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Correlation Of Psychological Disturbances And Serum Cortisol Level In Lung Cancer

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Abstract: ***Introduction: The diagnosis of cancer brings not only emotional distress as a normal response to the catastrophic event the illness represents, but also a series of issues that reflect the patient's perception of the illness. Changed patterns of serum cortisol level have been observed in connection with abnormal ACTH levels, clinical depression and psychological stress. The study was conducted to assess psychological behavior in lung cancer patients with different stages of diagnosis of lung cancer by using a self-reporting Symptom Check List-90-Revised (SCL-90-R).The SCL-90-R consisted 90 questions and each question is rated on five point scale of distress (0-4) ranging from 'not at all' at one end to 'extremely' at the other end. Serum level of cortisol hormone was also estimated in these patients.***

Aims: The purpose of the study was to find out correlation between serum cortisol levels and psychological disorders in lung cancer patients.

Material and Method: The study was conducted in Upgraded Department of Physiology, S.M.S.Medical College, Jaipur. Total 300 participants, included 150 lung cancer patients (divided in 3 sub groups A, B and C on the basis of their duration from diagnosis of lung cancer) and 150 healthy controls of both sexes were taken in the study. Serum cortisol levels were measured in blood sample collected at 8:30 a.m.±30 min.and Hindi version of Symptom Check List-90-Revised (SCL-90-R) was completed by all the subjects.

Results : Severity of psychological disorders and serum cortisol levels were highest in sub group A (recently diagnosed) followed by sub group B(diagnosed between 2 to 4 months) and sub group C (diagnosed for more than 4 months).On application of one way ANOVA test, this difference in severity was found highly significant (P<0.0001) for all the psychological symptoms (except hostility symptom which is non-significant, P<0.05)).The differences in mean of serum cortisol levels in 3 sub groups of lung cancer were highly significant (HS,P<0.0001). In comparison of patients and controls, the mean severity of psychological disorders in patients was higher than controls (P<0.0001, HS).The mean difference in serum cortisol levels in patients and controls was statistically highly significant (P=0.000).

Conclusion: Based on the above findings, it may be concluded that lung cancer patients had a high score of psychological disorders which was possibly correlated to serum level of cortisol and duration from the diagnosis of the disease in these patients. A multidisciplinary approach should be taken. Patients should be included for the comprehensive management of the psychological symptoms of the disease.

Key words: Cortisol, lung cancer, psychological disorders, SCL-90-R.

I. INTRODUCTION

Lung cancer can be conceptualized as a stressor with psychological, behavioral and biological components that can severely impact upon quality of life (QOL). Lung cancer patients generally experience decreased QOL and high levels of psychological distress (Porter L S, 2003). Cortisol is a steroid hormone, more specifically, a glucocorticoid, produced by the zona fasciculate of the adrenal cortex (Scott E, 2011). It is released in response to stress and a low level of blood glucocorticoid. Changed patterns of serum cortisol levels have been observed in connection with abnormal ACTH levels, clinical depression, psychological stress and psychological stressors such as hypoglycemia, illness, fever, trauma, surgery, fear, pain or temperature's extremes (Vedhara K et al, 2004). The psychology of lung cancer patients is affected by several factors related to the patient, stage of the disease and treatment characteristics. As lung cancer is a life-threatening disease, its

impact on patient's psychology has been widely studied. Psychological disturbances are common among the patients with advanced cancer and adversely affect quality of life. The study was designed to provide information useful to non psychiatric clinicians in assessing the psychological status of patient by using a standardized symptom inventory (SCL-90-R) to quantify levels of symptomatology in nine discrete areas (Craig T J et al, 1974). The SCL-90-R is scored and interpreted in terms of primary symptom dimensions:- (Craig T J et al, 1974 and Patel M J et al, 1987).

- ✓ Somatization (SOM)
- ✓ Obsessive Compulsiveness (O-C)
- ✓ Interpersonal Sensitivity (I-S)
- ✓ Depression (DEP)
- ✓ Anxiety (ANX)
- ✓ Hostility (HOS)
- ✓ Phobic Anxiety (PH-ANX)
- ✓ Paranoid Ideation (P-ID)
- ✓ Psychoticism (PSY)

II. AIMS AND OBJECTIVES

The present study was designed to find correlation between psychological disturbances and serum cortisol level in:

- ✓ Newly diagnosed lung cancer patients (within 1 week).
- ✓ Lung cancer patients who have been diagnosed between 2 to 4 months.
- ✓ Lung cancer patients who have been diagnosed for more than 4 months.

