

Awareness of Lifestyle Modifications Among High Stress Professionals Prone For Cardio-Metabolic Derangement

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Abstract

Introduction: Stress has become an integral part of our lifestyles. Stress to some extent improves management skills, job performance but when crosses the limit results adversely on health. Recent studies have mentioned majority of software professionals and bank employees are stressed and suffer from related disorders. Work duration, workload and mental stress have a great impact on the functioning of cardio-metabolic system and thereby evaluation of these functions helps to detect any health hazards and take appropriate preventive measures at the earliest. We carried out this study to find out the stress levels among working middle-aged male professionals through a questionnaire-based analysis; study the effects of work-related stress on Blood Pressure (BP), Body Mass Index (BMI), Waist-Hip ratio (W/H), Blood glucose and lipid profile and to find out their awareness about lifestyle modifications. **Materials and Methods:** The study consisted of 133 male participants of which 60 were bank employees and 73 software professionals. A pretested and validated questionnaire on work stress divided the participants into non-stressed and stressed groups. Their age, work experience, BP, BMI and Waist/Hip ratio, Random Blood Sugar, Lipid parameters and Atherogenic index were analyzed. Their awareness on lifestyle modifications was assessed. These parameters were compared by unpaired *t*-test. All tests were two-tailed and $p < 0.05$ was considered significant. **Results and Conclusions:** The study showed that significant stress levels are observed in these professions and as a result, there is derailment of cardio-metabolic parameters among them. There exists a difference in awareness about the need for yoga and exercise among them. Hence while addressing the complications of job stress, a more aggressive working health policy has to be implemented at all workplaces.

Keywords: Lifestyle; Occupational; Professionals; Stress; Yoga; Workplace.

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Introduction

Stress has become an active part of every occupation. Stress to some extent improves management skills and job performance but when it crosses the limit, adversely affects health; physical and mental. Work-related stress has been known to cause many ill-effects on the body or accentuate already existing morbidities. There is no standard procedure to track back and pin-point the causation and underlying

mechanism of ill health as "Stress".¹ But a rough estimate can be done by observing the health of people conditioned under stress. Such knowledge will help us to classify stress as an 'etiologic agent' or a 'predisposing factor'. By this, we can confer jobs with work-related stress as a potential health hazard.

Job stress has been known to potentiate the onset and the progress of diabetes mellitus, hypertension, bronchial asthma, and metabolic syndromes.^{2,3}

Of all the morbidities; hyperacidity, obesity, cardiovascular manifestations, and depression are the most common complaints of stressed workers.

World Health Organization (WHO) defines work-related stress as "is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope".⁴ Stress effects have been observed in almost all professions, more so in the banking sector and software industry as per the recent survey.

The banking sector forms an important contributor to the growth of the country's economy. India had 14 nationalized banks in 1969. Now scheduled commercial banks, private banks, public sector banks, regional rural banks, and foreign banks are added. The number of employees working in this sector has increased as well as the competition and associated stress.

Such organizational stress along with the sedentary lifestyle of a bank employee has made him our ideal candidate for studying cardio-metabolic risk factors that have been conditioned under work stress. World Health Organization report shows that 17.3 million deaths per year globally are due to cardiovascular disease.⁵ There has been an emerging trend of cardiovascular disease leading to mortality in developing nations.^{6,7} In developing countries, 80% of deaths are due to cardiovascular disease.⁸ Workplace stress has a major impact on personal, professional, organizational and national development. According to Botnia study in a population of Western Finland, finance, work, and social relationships had a direct effect on the prevalence of insulin resistance, obesity, and altered lipid levels.⁹ Work stressed employee suffers psychological strain and is more prone to develop cardiovascular disease according to a German study.¹⁰ It was observed that work duration, workload, and mental stress alter the functioning of cardiac¹¹ and autonomic nervous system.¹²

