



CANCER TYPES; CORRELATION OF RENAL AND LIVER FUNCTION TESTS

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ABSTRACT... Introduction: This study attempts to highlight the relation of various types of cancers to abnormalities in liver and renal function tests. **Objectives:** Correlation of deranged renal and liver function tests to different types of cancers in industrial workers who are exposed to industrial chemicals and carcinogens. **Patients and Methods:** This non-interventional study included 100 hundred confirmed cases of cancer were selected and studied from July 2011 to December 2011. The study was conducted at Fatima Memorial Hospital/College of Medicine & Dentistry, Lahore. **Results:** Out of these 100 patients, 21 had CA lung, 19 had lymphoma, 14 had sarcoma, 13 had CA breast, 6 had CA prostate, 4 had CA liver, 3 had CA colon, 3 had CA ovary, 3 had CA testis, 2 had leukemia, 2 had multiple myeloma, 2 had CA gall bladder, 2 had CA stomach, 1 had CA esophagus, 1 had CA tongue, 1 had CA parotid, 1 had CA rectum, 1 had CA cervix and 1 had CA larynx. Among lymphoma, non-Hodgkin lymphoma was more than Hodgkin lymphoma (out of 19 patients, 13 had non-Hodgkin and 6 had Hodgkin lymphoma). Out of 14 patients of sarcomas, 5 had Ewing sarcoma, 4 had chondrosarcoma, 3 had fibrosarcoma and 2 had liposarcoma. Similarly the serum bilirubin levels in liver cancer, ovarian cancer, multiple myeloma, stomach and gall bladder cancer were 1.50 ± 0.31 , 1.17 ± 0.10 , 1.46 ± 0.15 and 1.40 ± 0.50 mg% were 32.38 ± 18.81 , 37.73 ± 4.35 , 34.43 ± 4.35 , 45.00 ± 46.17 , 31.33 ± 44.70 , 65.25 ± 31.14 , 33.67 ± 80.90 , 99.00 ± 73.08 , 50.00 ± 98.49 , 33.50 ± 75.0 , 36.50 ± 85.0 and 49.0 ± 11.0 μ /l respectively which were statistically significantly higher ($p < 0.05$) then control individuals. respectively which were significantly higher ($p < 0.05$) than the control individuals. Similarly the ALT levels in lung cancer, lymphoma, sarcoma, breast cancer, prostate cancer, liver cancer, leukemia, ovarian cancer, cancer of colon, multiple myeloma, cancer of testis and stomach. The mean serum creatinine levels in lung cancer, liver cancer and cancer of colon were 0.89 ± 0.05 , 0.90 ± 0.16 mg% respectively which were significantly higher than the control individuals ($p < 0.05$). **Conclusions:** The renal and liver function tests should be frequently monitored in cancer patients from industrial back grounds.

Key words: Cancer, Industrial population, Bilirubin, Creatinine, Urea

Article Citation: Qaisar AM, Sirhindi GA, Mandokhel S. Cancer types; correlation of renal and liver function tests. Professional Med J 2014;21(1): 116-122.

Article received on:
15/05/2013

Accepted for Publication:

15/11/2013

Received after proof reading:
26/01/2014

INTRODUCTION

Cancer remains one of the leading causes of morbidity and mortality worldwide. It is predicted that by 2020, the number of new cases of cancer in the world will increase to more than 15 million, with deaths increasing to 12 million. Much of the burden of cancer incidence, morbidity, and mortality will occur in the developing world¹. The coming decades will bring dramatic increases in morbidity and mortality from cancer in the developing world. The burden of cancer is increasing globally half of which will be in low- and

middle-income countries². The three main causes of contamination in the industrialized world are energy production, and industrial and agricultural activities³. There is evidence for an increased risk of stomach and upper aero-digestive tract tumors - and possibly of all types of cancer among rubber industry workers⁴. Research shows that morbidity and mortality varies by social groups and that people in the low social strata experience poorer health and shorter life expectancy than others⁵.

