



Relationship between Occupational Stress and Cardiovascular Risk Factors Determination: A Case- control Study

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ABSTRACT

High stress occupational condition is known as psychosocial factor affecting incidence of cardiovascular diseases. Physicians and experts in profession pay less attention to occupational stress effect as a background cause of cardiovascular heart diseases. The aim of this study was to evaluation of profession stress effect on cardiovascular diseases incidence. Totally 300 people were recruited, 150 in control group and 150 in case group. The samples were matched based on gender and age. Cases were selected among incidence new cases of cardiovascular diseases by cardiologist diagnosis. ERI 17 questionnaire was used to measure job stress by interview and questionnaire. Demographic and clinical information was gathered through interview and the last tests of each person. The data were analyzed in independent T test, ANOVA, Linear regression. High triglyceride was found in clerks. There was a significant relationship of fasting blood glucose mean in both groups with high job stress compare to those without job stress ($P=0.0001$). Those with high job stress smoke more than those without job stress this result was statistically significant ($P= 0.004$). HDL mean of participants with high level of job stress was less than whom with low job stress and this difference was statistically significant ($P= 0.007$). High levels of triglycerides, blood sugar, low HDL levels and the number of cigarettes consumed in those with job stress make them beat risk for cardiovascular disease. Thus making best decision by employers to reduce stress of occupation is recommended.

Key words: Job Stress, Risk Factors, Cardiovascular Disease

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working conditions impact on cardiovascular system, such as chemical materials, physical factors and spiritual and mental stress. Often physicians and researchers don't pay attention to harmful factors lead to cardiovascular disease in working environment. They assess individual factors like gender, family history, hypertension, smoking, high cholesterol, obesity and diabetes,

INTRODUCTION

Job stress is very common features in modern life and is increasing. It has bad effects on cardiovascular systems [1]. Different factors in

commonly. Cardiovascular disease and stroke is main cause of death in America [2].

Job stress is emotional and Psychological response and when occurs that somebody feels doesn't have sufficient performance to react demands [1]. Job stress is interaction between individual characteristics and working conditions, so that the demands are more than the ability of individual [3]. Cardiovascular disease is the first known cause of death in Iran like other countries and it can derive from life style of people (4). Most of studies show that job stress prevalence in Iran is high and it's about 14.4 percent [1].

Recent studies confirm psychosocial factors effect on the emergence and progression of coronary heart disease. Nowadays Stressful situation of societies has caused CHD to be the most cause of premature deaths and it threaten life of million people all around the world every year and it cost billion of dollar expense because of deaths and disability [5]. Stress has been considered an important factor of variety of disease and individuals, organizations and society must pay more to treatment of cardiovascular patients. Thus the costs of cardiovascular disease caused by stress take more than 12% time of working people also it property damages about 4\$ billion annually [6].

It is expected that nearly 25 million death caused cardiovascular disorders occur annually from 2020. Cardiovascular disease in early age is more and it is increasing. Stress and psychosocial tension are independent risk factor for heart disease that through psycho-neuro-physiological mechanisms and stimulate the autonomic nervous system, especially the sympathetic, increase cardiovascular function and can lead to occurrence or continuation of heart diseases [5].

Job stress has mental nature and it's not possible to measure it by physical and chemical direct measurements. Ras -randol R (1998) & Kupper (1981) believe different needs and values, occupational expectation, the capacity to deal with the employee's needs the work environment to meet the demands of the job lead to job stress. Arnold & Feldman (1989) say that job stress is reaction to new factors and threatening factors in work environment. Bertil Gardel (1981) and Henri Estiphen (1980) conducted researches in this field too [3]. Stress affects the health of patients [23,28].

Some theoretical models are need to identify details of job stress and. There are two models of job stress that often used, model job tension and inconsistency between effort-reward. Effort-reward inconsistency model is imbalance between heavy workload and low control on received bonuses of job stress during long time [1].