Stress can be observed in all fields of work; big or small¹³ Earlier what was observed in heavy workers involving more of stressful activities at workplaces, has now become a common entity observed even in sedentary work atmospheres. Due to rapid changes in globalization, economic liberalization, financial progress, technological advancements, stress has entered banking industry. As there has been a rapid spurt of private banks into the arena in recent years, occupational stress in these employees is crippling their performance and health. Levels of stress depend on working conditions, workload, management, leadership,

strict deadlines to achieve ambitious targets and also on the type of banks whether Government or private. It has been observed that stress levels are more in the employees of non-nationalized banks compared to those working in Nationalized banks.¹⁴ Long hours of working conditions in the banking sector create a stressed mind that adversely affects their health and performance according to Jamshed et al.¹⁵

Corporate Indian adults are exposed to stressful life in the software profession. Increased work stress, strict deadlines, high expectations, soaring competition are some of the causes of this. A recent study by the Association Chambers of commerce and Industry of India (ASSOCHAM) has mentioned that 54% of workers in software industry are suffering from stress and its disorders like hypertension, diabetes, obesity, spondylosis, depression, and headaches. It has been shown that work duration, workload, mental stress, and stress-related disorders have a greater impact on the functioning of autonomic, cardio-metabolic systems and thereby evaluation of these functions helps to detect any health hazards.

A clear understanding of stress, its pathophysiology and its effects on the health of a bank employee and software professionals will help us find better remedies to manage work stress in banking sector and software industry effectively and add more years to the lives of the human resource of our country.

Objectives

1. To find out the stress levels among working middle-aged male professionals through a questionnaire-based analysis.
2. To study the effects of work-related stress on Blood Pressure (BP), Body Mass Index (BMI), Waist-Hip ratio (W/H), Blood glucose and lipid profile.
3. To find out their awareness about lifestyle modifications.

Materials and Methods

The present cross-sectional study consisted of 133 male participants by convenience sampling method of which 60 were bank employees 35-60 years age group and 73 software professionals 21-45 years age group. Ethical approval was obtained for this study from the Institute's Ethical review committee. Written informed consent was taken from each participant after describing in full

detail the procedure and purpose of the study.

A validated self-administered Likert Scale questionnaire on work stress was used for the study. Responses were collected from the participants. The questionnaire consisted of 20 questions; each with a minimum score of 0 and maximum of 4 per question, scores 0 to 25 indicate that the person is probably coping adequately with his job. If 26 to 40, there is job stress and a need to take preventive action. If scores are 41 to 55, employee needs to take appropriate action to avoid job burnout. And any score from 56 to 80, requires a comprehensive job stress management plan to be started at the earliest.

Based on the analysis of their job stress levels, study group was divided into control (Non-stressed) and test/experimental group (Stressed). Their age, Blood pressure (BP), Body Mass Index (BMI) and Waist-Hip Ratio (WHR) were recorded. General physical examination and, complete systemic examinations were done. A detailed history which included the work history, diet history, family and drug history were taken.

We included 35-60 year-old male bank employees, 21-45 year-old software professionals with stress level scores 26 and above as the test group. Healthy, non-stressed age-matched employees formed the controls. Those with a history of neurological disorders and any systemic illness were excluded.

Blood sample was collected under all aseptic conditions and blood glucose levels were measured by Glucoseoxidase-peroxidase endpoint by Trinder's method using glucose reagent. (Transasia Bio-Medicals Ltd, Solan, Himachal Pradesh, India). Their lipid profile parameters; Total Cholesterol (TC), High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), Triglycerides (TG), Very Low-Density Lipoprotein (VLDL) were measured. Lipid ratios TG/HDL, TC/HDL, LDL/HDL, Atherogenic index in Plasma (AIP) by Log (Triglycerides/HDL-Cholesterol) were calculated. AIP values of -0.3 to 0.1 are associated with low, 0.1 to 0.24 with medium and above 0.24 with high cardiovascular risk. Another questionnaire was administered to assess their awareness of lifestyle modifications. Data were analyzed for normal distribution. Age, work experience, BP, BMI, Waist-Hip ratio, Blood glucose, and Lipid profile parameters among stressed and non-stressed middle-aged male professionals were analyzed statistically by using the statistical software SPSS and MS Excel. All tests were two-tailed and $p < 0.05$ is considered as significant.

