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Effect of stress on cortisol and vanillyl mandelic acid levels

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Abstract

Introduction and objective : Cortisol is a biochemical index of Hypothalamus-Pitutary-Adrenal (HPA) axis activation and is an important index related to psychological stress. Beside cortisol, vanillyl mandellic acid (VMA), a catecholamine is also an example of stress related biochemical index.

Material and Method : On the basis of Holems & Rahe scale and HADS scale of stress, a total of 100 patients were selected for the study. Their serum cortisol was analyzed by fully automated Vidas analyzer from Biomeriuex. Urinary VMA was analyzed by kits from DRG Int using Robonik ELISA reader.

Results : Mean±SD value of serum cortisol level in controls were 14.6±19.1 ng/ml and in cases 76.3±29.8 ng/ml. Mean±SD values of VMA in controls were 4.85±2.3 µg/ml of creatinine and in cases were 7.21±4.8 µg/ml of creatinine.

Conclusion: Serum cortisol and urinary VMA levels were found to be significantly higher in those who were having stress (assessed on the basis of Holmes & Rahe and HADS scale) as compared to the controls.

Key Words – Stress, Cortisol, VMA.

Introduction

According to stress theory by Hans Seyele, Stress is the nonspecific response of the body to any demand upon it [1-3]. Distress was defined as stress that is unpleasant or harmful to the body [2]. Excessive, repeated, or inappropriate stress responses were viewed as maladaptive, and Selye described it with the phrase “disease of adaptation”.

Mental state can influence the hypothalamic-pitutary-adrenal (HPA) axis and alter the cortisol levels [3]. Cortisol secreted from the adrenal cortex is a biochemical index of HPA axis activation and is a important marker related to psychological stress [4]. Many studies describe the role of cortisol in health and disease and use of cortisol measure in stress research [5-7]. Besides cortisol, catecholamines such as norepinephrine, epinephrine and vanillyl mandelic acid are examples of stress related biochemical indices [8-10]. Changes in activity of catecholaminergic systems after influence of various stimuli from outside or inside the organism (later called stressors) had already been studied hundreds years ago. In spite of that the definition of stress is still not satisfactorily stated. A lot of papers have been dedicated

to the topic of catecholaminergic changes during stress, and a great deal of important knowledge has been obtained [3,11-15].

However, we still do not know exactly what stress is or what is or are the detailed mechanism of activation of catecholaminergic systems under various specific stressors.

Materials and Method

The present case control study was conducted in Department of Biochemistry and Psychiatry, Subharti Medical College, Meerut, U.P. The patients were selected from OPD of Psychiatry department after obtaining ethical clearance from the Institute.

On the basis of Holmes & Rahe [16] scale and HADS[17] scale of stress, depression and anxiety, a total of 100 patients belonging to age group of 20 to 60 years were selected for the study. These patients were not suffering from any other acute or chronic disorder.

Patients who were smokers and alcoholics and patients with the established diagnosis of diabetic nephropathy or nephropathy of any other origin, retinopathy, and hypertension, cardiovascular diseases, pheochromcytomas, neuroblastoma, Cushing's syndrome, Addison 's disease or any other systemic disease were excluded from the study. After obtaining informed consent, patients were evaluated for clinical history and psychiatric assessment.

Serum and spot urinary samples were collected and stored at -20˚C. Serum cortisol was estimated by fully automated Vidas analyzer from Biomeriuex. Urinary VMA was analyzed by Elisa kits (DRG Pvt Ltd Germany) using Robonik Elisa reader.

Statistics

The data was analyzed by using Statistical Package for Social Sciences (SPSS Inc, USA) for windows version 16. Values were expressed as Mean ± SD. p value of <0.05 were considered as significant.

Results

There were total of 100 patients and 50 controls involved in the study. Out of 100 patients 54 were males and 46 were females. Among the 50 controls, males and females were 25 each. The mean ± SD values of cortisol and VMA for cases and controls are given in Table 1.

	Controls	**Cases**	**p value**
Serum Cortisol (ng/ml)	14.6 ± 19.1	76.3 ± 29.8	< 0.05
Urinary VMA (µg/ml of creatinine)	4.8 ± 2.3	7.2 ± 4.8	< 0.05

Discussion

The findings from the present study indicate that patients with stress have significantly higher serum cortisol and urinary VMA levels as compared to controls.

Results of Jacobs N et al [18] showed that minor stressors were associated with decreased positive affect and increased negative affect, agitation and cortisol. Of the moods states only negative affect was independently associated with cortisol. Negative affect also mediated effects of daily stressors on cortisol. According to Sladek MR et al [19] perceiving greater stress than usual was significantly associated with elevation in cortisol. Timio *et al* [20] have reported increased activation of the adrenosympathetic system releasing catecholamines during occupational stress. Positive correlations were found by Fukuda M et al [21] between VMA levels and psychological stress response. Zaki and Elbatrawy [22] found statistically significant relation between VMA levels and anxiety/stress. They found elevated levels of VMA in patients of stress.

Conclusion

VMA measurements, which reflect the level of activity of the peripheral sympathetic nervous system and cortisol levels, may provide a useful biochemical index of psychological stress responses in normal subjects.

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