, the mean value of AST is significantly increased ( $P < 0.05$ ) in liver, colon, leukemia, breast and uterine cancer patients while that of ALT significantly increased ( $P < 0.05$ ) in uterine, breast, ovarian, liver and colon cancer patients (Figure 1b). Similar findings was also reported by Arun *et. al.*, (2008) and Philips *et. al.*(2004). The increase in the activities of both AST and ALT could be attributed to hepatocellular damage (Henry 2001), and this could be the reason why these enzymes activity are highest in liver cancer patients among other cancer patients.

Statistical significant increase ( $P < 0.05$ ) was also observed in the serum LDH (U/L) activity of all the cancer patients except in leukemia and colon cancer patients when compared with the healthy individuals (Figure1b) and among the cancer patients. This is in agreement with the report of Sandhya (2004) who reported high activity LDH in neoplastic tissues as well as in the serum of patients with a variety of epithelial tumors. The elevated LDH activity observed might be due to the fact that cancer cells rely on anaerobic respiration for the conversion of glucose to lactate even under oxygen-sufficient conditions and this state of fermentative glycolysis is catalysed by LDH (Sandhya 2004).

Gamma-glutamyl transferase (GGT) is a membrane – band enzyme catabolising reduced glutathione to cystein and glycine. The serum GGT (U/L) activity ranged from  $38.99 \pm 10.21$  to  $61.93 \pm 15.23$ . This study shows a significant increase ( $P < 0.05$ ) in the levels of all the cancer patients except in ovarian cancer patients when compared with the control subjects (Figure 1b). The elevated activity of GGT in this study is in accordance with the findings of Taniguchi *et. al.*, (1985). The result obtained from this study revealed a relationship balance between GGT activity and cancer. (Kultigin *et. al.*, 2010).

## Conclusion

The associations between elevated activities of these enzymes and risk of developing cancer (especially liver and colon) could be used as tumor markers in the prognosis, diagnosis and management of cancer.

## References

- Lee and Mary, 2009. Basic Skills in Interpreting Laboratory Data. ASHP. Pp. 259. ISBN 978-1-58528-180-0.
- Croche M. Carlo (2008): Oncogenes and Cancer. *New England Journal of Medicine* 358:502-511.
- Gupta S.K., Shukla, V.K., Vaidya M.P., Roy. S.K., and Gupta S. K., Shukla V.K., Vaidya M.P., Roy S.K., and Gupta S., *J. Surg. Oncol.* 52, 172(1993).
- Shetty R.S, Balu S, Kumari S, Shetty P, Hegdel S, and Karika A (2013). *Journal of Cancer Research and Treatment*, 1(1), 1-3.
- Arun Chougule, Sofia Hussain and Prasad Agarwal Dwaraka (2008): Prognostic and diagnostic values of Pseudocholinesterase, serum aspartate transaminase and serum alanine transaminase in malignancies treated by radiotherapy. *Journal of Cancer research and Therapeutics* vol.4, Num.1, 2008 pp 21-25.
- Sharma B.K and Ray. A (2000): Breast and Prostate cancer. *IJCB*,15,(Suppl.), 110-17.
- Kher, A, Maghe G and Deshpande, A.(1997). Significance of serum ferritin and lactate dehydrogenase in benign and malignant disease of breast. *Indian J. Pathol. Microbiol.* 40(3), 321-6.

- Wasif Saif MD; Dominik Alexander MSPH, Charles M. WICOX (2005). Serum Alkaline Phosphatase level as a Prognostic Tool in Colorectal Cancer: A study of 105 patients. *J. Appl Res.* 5(1) : 88-95.
- Philips, Jane E, Best and Mark A(2004): Liver function tests; Gale Encyclopedia of surgery: A guide for patients and Caregivers
- Halliwell B. (2002). Effect of diet on cancer development: Is oxidative DNA damage a biomarker? *Free Radic Biol. Med.* 2002; 32:968-974.
- Henry, J.B. 2001: Clinical Diagnosis and Management by Laboratory Methods 20<sup>th</sup> ed. Philadelphia W. B Saunders.
- Sandhya Mishra, D.C. Sharma and Praveen Sharma(2004): Studies of biochemical parameters in Breast Cancer with and without Metastasis. *Indian Journal of Clinical Biochemistry* 19, (1) 71-75.
- Tanighuchi, N.S., Lizuka, Z.N., Zhe,S. House, and C. Sekiya (1985): Measurement of human serum immune-reactive g-glutamyl transpeptidase in patients with malignant tumors using enzyme-linked immunoassay. *Cancer Res.* 45, 5835-5839.
- Kultigin Cavusoglu, Sukran Cakir Arica and Cengiz Kurtman (2010): Alterations in Serum biochemical parameters of patients with lung cancer exposed to radiotherapy. *Journal of Environmental Biology*,31(5) 841-844.