Results

Stress analysis of Bank employees

Based on the analysis of the questionnaire, there were 21 stressed and 39 non stressed male bank employees in the study group. The stressed group had a mean stress score of 34 whereas in the nonstressed group it was 22. The mean age of the stressed and nonstressed males was 50.71 ± 7.03 and 50.36 ± 8.04 years respectively (Table 1) 30.8% of the stressed were aged below 50 years. 38.2% were above 50 years old (Table 1). The most common responses from questionnaire analysis showed that 78% are callous nature about others' problems, 68% have dissatisfaction, 61% suffer from forgetfulness, 56% are irritable/impatient and 55% have lost their time, energy.

Systolic Blood Pressure and Diastolic Blood Pressure were significantly more in stressed individuals. ($p = 0.035$ and 0.031 respectively) (Table 1). BMI was statistically more in the test group. ($p = 0.04$) Mean RBS (mg/dl) in the stressed group was 139.62 ± 37.45 . Non-stressed males had 121.43 ± 24.78 with a significance value of $p = 0.02$. Waist/Hip ratio was not significant among the study group. Lipid parameters like Total Cholesterol, HDL, VLD Lipoprotein levels were not significantly altered except the Triglyceride and LDL levels which were elevated with p-value of 0.034 and 0.037 respectively (Table 1). TG/HDL was highly significant with $p = 0.0004$. Atherogenic Index, a predictor for cardiovascular risk was significant p-value of 0.0002.

Stress analysis of Software professionals

There were 21 stressed and 53 non stressed in the study group. Stressed group had a mean stress score of 36 where as in the non stressed group it was 24. Mean age of the stressed and non stressed males were 28.53 ± 6.25 and 27.62 ± 5.24 years respectively (Table 3). The most common responses from questionnaire analysis showed that they are physically, emotionally, spiritually depleted, have irritability, impatience, eating more or less, drinking more coffee, smoking more cigarettes, or using more alcohol or drugs to cope with job, feel a sense of dissatisfaction, of something wrong or missing and have less than usual decision-making ability.

Systolic Blood Pressure and Diastolic Blood Pressure were significantly more in stressed individuals p-value 0.0001 (Table 3). No difference was seen with respect to obesity parameters among the group probably due to their young age.

Random blood sugar was elevated in the stressed group (p -value ≤ 0.0009). Lipid parameters like LDL, VLD Lipoprotein levels were not significantly altered except Total Cholesterol, Triglycerides and HDL levels which were elevated with p - value of 0.026 and 0.0001 and 0.0016 respectively. TC/

HDL, TG/HDL and LDL/HDL were more in stressed group and highly significant with p 0.0001. Atherogenic Index, a predictor for cardiovascular risk was more in stressed group with significant p - value of 0.0001 (Table 3).

When the responses of bank employees on

Table 1: Baseline and cardio-metabolic risk parameters of bank employees.

Parameter	Stressed	N	Mean \pm SD	p
Age (Years)	Yes	21	50.71 \pm 7.03	1.534
	No	39	50.36 \pm 8.04	1.288
Work experience (yrs)	Yes	21	20.67 \pm 6.45	0.53
	No	39	22.13 \pm 9.56	
Stress score	Yes	21		34
	No	39		22
Systolic BP mmHg	Yes	21	137.33 \pm 12.17	0.035*
	No	39	128.29 \pm 20.15	
Diastolic BP mmHg	Yes	21	87.69 \pm 9.24	0.031*
	No	39	81.14 \pm 11.76	
BMI kg/m ²	Yes	21	29.62 \pm 7.45	0.04*
	No	39	26.43 \pm 4.78	
WHR	Yes	21	0.93 \pm 0.05	0.703
	No	39	0.93 \pm 0.05	
RBS mg/dl	Yes	21	139.62 \pm 37.45	0.02*
	No	39	121.43 \pm 24.78	
TC mg/dl	Yes	21	211.44 \pm 34.70	0.259
	No	39	200.86 \pm 33.54	
TG mg/dl	Yes	21	258.95 \pm 80.72	0.034*
	No	39	220.18 \pm 57.12	
HDL mg/dl	Yes	21	46.97 \pm 12.78	0.492
	No	39	49.48 \pm 14.41	
LDL mg/dl	Yes	21	117.31 \pm 37.59	0.037*
	No	39	101.24 \pm 21.08	
TG/HDL	Yes	21	5.50 \pm 1.41	0.0004***
	No	39	4.44 \pm 0.88	
TC/HDL	Yes	21	4.50 \pm 2.71	0.5116
	No	39	4.06 \pm 2.32	
LDL/HDL	Yes	21	2.49 \pm 0.94	0.21
	No	39	2.04 \pm 1.46	
Atherogenic index	Yes	21	0.74 \pm 0.14	0.0002***
	No	39	0.64 \pm 0.05	

