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COMPARISION OF SALIVARY CORTISOL LEVELS IN NORMAL AND SEVERELY DEPRESSED INDIVIDUALS

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Abstract:

Background: *Depression is a mood disorder characterized by sadness, inactivity, difficulty in thinking and concentration, feeling of hopelessness, and suicidal ideation. A type of depression is major depressive disorder which is signified by various characteristic features which have a strong impact on the person's over all personality (1). Cortisol is secreted by the adrenal cortex and is considered as a stress hormone. Recent studies have shown that cortisol levels are increased in severe depression and these higher levels can be detected in the saliva samples.*

Aims and Objectives: *We compared the salivary cortisol levels of in normal and severely depressed patients.*

Materials and Methods: *After getting approval from Ethical committee, this cross sectional-analytical study was conducted in Department of Physiology, Shaikh Zayed FPGMI, and Punjab Institute of Mental Health Lahore. Study was Cross-sectional, comparative and 60 participants were included in this study; 30 in control group and 30 in study group. Diagnosed cases of major depression were selected based on outdoor clinical assessment and confirmed by ICD-10 and DSM-4 criteria. .Cases of hyperaldosteronism, Cushing's syndrome/disease were excluded from the study. Data were collected in the form of a questionnaire based on the Becks Inventory. Saliva samples were taken, processed and assessed for cortisol levels using ELISA kits.*

Results*: Higher salivary cortisol was found in participants who were depressed with positive family history The mean cortisol level in normal subjects was 1.46±0.91 while in depressive patients was 2.23±1.69. The mean level of cortisol was significantly higher in depressive patients as compared to normal subjects (p-value= 0.031). BMI was also found to be associated with depression.*

Conclusion*: Salivary cortisol may be considered as a biomarker for diagnosis and prognosis of depression. Raised salivary cortisol levels very useful tool in early recognition of depression.(3) Early diagnosis of disease and commencement of treatment can result in better clinical outcomes in depression patients.*

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INTRODUCTION:

Depression is a common mental disorder characterized by sadness, loss of interest in daily life activities, feeling of guilt and tiredness, disturbed sleep or appetite and poor concentration. (1) A person having Major Depressive Episode (MDE) presents with complaints of mood disturbance. Various aspects of mood change like lack of interest in all those activities which one used to enjoy earlier. The person feels disheartened, dejected and useless. (2) According to Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (DSM-V), depression is characterized by sadness, feeling of emptiness or ill-tempered mood (3) In MDE, these symptoms are prolonged and persist for more than two weeks. The person is confined to himself and does not like to interact with anybody. Hopelessness and worthlessness increases to the extent that the person may even start thinking of suicidal ideas (4) Loss of loved ones, unemployment, divorce, morbid diseases, amputations or radical surgeries may trigger depression. Certain people are genetically prone and others have a depression prone personality. The pathophysiology of depression involves a chemical imbalance in the neurotransmitters, like serotonin, noradrenaline and cortisol. Structural changes in the brain are also seen. (5).

Depression is a global disorder and affects all races, cultures and geographical locations. It may affect both the genders of any age. (6) Approximately 350 to 355 million people are affected by depression (7).

Depression has been found to be associated with increased cortisol levels in a recently published report. Cortisol is a glucocorticoid and is the main hormone produced by the adrenal gland. (8).Cortisol and depression has a profound and remarkable relationship. Levels of cortisol are directly proportional to development of depression. When the levels of this hormone increases in blood, it also increases in the salivary secretion. Recently it was suggested that cortisol can act as a biomarker for depression and thus can help in the early diagnosis of disease. (8)Salivary cortisol is an emerging biomarker and only few studies are available. Little is known about its association with depression in South Asia. The objective of the study was to compare salivary cortisol levels in severely depressed patients and normal individuals and to establish salivary cortisol as a potential biomarker for severe depression.