One study confirms the high risk of bladder

cancer among benzidine exposed workers even years after exposure has ceased, and raises suggestive evidence of increased risk to lymphohematopoietic cancer from exposure to benzidine or dichlorobenzidine⁶. Another study revealed that women who have lifetime occupation in an industrial setting may have higher risk to develop breast cancer⁷. The role of workplace exposures in increasing risk of breast cancer among men employed in motor vehicle manufacturing and in blast furnaces, steel works, and rolling mills⁵. The use of smoky coal is associated with a substantial increase in the absolute lifetime risk of developing lung cancer and is likely to represent one of the strongest effects of environmental pollution reported for cancer risk⁸. This study aims to study the frequency of various cancers in the industrial workers and to examine the derangement of liver and renal functions in those cancers.

PATIENTS AND METHODS

One hundred confirmed cases of cancer were selected and studied from July 2011 to December 2011. This non-interventional study included 100 hundred confirmed cases of cancer were selected and studied from July 2011 to December 2011.

The study was conducted at Fatima Memorial Hospital/College of Medicine & Dentistry, Lahore for evaluation, investigation and management. A proforma was designed in order to record detailed information and history regarding to work, chemical exposure, onset of symptoms, onset of symptoms, any family history, diagnosis and treatment of cancer. Furthermore their socio-economic and occupational status was assessed. A detailed history regarding nature of work, duration of employment, exposure to chemicals and preventive measures was obtained. Preventive measures at their workplace/residential colonies were asked. Initial signs and symptoms before confirmation of diagnosis, which made the patients to see medical consultation and initial and initial symptomatic treatment was especially addressed. These patients were in chemotherapy. A strategy for maximum possible revisits was designed. In

addition to ward, the patients visiting outdoor for follow up were studied.

Attendants who were accompanying the patients were also evaluated for any sign and symptoms of cancer. The patients were aged from early 20s to 60s and included both male and female. Any previous medical history prior to present work was taken. How the cancer in these patients was assessed and diagnosed remained an important issue to be questioned. An account of investigations which helped the patients for confirmation of final diagnosis of cancer was taken. These included a range of tests like routine blood examination, specific biochemical tests, radiographs, ultrasounds, MRI, CTscan, biopsies of suspected cancer tissues and their histopathological studies. Grade/type of commonly occurring cancers was also investigated. Tissue biopsy and histopathology of the samples confirmed the diagnosis. The patients were also investigated for liver and kidney functions by performing various biological tests. The data was analyzed in SPSS 17.

RESULTS

Out of these 100 patients 65 (65%) were male and 35 (35%) were female. Age range of these patients was from 17 to 65 years (mean 41 years). Out of these 100 patients, 21 had CA lung, 19 had lymphoma, 14 had sarcoma, 13 had CA breast, 6 had CA prostate, 4 had CA liver, 3 had CA colon, 3 had CA ovary, 3 had CA testis, 2 had leukemia, 2 had multiple myeloma, 2 had CA gall bladder, 2 had CA stomach, 1 had CA esophagus, 1 had CA tongue, 1 had CA parotid, 1 had CA rectum, 1 had CA cervix and 1 had CA larynx. Among the 19 patients of lymphoma, 13 had non Hodgkin and 6 had Hodgkin lymphoma. Out of 14 sarcoma patients, 5 had Ewing sarcoma, 4 had chondriosarcoma, 3 had fibrosarcoma and 2 had liposarcoma. Out of these 100 cases, 38 were from textile industry, 11 were from engineering works, 10 were from leather factories) tanneries, 8 were from pipe/rubber factories, 8 were from wood/furniture trade, 6 were dyeing works, 4 were from steel/metal works, 4 were from spinning factories, 3 were from electrical field, 2 were from

dairy product units, 2 were from tile/ceramics factories, 2 were from pharmaceutical and 2 were from paint works (Table- I).

