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RESEARCH ARTICLE

ALTERATIONS IN HEMATOLOGICAL, LIVER AND RENAL PARAMETER LEVELS IN PEOPLE AFFLICTED WITH LUNG CANCER

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ABSTRACT: **Background:** Lung cancer is one of the most common cancers in the world. It has a bad prognosis and is associated with high cancer related mortality. The present study was carried out to ascertain the alterations in the haematological, hepatic and renal parameters in lung cancer patients who were yet to receive any treatment by comparing with healthy individuals (control cohort). **Methods**: This was a prospective study and was conducted in a superspeciality cancer care hospital at Mangalore, Karnataka, India. The study participants included people who were confirmed to have been afflicted with lung cancer and before start of any treatment. Data was collected after obtaining the ethics committee permission and patient's informed consent from December 2017 to February 2018. The standard blood data required for ascertaining the general health conditions were collected from patient file and analysed. **Results**: During the study time period, 13 females 32 males were diagnosed with lung cancer and agreed to be part of the study. When compared to the healthy individuals, some of the haematological, liver and kidney parameters were altered in either the males or in females ($p < 0.05$ to 0.0002). **Conclusion**: The present study indicates that there was a marked difference in the haematological, hepatic and renal parameters in people afflicted with lung cancer.

KEYWORDS: Lung cancer, clinical, haematological; hepatic; renal parameters.

INTRODUCTION:

Globally, lung cancer is a leading cause for cancer related mortalities and every year 1.8 million deaths are caused by this[1]. According to the Centre for Disease Control and Prevention (CDC), 90% of lung cancer is due to smoking. It is also estimated that 7300 people who never smoked, die from lung cancer every year, due to second hand smoking [(1,2)]. Additionally, prolonged exposures to inhaling of particulate air pollution, burning of solid fuels, coal and exposure to ionizing radiation like X-ray, gamma radiation, plutonium to the chest are also responsible[2,3]. Lung cancer is also associated with occupational hazards and records indicate that people who work in aluminium, cadmium, chromium, beryllium, iron, nickel, arsenic as well as in the generation of toxic gases like methyl ether,

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Bis-(chloromethyl) ether, sulfur mustard, fumes from painting are at increased risk[2,3]. The most worrying aspect is that in spite of all the advances in the diagnosis and treatment, the prognosis of lung cancer remains poor and has not improved appreciably over the last few decades[2]. Records suggest that nearly 50% of all patients succumb to the illness during the first year [2, 3].

From a clinical perspective, major illness like lung cancer has a systemic effect and this can be manifested in the hematopoietic and other systems. To substantiate this, previous studies have shown that a complete blood count (CBC) and vital hepatic and renal function tests can indicate the severity of the illness. CBC is a useful indicator to ascertain the cause of weakness or fatigue and help diagnose the general health status of a patient. In the recent past, numerous studies in etiological, epidemiological, pathological, molecular and genomic aspects of lung cancer have been published. However reports on the changes in the clinic-hematological, biochemical liver and renal function tests (LFT, RFT) parameters in lung cancer are lacking. For the first time this study attempts at understanding the biochemical (LFT, RFT) parameters in lung cancer.

MATERIALS AND METHODS:

This was an MSc Biochemistry dissertation study of the first author and was conducted at Mangalore Institute of Oncology, from December 2017 to February 2018 after taking the approval from the Institutional Ethics Committee. The data was prospectively collected from all patients who were diagnosed with lung cancer (based on the histopathological confirmation). The haematological and hepatorenal parameters were noted before the start of any treatment. Blood was collected in appropriate vacutainer using standard aseptic precautions by a trained phlebotomist from both the cohorts. The sample was thoroughly, but gently mixed with the anticoagulant immediately after filling the tube. Blood samples were tested within 1 hour on a fully automated 3 part differential cell counter (Coun Cell-23 plus, Tulip group, India) for RBC, WBC and platelet counts. The values obtained were entered into excel document (Microsoft Office 2011) for documentation and analysis. For this study only certain parameters such as Haemoglobin content, total count, RBC, WBC (monocytes, neutrophils, lymphocytes), platelet counts were taken. The biochemical assays were done as per standard procedures to estimate alkaline phosphatase, ALT (SGPT) and AST (SGOT), Creatinine, Blood Urea Nitrogen and bilirubin was done as per standard laboratory procedure using standard diagnostic kits in a auto analyser. In addition to this, healthy individuals who were not afflicted with cancer or any other chronic ailments like diabetes or acute illness from malaria, dengue, leptospirosis, filaria, tuberculosis, or any other infections were collected to be used as control.

The data from individual patients were noted and entered in to the Microsoft excel. The data is represented as mean ± standard deviation (SD) and are represented in the table 1. The student's unpaired "t" test was used and a p value of 0.05 was considered significant.

RESULTS:

The results of the study are expressed in Table 1. There were 13 females 32 males in the study. With regard to the haematological parameters it was observed that when compared to the controls, the haemoglobin was significantly higher in males (11.82±0.79 vs 12.44±2.08), while a similar observation was not seen in the females (12.49±0.76 vs 12.00±2.53). The total leukocyte count was higher in men with lung cancer (7930±2439 vs 13300±1465) and statistically significant ($p<0.022$). The neutrophils were significantly high for both males ($p<0.0002$) and females ($p<0.004$) in people afflicted with lung cancer, while lymphocytes and monocytes were high only in the females ($p<0.003$ and 0.06 respectively). The platelet were high in both males and females with lung cancer but was statically not

significant.With regard to the biochemical parameters indicated altered status of the liver, when compared to the health individuals, the ALT levels were high and statistically significant (p<0.03) only in males. There was no difference in the AST and ALP in both men and women. With respect to the serum proteins although there was no difference in the levels, the albumin and globulin quantities were altered and significant in both men and women (p = 0.05 to 0.0003) and the A/G ratio was significantly altered only in females (p = 0.02; Table 1). With regard to the Bilirubin levels although no significant difference was seen in the total levels, the levels of conjugated were altered in both men and women and was significant (P = 0.02 and 0.0005), while the unconjugated was significant only in males (p = 0.04). With regard to the renal parameters the urea levels were altered significantly in both men and women (p = 0.003 and 0.002) while that of creatine was significant only in females (P = 0.002)