*Statistically significant

Table 2: Awareness of bank employees on lifestyle modifications

Item	Stressed	N	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Can Yoga/ exercise can improve the wellbeing	Yes	21	19 (90%)	02 (10%)	—	—	—
	No	39	29 (74%)	07 (18%)	03 (8%)	—	—
Is yoga and exercise to be done after 40 years of age	Yes	21	—	—	—	10 (48%)	11 (52%)
	No	39	—	—	01 (3%)	20 (51%)	18 (46%)
Yoga and exercise must be practiced by people of all age group	Yes	21	11 (52%)	06 (29%)	03 (14%)	01 (5%)	—
	No	39	22 (57%)	13 (33%)	—	04 (10%)	—

lifestyle modifications were analyzed it was observed that 90% of the stressed and 74% of the non stressed strongly agreed that yoga/exercise improves the wellbeing of a person. Majority of them disagreed that yoga and exercise to be done after 40 years of age. They were of the opinion that yoga and exercise must be practiced by people of all age groups. Around 10% of the nonstressed group

disagreed to this (Table 2).

The responses of software professionals on lifestyle modifications showed that there was a difference in opinion compared with the bank employees on the fact that yoga and exercise to be done after 40 years of age. Only 10% of the non stressed group strongly agreed that yoga and

Table 3: Baseline and cardio-metabolic risk parameters of software professionals.

Parameter	Stressed	N	Mean \pm SD	p
Age (Years)	Yes	21	28.53 \pm 6.25	0.526
	No	53	27.62 \pm 5.24	
Work experience(yrs)	Yes	21	2.69 \pm 2.31	0.14
	No	53	3.58 \pm 2.33	
Stress score	Yes	21	24	
	No	53	36	
Systolic BP mmHg	Yes	21	142 \pm 16.09	0.0001***
	No	53	124 \pm 16.03	
Diastolic BP mmHg	Yes	21	96 \pm 11.10	0.0001***
	No	53	80 \pm 11.16	
BMI kg/m ²	Yes	21	24.72 \pm 3.07	0.8334
	No	53	24.57 \pm 3.64	
WHR	Yes	21	0.89 \pm 0.05	1.0000
	No	53	0.89 \pm 0.05	
RBS mg/dl	Yes	21	123.61 \pm 28.78	< 0.0009***
	No	53	91.83 \pm 19.79	
TC mg/dl	Yes	21	198.79 \pm 38.34	0.026**
	No	53	177.85 \pm 28.16	
TG mg/dl	Yes	21	125.39 \pm 19.56	< 0.0001***
	No	53	87.86 \pm 14.48	
HDL mg/dl	Yes	21	34.56 \pm 4.78	0.0016***
	No	53	42.71 \pm 5.27	
LDL mg/dl	Yes	21	91.29 \pm 7.07	0.071
	No	53	89.46 \pm 3.12	
TG/HDL	Yes	21	3.55 \pm 0.05	0.0001***
	No	53	2 \pm 0.1	
TC/HDL	Yes	21	5.65 \pm 0.25	0.0001***
	No	53	4.13 \pm 0.18	
LDL/HDL	Yes	21	2.5 \pm 0.3	0.0001***
	No	53	2.1 \pm 0.2	
Atherogenic index	Yes	21	0.55 \pm 0.07	0.0001
	No	53	0.3 \pm 0.11	