MATERIAL AND METHODS:

The study was conducted in the Department of Physiology, Shaikh Zayed FPGMI and Punjab Institute of Mental Health, Lahore. Total 60 participants were included in this study, divided equally in both groups. Both the groups included 14 males (46.67%) and 16 females (53.33%) respectively. females were were normal and 30 severely depressed.

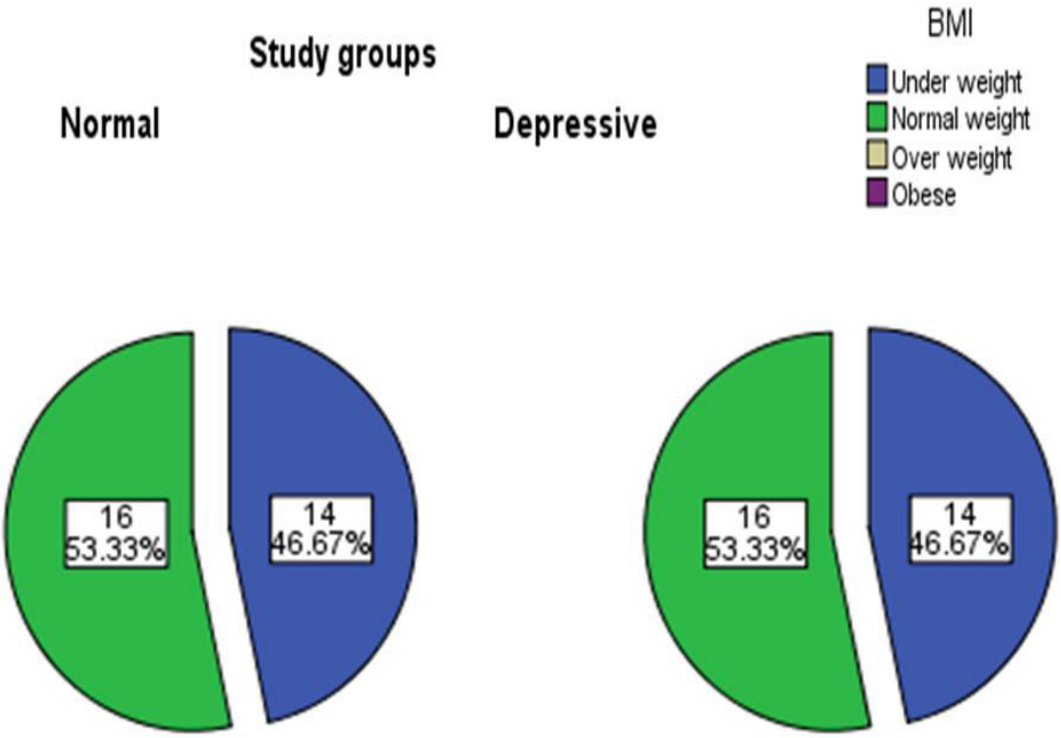
14Male (46.67%) and 16 female (53.33%) normal subjects and similarly 14 Male (46.67%) and 16 female (53.33%) depressed patients above the age of 17 years were included in the study. Diagnosed cases of major depression (based on outdoor clinical assessment and confirmed by ICD-10 and DSM-4 criteria) were selected. Cases of hyperaldosteronism, Cushing's syndrome/disease were excluded from the study. Personal data (including name, gender, age, BMI and education status) and information regarding the general physical health, family history of depression and other diseases were collected in the form of a questionnaire. Detailed medical history and physical examination of each subject were performed. Early morning saliva samples were collected (subjects were asked not to eat, drink or brush teeth before sample collection). The subjects were asked to rinse mouth with normal saline, 4-5 ml of saliva samples were collected in clean glass tubes and stored at 4^0C for 24 hours. The samples were centrifuged at 20,000 rpm for 10 minutes and transferred to secondary tube (stored at -20 ºC) for 30 days till the test was performed. Salivary cortisol levels were estimated by ELISA. The data were entered and analyzed using SPSS version 20. Salivary cortisol levels were compared between normal individuals and severely depressed patients. Quantitative variables were reported in the form of mean and standard deviation and qualitative variables like family history, marital status and severity of depression were presented in the form of frequency, percentages, and pie charts.