BILIRUBIN

The mean serum bilirubin level was 0.93 ± 0.07 mg% in control groups which was significantly lower ($p < 0.05$) then the level in lung cancer which was 1.25 ± 0.37 mg% (Table-II). Similarly the serum bilirubin levels in liver cancer, ovarian cancer, multiple myeloma, stomach and gall bladder cancer were 1.50 ± 0.31 , 1.17 ± 0.10 , 1.46 ± 0.15 and 1.40 ± 0.50 mg% respectively which were significantly higher ($p < 0.05$) than the control individuals. However the serum bilirubin levels in sarcoma, prostate cancer and leukemia showed slightly higher serum bilirubin values than the control but the difference were not statistically significant. The serum bilirubin levels in lymphoma (0.72 ± 0.06 mg%), cancer of colon (0.80 ± 0.21 mg%), breast cancer (0.65 ± 0.05 mg%), leukemia (0.93 ± 0.30 mg%), and cancer of testis (0.90 ± 0.30 mg%) were significantly lower ($p < 0.05$) as

compared to controls.

ALT

The mean ALT level was 30.93 ± 1.60 u/l in control group which was significantly lower ($p < 0.05$) then the level in cancer of gall bladder which was 162.0 ± 64.0 u/l. Similarly the ALT levels in lung cancer, lymphoma, sarcoma, breast cancer, prostate cancer, liver cancer, leukemia, ovarian cancer, cancer of colon, multiple myeloma, cancer of testis and stomach were 32.38 ± 18.81 , 37.73 ± 4.35 , 34.43 ± 4.35 , 45.00 ± 46.17 , 31.33 ± 44.70 , 65.25 ± 31.14 , 33.67 ± 80.90 , 99.00 ± 73.08 , 50.00 ± 98.49 , 33.50 ± 75.0 , 36.50 ± 85.0 and 49.0 ± 11.0 u/l respectively which were statistically significantly higher ($p < 0.05$) then control individuals (Table III).

AST

The mean AST level was 29.87 ± 1.07 in control group which was significantly lower ($p < 0.05$) then the level in cancer of gallbladder which was 185.0 ± 83.50 u/l (Table-IV). The mean AST levels in

Work place	No.	%
Textile industry	38	38.0
Engineering work	11	11.0
Leather tanneries	10	10.0
Pipe/rubber factories	8	8.0
Wood/furniture trade	8	8.0
Dyeing work	6	6.0
Steel/metal work	4	4.0
Spinning factory	4	4.0
Electrical field	2	2.0
Dairy products	2	2.0
Tile/ceramic	2	2
Pharmaceutical	2	2.0
Paint work	2	2.0

Table-I. Frequency and percentage of patient working at different factories (n=100)

Subject	Serum bilirubin mg%	P value
Control	0.93 ± 0.07	< 0.05
Lung cancer	1.25 ± 0.37	> 0.05
Liver cancer	1.50 ± 0.31	> 0.05
Ovarian cancer	1.17 ± 0.10	> 0.05
Multiple myeloma	1.46 ± 0.15	> 0.05
Stomach cancer	1.40 ± 0.50	> 0.05
Gall bladder cancer	1.40 ± 0.50	> 0.05
Lymphoma	0.72 ± 0.06	< 0.05
Colon cancer	0.80 ± 0.21	< 0.05
Breast cancer	0.65 ± 0.05	< 0.05
Leukemia	0.93 ± 0.30	< 0.05
Testis cancer	0.90 ± 0.30	< 0.05

Table-II. Mean serum bilirubin in subject (n=100)

Subjects	Serum ALT u/L	P value
Control	30.93±1.60	<0.05
Gall bladder	162.0±64.0	> 0.05
Lymphoma	32.38±18.81	> 0.05
sarcoma	37.73±4.35	> 0.05
Breast cancer	34.43±4.35	> 0.05
Prostate cancer	45.00±46.17	> 0.05
Liver cancer	31.33±44.70	> 0.05
Leukaemia	65.25±31.14	> 0.05
Ovarian cancer	33.67±80.90	> 0.05
Colon cancer	99.00±73.08	> 0.05
Multiple myeloma	50.00±98.49	> 0.05
Testis cancer	33.50±75.0	> 0.05
Stomach cancer	49.0±11.0	> 0.05

Table-III. Mean serum ALT level in subject (n=100)

lung cancer, lymphoma, sarcoma, breast cancer, prostate cancer, liver cancer, colon cancer, cancer of testis and myeloma, cancer of testis , stomach and gallbladder were 35.14 stomach were 32.61±17.91, 36.15±33.54, 37.71±27.76, 40.92±49.35, 38.33±54.93, 80.75±44.82, 35.33±12.45, 40.33±78.81, 34.50±75.0 and 39.00±13.0 u/l respectively which were significantly higher than control individuals. (p<0.05).