*Statistically significant

Table 4: Awareness of software professionals on lifestyle modifications

Item	Stressed	N	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Can Yoga/ exercise can improve the wellbeing	Yes	21	17 (80%)	4 (19%)	—	—	—
	No	53	34 (64%)	17 (32%)	02 (4%)	—	—
Is yoga and exercise to be done after 40 years of age	Yes	21	—	1 (4%)	01 (4%)	10 (48%)	09 (44%)
	No	53	—	6 (11%)	09 (17%)	23 (44%)	15 (28%)
Yoga and exercise must be practiced by people of all age group	Yes	21	11 (52%)	04 (19%)	01 (5%)	05 (24%)	—
	No	53	10 (19%)	40 (75%)	—	03 (6%)	—

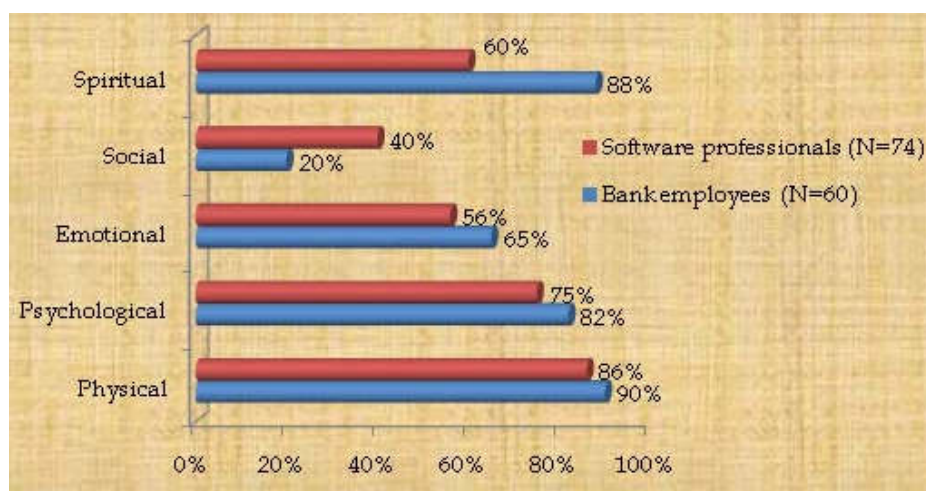


Fig. 1: The perception of the study group towards Yoga activity

exercise must be practiced by people of all age groups (Table 4).

We asked about their perception of Yoga activity: Physical/Psychological/Emotional/Social/Spiritual. Each individual had different perception about it. Participants selected the activities which were applied to them. The majority of them selected almost all the above options. But it was observed that many of them think that yoga is a physical activity. It was considered less of a social activity among bank employees (20%) compared to 40% among software professionals (Fig. 1).

Discussion

This study revealed the impact of job stress on cardiometabolic risk factors in male professionals. Stressed participants of the two groups had elevated BP, BMI, glucose and lipid levels. It has been shown from the earlier works that prolonged exposure to work stress affects autonomic, cardiovascular¹⁶ and neuroendocrine activity directly, contributing to the development of various disorders. Obesity, hypertension, diabetes mellitus, hyperlipidemia form important components of metabolic syndrome. Various factors like genetic, environmental, biological play interconnecting role in its pathogenesis. Stressful condition whether personal or professional leads to the activation of the hypothalamo-pituitary-adrenal (HPA) axis, leading in turn to endocrine abnormalities, such as high cortisol, low sex steroid levels and increase in visceral adiposity. High cortisol stimulates gluconeogenesis and glycogenolysis in skeletal muscle which inhibit insulin sensitivity and glucose uptake contributing to insulin resistance.¹⁷ Our results are in accordance with the studies by

Chandola et al. that showed that stressful work results in hypertension, obesity, hyperlipidemia and coronary vascular diseases.¹⁸

Stressed workers had significantly high BP both systolic and diastolic. Job stress is more prevalent under 50 years of age further developing cardiovascular diseases.¹⁹ Autonomic dysfunction in stressed workers was observed as a result of sympathetic predominance and vagal withdrawal that increases the BP.²⁰ Earlier studies have shown that stress induces the activation of sympathetic system releasing catecholamines which increases Blood Pressure.²¹ Obesity leading to insulin resistance has also been linked to the dysfunction of autonomic system and sympathetic predominance acting through the hypothalamus that increases Blood Pressure.²²