RESULTS:

Mean age of subjects in normal category was 35.73±6.89 years and of there were 14 (46.67%) males and 16 (53.33%) females in each normal and depressive group depressive subjects was 39.10±6.89 having no statistical difference in mean ages. Mean BMI of subjects in normal group was 22.02±4.21 and in depressive category was 24.64. Highly significant difference was observed in mean BMI among the two study groups (p-value=0.012). Mean cortisol level in normal subjects was 1.46±0.91 while in depressive patients was 2.23±1.69. The mean level of cortisol was significantly higher in depressive patients as compared to normal subjects (p-value= 0.031).

Comparison of height, weight and BMI in both study groups

		Mean	S.D	Minimum	Maximum	p-value
Height	***Normal***	1.67	0.08	1.52	1.85	0.056 (insignificant)
	Depressive	1.63	0.08	1.55	1.83	
Weight	***Normal***	61.55	11.61	42.90	99.80	0.151 (insignificant)
	Depressive	65.79	10.92	40.80	86.70	
BMI	***Normal***	22.02	4.21	16.20	35.20	0.012* (significant)
	Depressive	24.64	3.58	16.80	31.90	



Comparison of BMI in both study groups

p-value= 0.017 (significant association of BMI and depression)

Comparison of cortisol levels in both study groups

	Study Groups	Mean	S.D	Minimum	Maximum	p-value
Cortisol	***Normal***	1.46	0.91	.36	4.33	0.031
	Depressive	2.23	1.69	.35	6.34	

The mean cortisol level in normal subjects was 1.46±0.91 while in depressive patients was 2.23±1.69. The mean level of cortisol was significantly higher in depressive patients as compared to normal subjects (p-value= 0.031).

DISCUSSION:

This study found elevated Mean salivary cortisol levels were found to be significantly raised salivary cortisol levels in severely depressed participants as compared to healthy individuals (p-vale=0.031)

Depression is a treatable mental disorder if diagnosed and managed appropriately. Cortisol and depression have a profound relationship. In this study comparison of salivary cortisol levels was done in

normal and severely depressed patients. and thus may indicate disease progression. Hence, salivary cortisol may be considered as a future biomarker for depression.

These findings are consistent with research conducted by Owens and Herbert et al. (2014). They observed raised salivary cortisol levels in patients of Major Depression.. A similar study was conducted by Yonekura et al (2014) in Japan after a massive earthquake and it was noticed that salivary cortisol and depression have a remarkable relationship. Hanson MD and Chen E (2010) observed that levels of cortisol were raised during stress (9). Goodyer et al (2009) studied the effect of high morning cortisol levels which might be a predictor of development of depression.

These results can be explained by the fact that cortisol is released under the influence of Hypothalamic–Pituitary-Adrenal axis (HPA axis). Corticotrophin released from hypothalamus acts on the anterior pituitary, hence ACTH is released which acts on the adrenals to release cortisol. The primary reason for raised salivary cortisol levels in depression is due to excitation and stimulation of the entire HPA axis.

In this study, we found that high BMI and depression were significantly related too (p-value=0.017). A study conducted by Wojnar et al (2010) also observed same results, higher the BMI greater the chances of development of depression. According to WHO, it is predicted that depression will be the leading cause of disability in the entire world followed by cardiovascular diseases by the end of year 2020 (7,9)

It can be summarized that cortisol levels rise significantly in depressed patients and can easily be measured by taking a simple salivary sample. Moreover, salivary cortisol can be used as a biomarker for potential predictor for diagnosing depression in future if more work and research is done with greater number of participants under variable conditions. (10)

CONCLUSION:

Our study compares the salivary cortisol levels in normal and severely depressed patients. Salivary cortisol levels are significantly raised is severely depressed patients as compared to normal individuals. Cortisol might be considered as a diagnostic and prognostic marker in depression for future research initiatives. Similarly high BMI also had a significant relationship with salivary cortisol levels.

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