There are different mechanisms that link job stress to cardiovascular diseases. Direct mechanisms such as hypertension, high cholesterol serum level, increased left ventricular mass, high concentration of hormones particularly catecholamine, high concentration of fibrinogen, automated system profile changes, reaction by enhanced platelet, artery vasospasm, inflammation, electrical instability and atherosclerosis. Indirect mechanisms function through behavioral risk factors like smoking, alcohol consumption, physical activity reduction [1]. The role of heart disease is very important [17-22].

The relation between job stress and some of cardiovascular disease risk factors such as diabetes, body mass index, hypertension, smoking, alcohol consumption, triglyceride level, low and high lipoprotein, heart rhythm and metabolic syndrome are assessed. However, the findings are contradictory [1].

Aim

The aim of this study was to assessment of job stress using effort-reward, inconsistency model and the relationship of them with cardiovascular risk factors.

MATERIALS AND METHODS

This study was aimed to assess relationship between occupational stress and cardiovascular risk factors determination.

Design and setting of the study: This was a case-control study in clinics of all of cardiologist doctors in Ilam city. The sample size was determinate using Statcalc software (Epi-info) with 95% CI and 80% P; finally 150 cases and 150 controls were selected randomly. Cases group were people with diagnosed cardiovascular disease according to angiography. Control group were people free of any cardiovascular disorders according to angiography and cardiologist idea. Cases were selected from incidence cases. Control

people were matched with cases in term of age and gender to prevent confounding.

A standard questionnaire (ERI) with two reach of effort and reward was used to measure job stress. The questions related to effort were 6. Top- rated in these criteria shows that the person devoted high efforts for his work and evaluates some factors; time-bound, Failures and interruptions occurring in the work, the responsibilities and overtime, and heavy physical work and increasing demands. If sum of point be more than 3 means enough efforts occurred. Reward measure by 11 questions.

Reward includes three parts, financial reward and occupational situation, not respected in work environment and job security. If sum of point be less than 7, received reward is low. Finally if external effort be with low reward in work environment, imbalance occurs in effort-reward. There was not Persian version of the ERI questionnaire, it was translated and was confirmed by psychologist, epidemiologist and health professional experts. To assess questionnaire reliability 20 people were selected randomly, at the end to questionnaire confirmation, test-retest was used.

For any participate ERI questionnaire and demographic information was completed by questioner, the questionnaire was evaluated again to ensure the completion of it. Medical history information of participates (case and control) like diabetes mellitus, BMI, LDL, HDL and triglyceride were gathered from the last tests. The questioner was unaware from exercise test results and physicians' diagnosis to prevent interviewer bias. After data collection, interpretation and scoring ERI questionnaire, statistical analyses were performed using SPSS version 20 software (Purchased from a trusted center) and Independent T test and ANOVA for assessing relationship between variables and Linear Regression for assessing correlation between variables and Scatter Plot. The significance level is less than 0.05.

RESULTS

The mean age of participates was 54.15 ± 11.29 years. The mean age of males 168 (56%) was 53.57 ± 11.78 years and females 132 (44%) was 54.89 ± 10.63 years.

Fasting blood glucose average in all participants was 127.52 ± 60.28 mg/dl. The FBG average in whom with imbalance effort-reward was 134.25 ± 60.28 and in people with balance effort-reward was 117.13 ± 43.7 mg/dl. Participates without balance effort-reward FBG average was 17.12 mg/dl more than whom with balance effort-reward, this difference was statistically significant ($P = 0.008$). In both groups (case & control) the average of blood glucose in people with effort-reward imbalance was more than people with effort-reward balance ($P = 0.0001$) (Table 1).

The average number of cigarettes smoked per day in people with effort-reward imbalance was 4.03 ± 8.8 and in others was 3.39 ± 7.53 . There was a statistically significant difference between two types of smoking behavior ($P = 0.004$).

The average number of cigarettes smoked per day in case group was equal to 5.17 ± 9.82 and in control group was 2.38 ± 6.2 . There was a statistically significant difference between case and control groups ($P = 0.004$). Increasing of the number of cigarettes lead to the number of vessels involved in cardiovascular disease addition ($R^2 = 0.041$). Correlation coefficient between the number of cigarettes and involved vessels was 0.203 ($P = 0.0001$) (Table 2) (Plot 1).