III. MATERIAL AND METHOD

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 (within 1 week).
- ✓ Sub group B: Lung cancer patients who have been diagnosed between 2 to 4 months.
- ✓ Sub group C: Lung cancer patients who have been diagnosed for more than 4 months.

GROUP 2: CONTROL GROUP

All the subjects were analyzed for serum cortisol in nmol/l by ELISA (Enzyme Linked Immuno Sorbent Assay) Kit method. A self reporting questionnaire, Hindi adaptation of Symptom Check List-90-Revised (SCL-90-R) was completed by all the subjects. The SCL-90-R consisted 90 questions and each question is rated on five point scale of distress (0-4) ranging from 'not at all' at one end to 'extremely' at the other end. On the basis of severity of scores, subjects were categorized in 3 categories:

- ✓ Mild: score was <1
- ✓ Moderate: score was 1-2
- ✓ Sever: score was >2

IV. RESULTS

On the application of z-test, we found highly significant differences in various psychological disorders between 2 groups of subjects ($p<0.001$), except hostility which is significant ($p<0.05$). This reflects the high level of psychological disturbances in lung cancer patients due to having such a life threatening illness. Sub group A showed sever score on almost all the symptom dimensions whereas, sub groups B and C showed high moderate and mild scores. It can be inferred that the stress levels were high in recently diagnosed patients and it decreases after few months of diagnosis as with passes of time the patient has adapt to cope with the adverse psychological impact of the illness. The stress levels were found very low in sub group C because most of the patients of this sub group had been diagnosed before more than 1 year and they had enough time to fight with the illness and its adverse effects on their well-being. These results shows that in sub groups A and B, there is strong positive correlation between serum cortisol level and psychological disturbances ($p<0.001$). In sub group C, this correlation is positive but not as strong as in the sub groups A and B. All the 3 sub groups shows negative correlation between serum cortisol and hostility symptom ($p>0.05$). The cortisol level decreases with severity of hostility. The low scores on hostility dimension shows less aggressiveness and calm nature of lung cancer patients. There are differential changes depending on the sub groups, however. Thus the sub group A showed high scores on almost all of the psychological symptoms, while the sub group B showed high scores on some dimensions and the sub group C showed high scores on somatization and obsessive-compulsiveness only. The patient's capacity to cope indicates a strong inverse relationship with the psychological disorders. The relationship between duration from diagnosis of the illness and psychological disturbances indicates that the degree of progression of disease was related to the patient's coping and distress levels. The results presented in the study support the view of a stress condition in patients with lung cancer. Raised levels of serum cortisol were seen in recently diagnosed patients (sub group A) and comparatively low levels were seen in sub groups B and C. During sever illness, surgery, trauma or infection, there is an activation of the hypothalamus-pituitary-adrenal axis (HPA-axis) and a sub sequent elevation of cortisol levels.

V. TABLES AND FIGURES

Psychological Disorder	Mean ± Standard Deviation		p-value	Significance
	Lung Cancer Group (n=150)	Control Group (n=150)		
Somatization	1.58 ± 0.67	0.59 ± 0.27	< .001	HS

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Obsessive Compulsiveness	1.62 ± 0.60	0.69 ± 0.43	< .001	HS
Interpersonal sensitivity	1.44 ± 0.55	0.34 ± 0.22	< .001	HS
Depression	1.70 ± 0.68	0.70 ± 0.41	< .001	HS
Anxiety	1.71 ± 0.67	0.54 ± 0.31	< .001	HS
Hostility	0.08 ± 0.28	0.03 ± 0.08	< .05	Sig
Phobic Anxiety	1.07 ± 0.62	0.35 ± 0.41	< .001	HS
Paranoid Ideation	1.45 ± 0.59	0.12 ± 0.11	< .001	HS
Psychoticism	1.44 ± 0.67	0.08 ± 0.12	< .001	HS

n= number of subjects, HS=highly significant, Sig=Significant, NS=Non significant

Table 1: Distribution of various psychological disorders in 2 groups of subject

The table 1 showing mean and standard deviation of psychological disorders in lung cancer group and control group. Levels of significance between these 2 groups were high (p<0.001) in all the symptom except hostility disorder, which was significant (p<0.05)

Group	n	Mean Serum Cortisol (nmol/l)	Standard Deviation
Control Group	150	206.6	92.51
Lung Cancer Group	150	496	238.8

P<0.0001 (HS), n=number of subjects

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

Table 2 and figure 1 showing mean and standard deviation of serum cortisol. Lung cancer group shows high serum cortisol levels than control group and this difference is highly significant (p<0.0001).

