A CLINICAL STUDY ON CORTISOL AND CERTAIN METABOLITES IN SOME CHRONIC PSYCHOSOMATIC DISORDERS

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ABSTRACT

Present clinical study involved two groups of psychosomatic disorders, bronchial asthma and rheumatoid arthritis. In the study, the levels of plasma cortisol, blood glucose, total cholesterol and triglycerides were estimated in 125 clinical subjects, (50 normal controls, and 40 having bronchial asthma and 35 suffering from rheumatoid arthritis). The results showed a significant change in the levels of plasma cortisol and blood glucose in both the stressed clinical groups' vis-à-vis normal controls. The levels of atherogenic lipids (total cholesterol and triglycerides) were found quite elevated in both the diseased groups. However, in rheumatoid arthritis, the physiological changes were relatively more pronounced. The findings of this study indicate that rheumatoid arthritis is a relatively more chronic and late onset disorder as the functional performance of hypothalamo-pituitary-adrenocortical axis gradually declines with passage of time and the ability of the adrenocortical response to return to normalcy becomes impaired.

KEY WORDS

Stress, Glucocorticoid, Hypothalamo-pituitary-adrenocortical axis, Homeostasis

INTRODUCTION

A psychosomatic disorder, by definition, is a stress disorder whose principal cause is psychological in origin but its manifestations are predominantly observed in the body. Rheumatoid arthritis and bronchial asthma are such psychosomatic disorders where stress plays a cardinal role in their pathogenesis (1-3). Stress is a non-specific response of the body to any demand made upon it (4-5). Such a response consists of a series of neurohumoral, endocrine and metabolic changes with related physiological alterations involving entire body parts and systems albeit to varying degrees (6-8). Normally these stress-induced physiological changes are adaptive, compensatory, and self-limiting but when stressful conditions are frequent, intense and override certain limits,

these physiological changes become rather irreversible and pathological in nature (9). Adrenal cortex, an integral part of the hypothalamic-pituitary-adrenocortical (HPA) axis plays a very important role in the stress physiology. Cortisol, a principal glucocorticoid in man, is secreted by the adrenal cortex, has profound effects in health and disease. The principal effects of cortisol are to reduce inflammation, stabilize blood glucose, and maintain muscle strength and fluid excretion. Increased level of cortisol in circulation (hypercortisolism) plays a dominant role in lipid and glucose metabolism in the body (10). In view of the points mentioned above, the present study was taken up to find out the pattern of physiological changes in subjects of bronchial asthma and rheumatoid arthritis with reference to the levels of cortisol and certain metabolites.

MATERIALS AND METHODS

Investigations were carried out on the blood samples from normal controls and the subjects suffering from rheumatoid arthritis and bronchial asthma. The number of subjects studied was 125 (50 controls, 40 rheumatoid arthritis and 35 bronchial asthma). All the subjects belonged to middle socio-economic

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Table 1 : Laboratory data in normal controls and diseased subjects (Values are in Mean $\pm$ SD)

Groups	Plasma Cortisol $\mu\text{g/dl}$	Blood glucose mg/dl	Serum Triglycerides mg/dl	Serum Total cholesterol mg/dl
Controls (n = 50)	20.5 $\pm$ 2.5 (14.5-26.4)	78.0 $\pm$ 6.5 (66.2-93.7)	132.6 $\pm$ 18.3 (102.0-148.2)	178.28 $\pm$ 9.1 (156.35-232.80)
Bronchial Asthma (n = 40)	28.4* $\pm$ 1.4 (17.6-37.4)	79.7** $\pm$ 10.1 (64.8-108.2)	146.7** $\pm$ 17.2 (118.0-174.2)	201.1** $\pm$ 15.4 (168.4-264.0)
Rheumatoid Arthritis (n = 35)	30.9* $\pm$ 2.8 (22.3-39.6)	92.2** $\pm$ 9.8 (76.4-114.2)	182.8** $\pm$ 20.6 (112.2-166.4)	209.8** $\pm$ 20.2 (162.0-246.8)

Values in parenthesis indicates range. *P<0.001 **P<0.01

class of families and were in the age group of 35-50 years. They were visiting the outpatient department (OPD) of the S. S. Hospital, Banaras Hindu University. Prior to study, all these patients were thoroughly examined by expert clinicians in order to rule out any other associated disease. Only vegetarian subjects were chosen for the study. This was to rule out the possibility of any interference of dietary factors. Each subject was asked to fill in a proforma, which contained detailed information about his/her stressful life circumstances. In addition to recording the age and blood pressure, anthropometric measurements were also noted. Blood was taken in supine state of the subjects from antecubital vein between 0900-1000 hours after an overnight (12-14 hours) fast. Plasma cortisol was estimated fluorimetrically as per the method of Mattingly *et al* (11). Blood glucose and serum cholesterol were estimated by procedures of King and Wootton (12) whereas triglyceride was estimated by the method of Laurell (13).

RESULTS AND DISCUSSION

Laboratory data showed a significant change in the levels of biochemical parameters in both the stressed clinical groups in comparison to normal controls (Table-1). Compared to normal controls, the subjects of rheumatoid arthritis exhibited relatively greater physiological aberrations. As regards TG and TC, they were found more elevated in arthritis subjects with respect to normal controls. Cortisol, a principal glucocorticoid in human produced by the glomerular cortices of adrenal gland, has a significant role in the stressed clinical states. Adrenal cortex is an integral part of the HPA axis. Cortisol is an important hormone, which suppresses inflammation and serves as autacoids (self medicine) under stressful states. Hypercortisolism under stressful states is an adaptive natural response. It helps to maintain fluid excretion and muscle strength and provides surplus body fuels (glucose and lipids) in circulation to avoid exhaustion of the body. It is done through the mechanism of hepatic gluconeogenesis and other related processes (14). In addition to that cortisol also exerts inhibitory

action on insulin action. This aggravates the magnitude of stress-hyperglycemia (15-16). Clinical data show a significant rise in the levels of triglycerides and total serum cholesterol in the diseased subjects. However, present study shows relatively more pronounced elevations in the levels of plasma cortisol and metabolites in rheumatoid arthritis as compared to those of bronchial asthma. The finding of this study thus establishes that rheumatoid arthritis is relatively a chronic and late onset stress disorder. It is obvious from the data that the negative feedback mechanism of HPA axis declines with the chronicity of stressful state (17). It is because the prolonged and recurrent exposure to stress disrupts the efficacy of HPA axis, which modulates the secretion of cortisol (18). Increased secretion of cholesterol (hypercholesterolaemia) in the stressed clinical state could be an antecedent to atherosclerosis, which leads to various cardiovascular complications in the later stage (19).

The results suggest caution in the treatment of inflammatory disorders with corticoids as stress-induced hypercortisolism together with therapeutic doses may lead to hyperglycemia. In addition to that hyperlipidaemia could be a prelude to atherosclerosis in patients already suffering from essential hypertension. The present study lays emphasis on further investigations on physiological changes in psychosomatic subjects, as it may prove very helpful to clinicians and medical practitioners in diagnosis and treatment of patients suffering from stress-disorders.

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