Our study showed that BMI, an important obesity marker is elevated in stressful work atmosphere among bank employees and not among software professionals probably due to their lesser mean age. White hall II study has depicted the association between work stress, autonomic activity, cortisol levels, weight gain, blood glucose levels and hence the emergence of metabolic syndrome.²³

Lipid parameter, LDL, Triglyceride levels, TG/HDL levels were elevated in the stressed individuals as per the present study. Qureshi et. al., have discussed the role of routine mental stress in cardiovascular derangement and lipolytic changes even in healthy young individuals in the age group of 18-23 years. There were increased BP, Heart rate and lipid levels in 114 medical students.²⁴

Young men had increased lipid levels like TG, LDL, VLDL and elevated Total cholesterol count as a result of stress.²⁵ Job stress has been associated

with altered cholesterol, HDL and LDL levels.²⁶ Cortisol and epinephrine have been linked to the pathogenesis of dyslipidemia.²⁷ The sympathetic nervous system innervating the adipose tissue activates the process of lipolysis. Elevated LDL, Triglyceride levels promote the development of atherosclerosis. Atherogenic Index is a better marker to test the atherogenic dyslipidemia and can identify increased coronary artery disease risk compared to cholesterol ratios which was more in the stressed employees in our study. The atherogenic index of plasma was calculated to predict cardiovascular risk. The value should be below 0.1.²⁸

Our study showed that though the study participants are aware of the lifestyle modifications that are required in their lives, majority of them are not following them strictly. There is difference in perception of the young professionals about the yoga activity which needs to be looked into. Previous studies have shown that young individuals should be informed about the benefits of yoga and exercise and they need to be motivated to practice these lifestyle modifiers which increase the overall quality of an individual's life.^{29,30}

Limitations of not including female employees as the available sample size was limited as this was a cross-sectional study. Hence forms the future scope of the study. Further, with a larger sample, across different work atmosphere, age group, in both the genders, measures to increase their awareness and practice of yoga and exercise, correlating with hormonal analysis the effect of stress and de-stress activities on the above discussed parameters will be studied.

Conclusion

Work stress alters cardio metabolic parameters which are mainly due to autonomic and neuroendocrine alterations. Stressed professions though are aware of life style modifications fail to practice it regularly. This study indicates that while addressing the complications of job stress, a more aggressive working health policy has to be implemented at all work places. All professionals irrespective of their age should develop active and healthy lifestyles. This includes amongst others, the practice of yoga and regular exercise which soothe the mind and body to perform the duties disease-free effectively. Well planned awareness programs to prevent development of risk factors and complications in working employees should be encouraged.

References

1. Brunner EJ, Marmot MG. Social organisation, stress and health. In: Marmot MG, Wilkinson RG, eds. Social determinants of health. Oxford: Oxford University Press 2006;6-30.
2. Chandola T, Brunner E, Marmot M. Chronic stress at work and the metabolic syndrome: prospective study. *BMJ* 2006 Mar 4;332(7540):521-5.
3. Kang MG, Koh SB, Cha BS, et al. Association between job stress on heart rate variability and metabolic syndrome shipyard male workers. *Yonsei Med J* 2004;45(5):838-46.
4. World Health Organization. Occupational health http://www.who.int/occupational_health/topics/stressatwp/en/ Accessed 2019 November 15.
5. World Health Organization. Cardiovascular Diseases. Available online: <https://www.who.int/health-topics/cardiovascular-diseases/> Accessed 2019 November 15.
6. Reddy KS. Cardiovascular Disease in Non-Western Countries. *N Engl J Med.* 2004 Jun 10;350(24):2438-40.
7. Gaziano TA. Reducing the growing burden of cardiovascular disease in the developing world. *Health Aff (Millwood).* 2007 Jan-Feb;26(1):13-24.
8. Mezue K. The increasing burden of hypertension in Nigeria - can a dietary salt reduction strategy change the trend? *Perspect Public Health.* 2014; 134(6):346-52.
9. Pyykkönen AJ, Räikkönen K, Tuomi T, et al. Stressful life events and the metabolic syndrome: the prevalence, prediction and prevention of diabetes (PPP)-Botnia Study. *Diabetes Care* 2010;33:378-84.
10. Emeny RT, Baumert J, Zierer A, et al. Job Strain, Inflammatory Biomarkers and Coronary Events in Healthy Workers of the MONICA/KORA Augsburg Case-Cohort Study. *Psychother Psych Med* 2011;61-A017.
11. Trudel X, Brisson C, Milot A. Job strain and masked hypertension. *Psychosom Med.* 2010 Oct;72(8):786-93.
12. Yu SF, Zhou WH, Jiang KY, et al. Effect of occupational stress on ambulatory blood pressure. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing ZaZhi* 2009;27:711-15.
13. Rose M. Good Deal, Bad Deal? Job Satisfaction in Occupations. *Work Employment Society* 2003;17(3):503-30.
14. Katyal S, Katyal R. Prevalence of Occupational Stress among Bankers. *International Journal of Humanities and Social Science Invention* 2013;2(4): 53-56.
15. Khattak JK, Khan MA, Haq AU, et al. Occupational stress and burnout in Pakistan's banking sector.