BLOOD UREA

The mean blood urea level in control group was 33.33±1.60 mg% which was significantly lower (p<0.05) than the level in ovarian cancer which was 49.67±16.33 mg% (Table-V). Similarly the mean blood urea levels in lung cancer, lymphoma, sarcoma, breast cancer, prostate cancer, liver cancer, leukemia, colon cancer, multiple myeloma, cancer of testis, stomach and gallbladder were 35.14±17.03, 35.16±17.03, 37.36±24.95, 35.85±14.09, 37.67±29.74,

38.75±57.06, 39.00±87.18, 38.67±82.12, 36.59±85.0, 49.00±19.0, 40.0±50.0 and 43.0±50.0 mg% respectively which were significantly higher than control individuals (p<0.05).

SERUM CREATININE

The mean creatinine in different cancer patients and control showed that the mean serum creatinine level in control group was 0.87±0.03 mg% which was significantly lower (p<0.05) than the level in ovarian cancer which was 1.00±0.35 mg% (Table-VI). Similarly the mean serum creatinine levels in lung cancer, liver cancer and cancer of colon were 0.89±0.05, 0.90±0.16 mg% respectively which were significantly higher than the control individuals (p<0.05). The mean serum creatinine levels in lymphoma, sarcoma, breast cancer, prostate cancer, leukemia, multiple myeloma, cancer of testis, stomach and gallbladder were 0.76±0.08, 0.84±0.06, 0.65±0.02, 0.03±0.02, 0.80±0.11, 0.85±0.25, 0.80±0.20, 0.70±0.10 and 0.55±0.50 mg% respectively which were significantly lower (p<0.05) than control individuals.

Subject	Serum AST u/L	P value
Control	29.87±1.07	<0.05
Gallbladder cancer	85.0±83.50	>0.05
Lung cancer	35.14±30.50	>0.05
Lymphoma	36.15±33.54	>0.05
Sarcoma	37.71±27.76	>0.05
Breast cancer	40.92±49.35	>0.05
Prostate cancer	38.33±54.93	>0.05
Liver cancer	80.75±44.82	>0.05
Colon cancer	35.33±12.45	>0.05
Testis cancer	40.33±78.81	>0.05
Multiple myeloma	34.50±75.0	>0.05

Table-IV. Mean serum AST level in subject (n=100)

Subject	Blood urea level mg %	P value
Control	33.33±1.60	<0.05
Ovarian cancer	49.67±16.33	>0.05
Lung cancer	35.14±17.03	>0.05
Lymphoma	35.16±17.03	>0.05
Sarcoma	37.36±24.95	>0.05
Breast cancer	35.85±14.09	>0.05
Prostate cancer	37.67±29.74	>0.05
Liver cancer	38.75±57.06	>0.05
Leukaemia	39.00±87.18	>0.05
Colon cancer	38.67±82.12	>0.05
Multiple myeloma	36.59±85.0	>0.05
Testis cancer	49.00±19.0	>0.05
Stomach cancer	40.0±50.0	>0.05
Gallbladder cancer	43.0±50.0	>0.05

Table-V. Mean blood urea level in subject (n=100)

Subject	Serum creatinine mg %	P value
Control	0.87±0.03	< 0.05
Ovarian cancer	1.00±0.35	>0.05
Lung cancer	0.89±0.05	>0.05
Liver cancer	0.90±0.16	>0.05
Colon cancer	0.90±0.16	>0.05
Lymphoma	0.76±0.08	<0.05
Sarcoma	0.84±0.06	<0.05
Breast cancer	0.65±0.02	<0.05
Prostate cancer	0.03±0.02	<0.05
leukaemia	0.80±0.11	<0.05
Multiple myeloma	0.85±0.25	<0.05
Testis cancer	0.80±0.20	<0.05
Stomach cancer	0.70±0.10	<0.05
Gall bladder cancer	0.55±0.50	<0.05

