

SERUM CORTISOL LEVEL IN LUNG CANCER PATIENTS AT VARIOUS STAGES OF DIAGNOSIS

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Background & Objectives: Lung cancer is the leading cause of death in developed countries and is rising in alarming rates in developing countries. Diagnosis of lung cancer is a form of psychological stress, so there may be neuroendocrine alteration in these patients like elevated serum cortisol level, as cortisol is considered as 'stress hormone'. The study was designed to compare the serum cortisol levels in lung cancer patients at various stages of diagnosis. **Methods:** The study was conducted in 3 sub groups of lung cancer patients (n=150) and controls (n=150) in Upgraded Department of Physiology, S.M.S. Medical College, Jaipur to estimate serum cortisol level by ELISA (Enzyme Linked Immuno Sorbent Assay) method. **Results:** The mean serum cortisol levels were highest in sub group A (676.82 nmol/l) followed by sub group B (557.27 nmol/l) and sub group C (236.61 nmol/l). These differences were found highly significant on application of ANOVA ($p < 0.0001$). **Interpretation & Conclusion:** The level of serum cortisol was highest in newly diagnosed lung cancer patients. The data obtained also indicate that the high cortisol level is due to more psychological disturbances in newly diagnosed patients.

Key words: Cortisol, ELISA, lung cancer.

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Introduction:

Cancer is associated with high levels of psychological stress. Lung cancer is one of the most common causes of cancer related mortality. It is characterized by uncontrolled growth in lung tissues.

Two main types of lung cancer are following (Horn L et al, 2012):-

1. Small Cell Lung Cancer (SCLC) also called oat cell cancer.
2. Non-Small Cell Lung Cancer (NSCLC).

The 3 main subtypes of NSCLC are:

- A. Adenocarcinoma
- B. Squamous cell lung carcinoma and
- C. Large cell carcinoma.

Cortisol is one of the main biomarkers of depression and is often used for monitoring depression therapies. The amount of cortisol present in the blood undergoes diurnal variation: the level peaks (140-700 nmol/l) in the early morning (approximately at 8.00 a.m.) and reaches its lowest level (80-350 nmol/l) at midnight 12.00. Worldwide, lung cancer is the most common cancer in terms of both incidence and mortality. Lung cancer is a life threatening disease so it not only affects physically but also affects psychologically in terms of neuroendocrine

alteration in the patients with lung cancer (e.g. Changed pattern of serum cortisol level) (Mazzoccoli G et al, 2003).

The present study was therefore designed to assess the level of serum cortisol in lung cancer patients at different stages of diagnosis of lung cancer.

Material and Methods:

The present study was conducted in Upgraded Department of Physiology with collaboration of T B & Chest Department, S.M.S. Medical College and attached Hospital; Jaipur. Total 300 subjects of age ranging from 30 to 60 years of both sexes participated in the study and grouped as follows:

Group 1: Lung cancer group further divided into 3 subgroups:-

Sub group A: Newly diagnosed lung cancer patients who have been diagnosed within 1 week.

Sub group B: Patients diagnosed between 2 to 4 months

Sub group C: Patients diagnosed for more than 4 months.

Group 2: Control group.

Permission for human studies from Institutional Review Board and Ethics Committee, SMS Medical College, Jaipur, was duly taken. The purpose of the study was explained to each subject and written

informed consent was taken from him/her prior to the test. All the subjects were interviewed and data was recorded regarding patient's age, gender, occupation, smoking, alcohol and tobacco chewing habits and types of lung cancer.

5 ml of venous blood samples were taken from all the subjects at 8.30-9.30 a.m. Serum cortisol in nmol/l was analyzed by ELISA (Enzyme Linked Immuno Sorbent Assay) method (Peters J R, 1982 and Check J H, 1995).

To determine the presence of cortisol in human blood, an one step competitive micro plate enzyme immunoassay "DS-EIA-STERIOD-CORTISOL" was used. The range of the assay is between 0-1800 nmol/l and lower detection limit is 5 nmol/l. The data were analyzed by z-test and ANOVA to find out significance of differences in serum cortisol levels between 3 sub groups of lung cancer and control group.