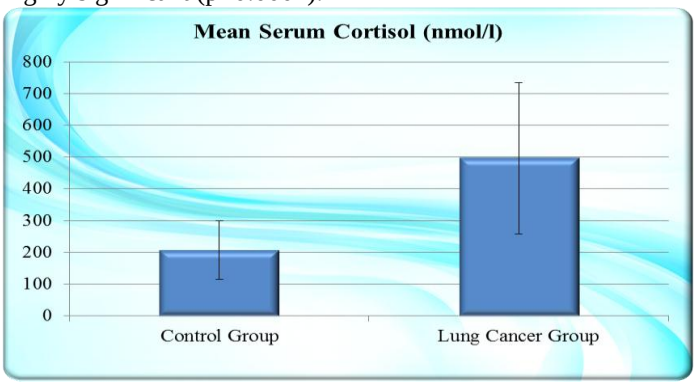

Figure 1: The Mean and Standard Deviation in 2 groups of subjects for serum cortisol levels

Group	n	Mean Serum Cortisol (nmol/l)	Standard Deviation	Standard Error of Mean
Sub group A	65	676.82	161.3	20.01
Sub group B	33	557.27	192	33.42
Sub group C	52	236.61	86.42	11.98

P<0.0001 (HS), n=number of subjects

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

According to the table 3 and figure 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).

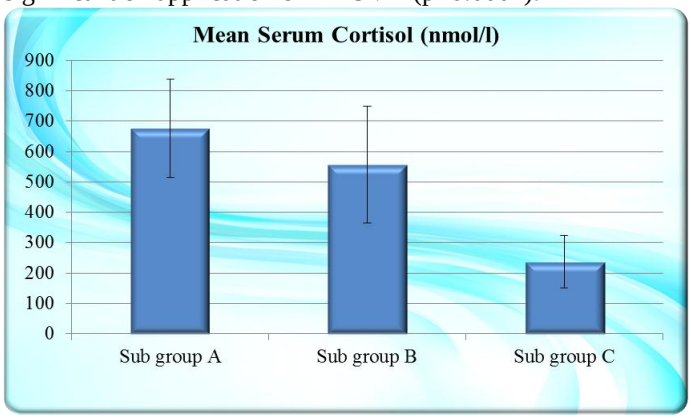

Figure 2: Analysis of Variance (ANOVA) between 3 subgroups of lung cancer for serum cortisol levels

VI. DISCUSSION

Cancer is a widely prevalent disease across all the cultures and races. The associated mental disorders are common in cancer patients and many studies have reported a high incidence of mental disorders in these patients. Severity and type of the disease, personal traits, social and cultural factors may be the underlying causes of mental disorders in cancer patients. It is evident from the results that on the basis of severity, sub group A showed high percentage on sever scores. Whereas, sub group B and C had high percentage of mild and moderate scores on the entire symptom dimensions. Our findings suggest that the psychological disorders are more in the lung cancer patients immediate after diagnosis but these disorders decreases with time in these patients. The present study showed decline in psychological disturbances after the diagnosis of lung cancer. These findings indicate that the trauma-related distress gradually decreases within the 1st year following diagnosis. This outcome demonstrates the resilience of a considerable proportion of individuals to psychologically adapt following a cancer diagnosis, a potentially life-threatening experience that is also associated with aversive medical procedures and treatment's side effects.

In general, the concentration of cortisol correlates well with the degree of psychological disorders. There was a significant correlation between serum cortisol levels and psychological disturbances in lung cancer group. In present study, this correlation in most of the psychological disturbances was highest in sub group A followed by sub group B and C. Spiegel D et al, 2003 found that these psychological disturbances cause alteration in Hypothalamus-Pituitary-Adrenal (HPA) axis functioning, as indicated by abnormal cortisol levels. This relationship of psychological

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and physiological factors related to cancer also found by Uedo N et al (2004) and Oswald L et al, (2004).

VII. CONCLUSION

A number of studies reported more cancer cases with depressed mood than possibility that the knowledge of having cancer might have induced depressed mood. The researchers also suggest the psychological factors depress the immune system activity and hence the cancer tends to grow faster. Patients and their families often have a number of psychological and adjustment issues related to the illness, its treatment and its resulting disabilities. The psychologist can assess and treats patients to help them, manage their cancer-related psychological distress and provide effective therapy.

This study also shows a positive correlation between psychological disturbances and serum cortisol levels in lung cancer patients. This correlation is highest in newly diagnosed lung cancer patients than in chronic patients. The data obtained by the study also indicate that the increase in cortisol level is due to more psychological disturbances in newly diagnosed patients.

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