- African Journal of Business Management 2011;5(3):810-17.
16. Esquirol Y, Bongard V, Mabile L, et al. Shift work and metabolic syndrome: respective impacts of job strain, physical activity, and dietary rhythms. *ChronobiolInt* 2009;26(3):544-59.
 17. Innes KE, Vincent HK, Taylor AG. Chronic stress and insulin resistance-related indices of cardiovascular disease risk, part I: neurophysiological responses and pathological sequelae. *Altern Ther Health Med* 2007;13(4):46-52.
 18. Chandola T, Britton A, Brunner E, et al. Work stress and coronary heart disease: what are the mechanisms? *Eur Heart J*. 2008 Mar;29(5):640-8.
 19. Kivimaki M, Leino-Arjas P, Luukkonen R, et al. Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees. *BMJ*. 2002 Oct 19;325(7369):857.
 20. Vrijkotte TGM, van Doornen LJP, de Geus EJC. Effects of work stress on ambulatory blood pressure, heart rate, and heart rate variability. *Hypertension* 2000;35:880-86.
 21. Brunner EJ, Hemingway H, Walker BR, et al. Adrenocortical, autonomic, and inflammatory causes of the metabolic syndrome: nested case-control study. *Circulation* 2002 Nov 19;106(21):2659-65.
 22. Reaven GM, Lithell H, Landsberg L. Hypertension and associated metabolic abnormalities – the role of insulin resistance and the sympathoadrenal system. *N Engl J Med*. 1996 Feb 8;334(6):374-81.
 23. Kuper H, Marmot M. Job strain, job demands, decision latitude, and the risk of coronary heart disease within the Whitehall II study. *J Epidemiol Community Health* 2003 Feb;57(2):147-53.
 24. Qureshi GM, Seehar GM, Zardari MK, Pirzado ZA, Abbasi SA. Study of blood lipids, cortisol and haemodynamic variations under stress in male adults. *J Ayub Med Coll Abbottabad* 2009;21(1):158-61.
 25. Le Fur C, Romon M, Lebel P, Devos P, Lancry A, Guédon- Moreau L, et al. Influence of mental stress and circadian cycle on postprandial lipemia. *Am J Clin Nutr*. 1999 Aug;70(2):213-20.
 26. Alfredsson L, Hammar N, Fransson E, de Faire U, Hallqvist J, Knutsson A, et al. Job strain and major risk factors for coronary heart diseases among employed males and females in a Swedish study on work, lipids and fibrinogen. *Scand J Work Environ Health*. 2002 Aug;28(4):238-48.
 27. Sternberg EM. Neuroendocrine regulation of autoimmune and inflammatory disease. *J Endocrinol*. 2001 Jun;169(3):429-35.
 28. Dobiášová M, Frohlich J. The plasma parameter log (TG/HDL) as an atherogenic index: correlation with lipoprotein particle size and esterification rate in apoB-lipoprotein-depleted plasma (FER HDL). *Clinical Biochemistry* 2001 Oct;34(7):583-8.
 29. Smith JA, Greer T, Sheets T, Watson S. Is there more to yoga than exercise? *Altern Ther Health Med* 2011;17(3):22-9.
 30. Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life *Int J Yoga* 2011;4(2):49-54.