HDL level mean in participates suffering from job stress was 13.44 measure less than those without job stress and this result was statistically significant ($P = 0.007$). The most triglyceride level was related to clerk people (177.83 ± 85.31) and the lowest was shown in labor (144 ± 55.75). There was no significant difference between triglyceride and job types ($P = 0.484$). After case and control groups fixing and effort-reward balance, was founded statistically significant difference between working people with job stress and triglyceride mean ($P = 0.047$) (Table 3).

Totally, 103 people (68.7%) of case group and 42 people (28%) of control group suffered from hypertension ($P = 0.0001$). There was not statistically significant difference between hypertension in case and control groups and in all of participates based on effort-reward balance ($P > 0.05$).

Table 1: Assessment of effort-reward balance effect on cardiovascular disease based on diabetes in case and control groups

Population Study	Effort-Reward Situation	Number of participates	Blood glucose Mean	S.D	%95CI		P-Value*
					Upper Band	Lower Band	
Case	Effort-reward Imbalance	99	154.57	65.31	163.3	136.72	0.0001
	Effort-reward Balance	51	142.25	49.6	159.29	125.56	
Control	Effort-reward Imbalance	83	110.02	42.79	125.33	97.9	
	Effort-reward Balance	67	98.02	25.79	116.71	91.66	
Total	Effort-reward Imbalance	182	138.25	60.28	147.07	125.94	
	Effort-reward Balance	118	117.13	43.7	137.47	112.83	

*Independent T test

Table 2: Relationship between number of cigarettes and involved vessels in cardiovascular patients

Variable	Non- Standard Coefficient	Standard Coefficient	95% CI		P-Value*
			Upper Band	Lower Band	
Number of Involved vessels	1.67		1.92	1.36	0.0001
Number of Cigarettes	0.206	0.17	0.399	0.013	0.037

*Linear Regression

Table 3: Difference assessment of triglyceride mean in types of jobs based on job stress in case and control groups

Population study	Job stress	Type of job	Number	Mean	S.D	95% CI		P-Value*
						Upper Band	Lower Band	
Case	Yes	Housewives	22	153.61	57.17	178.96	128.26	0.047
		Farmer	12	147.75	68.43	191.23	104.26	
		Clerk	19	200.13	79.77	238.58	161.68	
		Retired	7	119.2	49.32	164.82	73.59	
		Labor	5	157.8	56.6	228.07	87.52	
	No	Housewives	16	228.62	63.53	262.48	194.76	0.186
		Farmer	8	178	44.18	218.86	137.13	
		Clerk	12	174.58	81.2	226.17	122.92	
		Retired	4	163.75	56.4	253.56	73.93	
		Labor	1	118	0	0	0	
Control	Yes	Housewives	36	150.19	62.63	171.38	129	0.863
		Farmer	7	138.12	63.8	191.46	84.78	
		Clerk	14	157.64	109.38	220.79	94.48	
		Retired	0	0	0	0	0	
		Labor	0	0	0	0	0	
	No	Housewives	15	157.65	60.05	169.05	102.54	0.605
		Farmer	4	131.75	86.65	269.63	-6.13	
		Clerk	8	165.08	52.52	208.98	121.17	
		Retired	3	209	191.95	685.84	-267.84	
		Labor	3	129.66	70.03	303.65	-44.31	
		Other	6	195.16	94.99	294.86	95.47	

*ANOVA

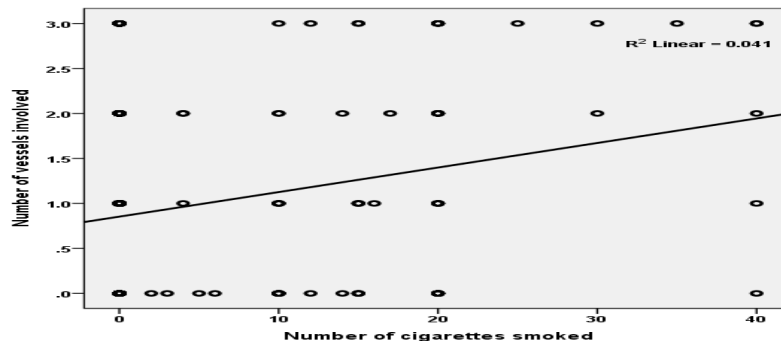


Figure1. The relationship between the Number of smoked cigarettes and the number of vessels involved in cardiovascular disease