Result:

Chart 1: The Mean and Standard Deviation in 2 groups of subjects for serum cortisol levels

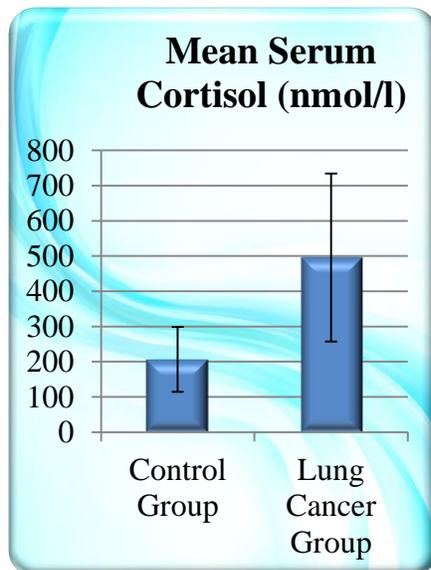
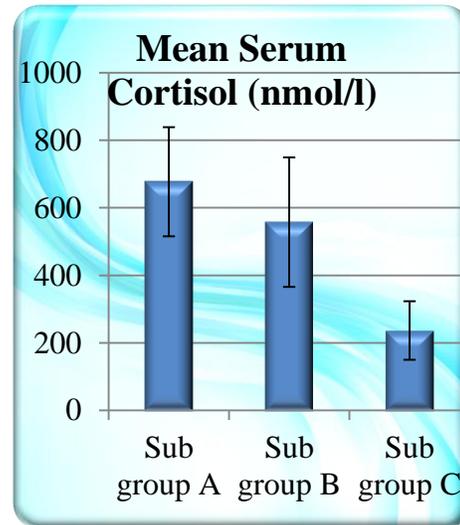


chart 1 shows mean and standard deviation of serum cortisol. Lung cancer group shows high serum cortisol levels than control group and this difference was highly significant ($p < 0.0001$).

Chart 2: Analysis of Variance (ANOVA) between 3 subgroups of lung cancer for serum cortisol levels



According to the chart 2, the mean serum cortisol levels were highest in sub group A (676.82 nmol/l) followed by sub group B (557.27 nmol/l) and sub group C (236.61 nmol/l). These differences were found highly significant on application of ANOVA ($p < 0.0001$).

Discussion:

Lung cancer is characterized by an altered pattern of hormonal secretion, with changes that may be qualitative (loss of circadian rhythmicity) and/or quantitative (increase or decrease of serum levels). The study showed significantly high mean serum cortisol level (496 nmol/l) in lung cancer group as compare to control group (figure 1). Similar levels were found in study of Mazzoccoli G et al, 2011 and Eugenia L et al, 2011.

In other studies, Lichter I et al (1968) and DeMeester T R et al (1979) also found high serum cortisol levels in the lung cancer patients (621 nmol/l and 713 nmol/l respectively). In these studies, cortisol levels were high in compare to the present study.

In contrast to these studies, Vedhara K et al, 2006 found no significant differences in cortisol level between lung cancer and control group.

The present study showed variation in mean serum cortisol levels in 3 sub groups of lung cancer. Sub group A (newly diagnosed lung cancer patients) had highest mean serum levels of cortisol in comparison to sub group B and C.

Similarly, Sephton S E et al, 2000 also found high serum cortisol levels in newly diagnosed cancer patients and the level decreased after few months of diagnosis. The highest level of cortisol in newly diagnosed group indicates that just after diagnosis of lung cancer there is a lot of stress on mind of the patient which causes various psycho-physiological changes including change pattern of serum cortisol levels. The low level of cortisol in sub group B and C indicated that in these sub groups with passes of time, they have adapt to cope with the disease and psychological stress is reduced so cortisol level also decreased.

Conclusion:

This study shows high serum cortisol level in lung cancer patients and the level was highest in newly diagnosed lung cancer patients (sub group A). The diagnosis of lung cancer causes many physical and psychological changes in the patient. These psychological disturbances cause alteration in Hypothalamus-Pituitary-Adrenal (HPA) axis functioning, as indicated by abnormal cortisol levels.

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