Table-VI. Mean serum creatinine level in subject (n=100)

DISCUSSION

Our study showed that the males comprised 65% and females 35%, but another study from Hyderabad Pakistan showed that Males comprised 53.1%, and females 46.9% of the cases⁹. This could be due to less female participation in the industrial force in this province compared to Sindh. In another study the most common malignancies (ASR per 100,000) in males were oral cavity (11.8), lymphoma (10.6), lung (8.0), urinary bladder (6.8), prostate (4.8), liver (4.4), pharynx (4.2), colo-rectum (3.6), larynx (3.2), and skin (3.2). The cancers in females (ASR per 100,000) were breast (22.4), oral cavity (11.5), gall bladder (4.8), esophagus (4.2), cervix (3.6), ovary (3.4), colon-rectum (3.4), lymphoma (3.4), uterus (3.4), and thyroid (2.4)⁹. Our study showed that 21% had CA lung, 19% had lymphoma, 14% had sarcoma, 13% had CA breast, 6% had CA

prostate, 4% had CA liver, 3% had CA colon, 3% had CA ovary, 3% had CA testis, 2% had leukemia, 2% had multiple myeloma, 2% had CA gall bladder, 2% had CA stomach, 1% had CA esophagus, 1% had CA tongue, 1% had CA parotid, 1% had CA rectum, 1% had CA cervix and 1% had CA larynx. Our study was limited that it did not determine the frequency among the two genders separately because of smaller sample size. A much larger study is needed to document the frequencies in both genders separately. A Chinese study showed that the top three malignant tumors of death were digestive system, respiratory system and rhino pharynx malignant tumors. While the top three mortalities for single organ malignant tumor were lung cancer, liver cancer, and rhino pharynx cancer¹⁰. A variety of neoplasias of the respiratory, digestive, and urinary tracts as well as the hemopoietic and

lymphatic systems, including Hodgkin's disease are reported to be significantly associated with occupational exposure to wood dust¹¹. Our study had 8% of workers in wooden factories. Yao and workers¹² showed that the rubber industrial workers in China have a higher morbidity of malignancy than other local industries. Wu and workers¹³ found a significantly increased risk of lung cancer associated with employment involving the manufacture of transportation equipment. Our study had 8% population working in transportation industry. Cement dust causes lung function impairment, chronic obstructive lung disease, restrictive lung disease, pneumoconiosis and carcinoma of the lungs, stomach and colon¹⁴. 2% of our sample size was involved in cement/tile industry.

The rise of serum bilirubin in cancer patients has been documented in many studies¹⁵. Serum bilirubin levels are the only factor of prognostic value in hepatocellular carcinoma¹⁶. This study suggests an association between periodontal disease and serum albumin concentration in patients with head and neck cancer¹⁷. But studies demonstrating the association between serum bilirubin and other cancers are scarce. One Nigerian study demonstrated that the levels of serum ALT, AST, ALP and TB, ALB, TP and AST/ALT were significantly higher in cancer patients than in controls both before and after chemotherapy, with more pronounced elevations after chemotherapy¹⁸. Our study shows similar results.

Various workers have shown that impaired renal function is a poor prognostic factor for non-Hodgkin's lymphoma¹⁹. Furthermore it has found to be decreased in workers in urea factories²⁰. The levels of blood urea and reticulocytes were significantly higher in the exposed workers than in the non-exposed workers in aluminum industry²¹. Our study also shows that the levels of blood urea and serum creatinine were raised in all types of cancers.

CONCLUSIONS

In industrial workers frequent renal and liver function tests are beneficial for early diagnosis of

cancer and help in management of patients.

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PREVIOUS RELATED STUDY

Mohammad Jawaid Sabzwari, Mukhtar Ahmad, Muhammad Tahir Majeed, Muhammad Riaz, Muhammad Umair. CANCER PATIENTS; COMPARATIVE STUDY BETWEEN TOTAL SERUM SIALIC ACID AND CARCINOEMBRYONIC ANTIGEN. (Original) Prof Med Jour 13(3) 1344-348 Jul, Aug, Sep, 2006.