DISCUSSION

The study was conducted in Ilam city for first time; it assessed impression of job stress on cardiovascular disease. The results showed that people suffering from cardiovascular disease compare to healthy people were more in stressful situation. In current study there was significant relationship between case control groups and components of job stress (external attempt, financial satisfaction, reward) ($P= 0.011$). This result was consonant with Heidari Pahlaviyan *et al* [5] and Yadegarfar *et al* [1] studies.

Researches on animals and human have shown acute and chronic stressors components could cause cardiovascular disorders [7], previous studies support our findings. Body reaction is associated with social stressors. Releasing stress hormone such as catecholamine and corticosteroids could lead to increasing blood pressure, irregular heartbeat, Blood clots, abnormal narrowing of coronary and heart failure [8, 9].

About 121 participates were diabetic, 85 cases (70.24%) of them were effort-reward imbalance and 36 (29.76%) were effort-reward balance; it founded significant relationship between diabetic patients in case and control groups based on effort-reward balance ($P= 0.0001$). It was not agreement with Rangamiz *et al* [4] and Yadegarfar *et al* [1] studies.

There was significant relationship between artery disease in participates according to effort-reward balance ($P= 0.026$). Studies conducted by Biyazi [10], Ramachandrani [11], Hallman [12] and Bakhshipour [13] supports our results. In Pour Reza *et al* study, relation of occupational degree and Coronary artery disease was evaluated. About 1/3 Comparative advantage for students and 3/9 for masters was found [14].

There was a significant relationship of the average of cigarettes number in all participates based on effort-reward balance was seen ($P= 0.004$). In Kouvonen *et al* study was not found any relation between job stress and smoking (15). The results showed that 27.3% of cardiovascular patients reported smoking that it was shown in Mohammadi Zeidi *et al.*, study too [16].

In current study 150 people without effort-reward balance had HDL average (52 ± 34.78). About 80 people of them (53.33%) had cardiovascular disease with HDL average (46.6 ± 13.81) and the rest were healthy with HDL average of 58.17 ± 48.32 ; there was a statistically significant relationship of HDL average in both case and control groups based on effort-reward balance ($P=0.007$). in Yadegarfar *et al* study, Despite the additional risk of HDL levels in people with job stress, there was no significant relationship HDL average in case and control groups according o effort-reward balance, this result was not proved in this study [1].

Triglyceride mean in people with effort-reward balance was 154.4 ± 68.48 and in people with effort-reward imbalance was 173.71 ± 77.04 ; Triglyceride mean in people with effort-reward imbalance was 19.03 more than people with effort-reward imbalance ($P= 0.037$).

Triglyceride level in case group was 20.43 more than control group ($P= 0.023$), among people with different job, amount of triglyceride in clerk was very high, after fixing case and control groups and effort-reward balance was found significant relationship between triglyceride mean of working participates in different type of occupation among case group with job stress ($P= 0.047$). In Yadegarfar *et al.*, study comparing stress level indicate increasing trend of cardiovascular disease for high triglyceride but it was not statistically significant and disagree with our result [1]. In Rangamiz *et al.*, study was significant difference in high triglyceride prevalence among working women and housewives, working males in loud and low voice jobs, working males in shift and non-shift jobs [4]. This study emphasizes the importance of the role of reducing occupational stress in preventing cardiovascular diseases. The limitation of this research was results that related to a particular geographic area.

CONCLUSION

As final conclusion, high blood glucose mean and smoking and low HDL in effort-reward imbalance participates (with job stress) and versus relationship between triglyceride and physical activity level in work situation; thus increasing physical activity in clerks outside the workplace and the mitigation required strategies by

employers to reduce the level of stress and cardiovascular diseases risk factors is recommended.

Competing interests

All financial and non-financial competing interests must be declared in this section.

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