

## Effect of Stress on Coronary Risk Factors

Dear Editor,

In India, a survey indicates the prevalence of 30 times increase in hypertension among urban dwellers, compared with 10 times in rural inhabitants.<sup>1</sup> Urbanization together with a change in life style, diet, and job stress, has been attributed in causing hypertension. Stress can cause hypertension by elevating the blood pressure (BP) and by stimulating the nervous system leading to the production of large amounts of vasoconstrictor hormones. High BP due to stress includes white coat hypertension, job strain, race, social environment, and emotional distress. BP is multiplied when more than one risk factor are involved. Emotional stress-activated sympathetic nervous system increases circulating angiotensin II, aldosterone, and vasopressin, which increase systemic vascular resistance. Prolonged elevation of angiotensin II and catecholamines can lead to cardiac and vascular hypertrophy, both of which can contribute to a sustained increased BP.<sup>2</sup> Karasek Demand-Control model describes the relationship between perceived job stress and coronary heart disease (CHD).<sup>3</sup> Job strain, high job demands, and low decision attitude increase the risk of CHD whereas Tien has demonstrated the other way.<sup>4</sup>

The present study consists of 72 workers of both genders working in a bank. The study measured different metabolic risk factors and biochemical parameters. The job characteristics including job strain, mental stress, medical history, and behavioral characteristics including smoking and alcohol consumption habits were assessed by using a questionnaire. Pearson correlation coefficient and linear regression model between the levels of BP, serum glucose, cholesterol and triglyceride levels and the job stress were carried out using SPSS software version 12.0.

Among the demographic variables, age was negatively correlated with diastolic BP ( $r=0.217$ ), but no significant correlation was found. Body mass index (BMI) was significantly correlated with diastolic BP ( $r=0.424$ ), serum triglyceride ( $r=0.342$ ), and blood glucose ( $r=0.234$ ). Systolic BP was found markedly correlated with job stress ( $r=0.192$ ). Our results showed an increase in the systolic BP for middle aged adults with high job stress, whereas others did not show significance correlation with job stress. Therefore, it is concluded that job stress can alter the metabolic risk factors. Further, the relationship between BMI and biological risk factors including serum triglyceride ( $r=0.391$ ) remains significant. The middle aged adults displayed positive relationship between serum glucose and triglyceride ( $r=0.347$ ). It directs that different life styles such as eating habits, smoking frequencies, and consumption of alcohol, have distinct effects on biological factors. The statistical results revealed that there was a relationship between the working condition and metabolic risk factors. The scatter plot suggests that there was a significant direct correlation between the systolic BP ( $r=0.255$ ) and higher job stress. BMI was characteristically related to the working condition among male workers, but not females. Lack of relationship between glucose and job stress and inverse relationship of total cholesterol and triglycerides, direct an association between work duration and the hypertension that is observed to be a risk factor of cardiovascular disease.

Metabolic syndrome, a concurrence of hypertension, dyslipidemia, hyperglycemia, and central obesity are strong risk factors in cardiovascular diseases.<sup>5</sup> However, stress and work site environment influence cardiovascular complaints. Work stress is typically associated with increased BP and job characteristics. The present study does not concur the above risk factors for CHD for bank employees. Instead, it gives emphasis to stress-induced response on BP during working hours. It projects that high job strain is associated with a higher systolic BP. In the study of Kang and colleagues,<sup>6</sup> job stress has shown to be involved in elevated serum triglycerides and cholesterol levels, whereas in the other study, acute psychological stress reduced plasma triglycerides and cholesterol.<sup>7</sup>

Earlier studies have presumed that the stress associated with aversive condition, decreases the levels of circulating triglycerides, and increases lipoprotein lipase.<sup>8</sup> However, the hypertension caused by job stress may be attributed either to physical stress or emotional stress, while the group of bank employees may not be expected to have physical stress and invariably exposed to emotional stress.

Hypertension is the function of metabolism and hormonal imbalance. The present study found no rise in plasma cholesterol and triglyceride levels of those having hypertension. During stress, hypertension is increased either by hormone release,<sup>9</sup> or burning out of the carbohydrates. Generally, chronic stress influences the cardiovascular complaints. Bank employees may not have such stress and so the hormone imbalance must have triggered the hypertension. It is accepted that stress

elevates blood glucose levels and worsen glycemic control. However, research on psychological stress is limited, so Wing reported only a temporal shift in the glucose level.<sup>10</sup>

It is concluded that CHD risk factors such as plasma cholesterol and triglycerides levels are posing less risk, whereas hypertension such as systolic BP increases during high job stress. Hence, the incidence of CHD is more possible due to job stress associated hypertension.

Thambiraj Antony Thangadurai, Chelladurai Savariraj Sagayam, Gnanarajamanickam Victor Rajamanickam, Govinda Prasad Dubey

Centre for Advanced Research in Indian System of Medicine (CARISM),  
Shanmugha Arts, Science, Technology and Research Academy (SASTRA),  
SASTRA University, Thanjavur, Tamilnadu, India.

**Department:**

Thambiraj Antony Thangadurai PhD,  
Centre for Advanced Research in Indian System of Medicine (CARISM),  
SASTRA University,  
Zip code: 613402,  
Thanjavur, Tamilnadu, India.

**Tel:** +91 9789 436222

**Fax:** +91 4362 264346

**Email:** antonythangadurai@yahoo.co.in  
antony@carism.sastra.edu

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## References

- 1 LCVK Agrawal, CR Bhalwar, DR Basannar. Prevalence and Determinants of Hypertension in a Rural Community. *MJAFI* 2008; 64: 21-5.
- 2 Klabunde Richard E. Secondary Hypertension: Cardiovascular Physiology Concepts. [Cited: 2007 January 1] <http://www.cvphysiology.com/Blood%20Pressure/BP023.htm#Stress>.
- 3 Kittel F, Leynen F, Stam M, et al. Job conditions and fibrinogen in 14 226 Belgian Workers: Belstress study: *European Heart Journal* 2002; 23, 1841-8.
- 4 Su CT. Association between Job Strain Status and Cardiovascular Risk in a Population of Taiwanese White-Collar Workers. *Jpn Circ J* 2001; 65: 509-13.
- 5 Assmann G, Cullen P, Jossa F, et al. Coronary heart disease: Reducing the risk: The scientific background to primary and secondary prevention of coronary heart disease a worldwide view. *Arterioscler Thromb Vasc Biol* 1999; 19: 1819-24.
- 6 Kang MG, Koh SB, Cha BS, et al. Job stress and cardiovascular risk factors in male workers. *Prev Med* 2005; 40: 583-8.
- 7 Stoney CM, West SG, Hughes JW, et al. Acute psychological stress reduces plasma triglyceride clearance. *Psychophysiology* 2002; 39: 80-5.
- 8 Rogers MP, Robinson DS. Effects of cold exposure on heart clearing factor lipase and triglyceride utilization in the rat. *J Lipid Res* 1974; 15: 263-72.
- 9 Miyabo S, Asato T, Mizushima N. Psychological Correlates of Stress-Induced Cortisol and Growth Hormone Releases in Neurotic Patients. *Psychosom Med* 1979; 41: 515-23.
- 10 Wing RR, Epstein LH, Blair E, Nowalk MP. Psychologic Stress and Blood Glucose Levels in Nondiabetic Subjects. *Psychosom Med* 1985; 47: 558-64.