Table1: Alterations in haematological and biochemical parameters in people afflicted with lung cancer

	Males			Females		
	Control	Lung Cancer	*P* value	Control	Lung Cancer	*P* value
HB (g/dL)	11.82±0.79	12.44±2.08	0.38	12.49±0.76	12.00±2.53	0.56
Total Count (cells/cumm)	7930±2439	13300±1465	0.02	7550±6493	12410±11620	0.20
Neutrophils (cells/cumm)	57±11.5%	75±14.3%	0.0002	55±6.9%	72±10.5%	0.004
Lymphocytes (cells/cumm)	36±9.5%	16.8±11.4%	1.96	37±6.7%	±8.7%	0.0003
M (cells/cumm)	6±2.2%	8±3.6%	0.12	5.5±3.1%	8±3.4%	0.06
Platelet (cells/ml)	142,600±22,071	333,846±81,437	4.35	141,900±25757	387,461±15,765	8.54
AST (unit/L)	20±4.4	30±12.9	0.18	20±4.5	25±11.3	0.40
ALT (units/L)	12±3.3	45±20.2	0.03	13±3.5	28±14.6	0.15
ALP (unit/L)	76±14.6	231±58	2.23	62±11.5	234±48.1	2.62
Total protein (g/dL)	7.3±0.37	7.3±0.72	0.87	7.3±0.31	7.3±0.85	0.83
Albumin (g/dL)	4.2±0.33	3.5±0.55	0.00006	4.4±0.36	3.8±0.45	0.001
Globulin (g/dL)	3.0±0.34	3.7±0.6	0.003	3.0±0.31	3.4±0.65	0.05
Albumin : Globulin ratio	1.5±0.2	1.00±0.2	1.73	1.5±0.2	1.14±0.3	0.02
Total Bilirubin (mg/dL)	0.5±0.11	0.4±0.14	0.61	0.4±0.11	0.4±0.24	0.79
Conjugated Bilirubin (mg/dL)	0.25±0.065	0.13±0.06	0.00005	0.25±0.07	0.16±0.096	0.02
No conjugated Bilirubin (mg/dL)	0.17±0.06	0.26±0.11	0.04	0.18±0.068	0.55±0.15	0.24
Creatinine (mg/dL)	0.5±0.08	1±0.26	6.10	0.5±0.1	1±0.26	0.0002
Urea (mg/dL)	14.6±3.2	31±15.2	0.003	15±3.2	25±8.7	0.002

DISCUSSION:

Lung cancer is the most commonly diagnosed cancer worldwide. It is the leading cause of death in males and 2nd cause of cancer death in females[1]. Approximately 15% to 18% of all cancers are due to small cell carcinoma of the lung and it is usually associated with smoking [(3)]. In this study an attempt is made to analyse the difference in the levels of haematological parameters between health individuals and people afflicted with lung cancer.

In this study, the total leukocyte count was high in both males and females diagnosed with cancer when compared to their controls. Total leukocyte count usually responds to both acute and chronic stimuli, it can also be elevated due to stress, infections and chronic irritative exposure like smoking [4]. Its non-

specific nature can be used to predict multiple diseases including cancer, stroke and coronary heart diseases[5]. Studies have shown that WBC count is significantly associated with death due to cancer and that increase in their levels substantiates the pathogenic status. Previous studies aimed at understanding the correlation between tumor status and total count, have shown no association, indicating that leucocyte counts cannot be used as a marker for identifying recurrence and metastasis [5]. However an altered lymphocyte homeostasis persisted for months or years, even after curative therapies [6]. In our study, the reduction in lymphocyte levels in both males and females diagnosed with cancer was statistically significant and the neutrophil counts were significantly higher compared to their controls. In conclusion, the present study suggests that low pre-treatment hemoglobin levels could be an independent biomarker for poor prognosis in patients with NSCLC [7]. In our study in males diagnosed with cancer the haemoglobin levels were high in contrast to the previous observations [7].

Serum albumin which is produced in the liver helps in maintaining osmotic pressure, buffers blood pH and also helps in the transportation of hormones, fatty acids and other compounds, and plays a very crucial role in maintaining calcium homeostasis and steroid hormones. It has an inhibitory effect on cancer cell lines. Serum albumin cell lines can be used to assess nutritional status, disease progression, severity and prognosis in the hospital [8, 9]. Hypoalbuminemia helps in reporting the negative prognostic factor for survival in cancers including the lungs [8, 9]. In this study serum albumin levels in both male (3.5±0.55) and female (3.8±0.45) was low compared to the control of males (4.2±0.33) and females (3.8±0.45) hence it was statistically very significant.

In this study, conjugated bilirubin values are significantly lower compared to the controls, similarly in a study conducted by Ying-jian song et al, showed how direct bilirubin are prognostic in small cell lung cancer [10]. Study showed that elevated direct bilirubin will be associated with the prognosis of non small cell lung carcinoma which may be explained by the anti-inflammatory, anti-oxidative, and anti-proliferative effects of bilirubin[11]. With regard to the kidney parameters serum urea levels were raised in both male and female patients diagnosed with cancer in comparison to their controls. Previous studies have shown that increased serum urea levels are predictors of early deaths due to cancer [(12)].

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