Original Article

Systolic and Diastolic Blood Pressure among Three Groups of Occupation

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Abstract

Background: It is believed that occupation influences cardiovascular risk factors. To assess blood pressure (BP) and other cardiovascular risk factors in three occupation groups—teachers, military personnel and female housekeepers residing in Shiraz, southern Iran.

Methods: We studied 2783 teachers, 366 military personnel, and 1896 female housekeepers who attended various medical education centers in Shiraz. BP, anthropometric parameters as well as fasted lipid profile and blood glucose level were measured determined for each participant.

Results: The mean values of all analyzed cardiovascular risk factors were higher among female housekeepers compared to female teachers. The mean systolic and diastolic BP was significantly ($P<0.001$, and $P=0.047$, respectively) higher in female housekeepers than female teachers. Neither systolic nor diastolic BP had association with the type of occupation in men (military personnel *vs*. male teachers).

Conclusion: Housekeeping compared to teaching, may increase both systolic and diastolic BP in women.

Keywords: Cardiovascular Risk Factors; Occupation; Blood Pressure, Systolic; Blood Pressure, Diastolic

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Introduction

Coronary heart disease (CHD) remains the leading cause of mortality and morbidity in developed and developing countries including Iran.[1-3] So far, many studies have established an association between occupation and development of cardiovascular risk factors.[4-9] The association might be due to excessive psychological and physiological job-related stress[4,5] like exacerbation of various cardiovascular risk factors including altered lipid profile, glycemic status, blood pressure (BP) and obesity indices. The adverse effect of "job strain" (excessive psychological pressure and low decision latitude) on cardiovascular risk factors has been clarified in epidemiologic investigations.[4,8] The hypothesis that high job strain may adversely affect cardiovascular risk factors might be justified by stress-dependent higher rate of anxiety and its aggravating effects on cardiovascular risk factors and lack of attention to life style modification in those with high job strain. Educational level of employees is also known to influence the cardiovascular risk factors.[10,11] However, this has not been shown in other studies.[12,13] The potential effects of psychosocial factors in work environment on cardiovascular risk factors have also been proposed.[14,15]

Direct and indirect effects of other occupation environmental and physical parameters such as biochemical toxin exposure, physical inactivity and unhealthy diet have been considered as important factors influencing cardiovascular risk factors.[16]

It has been shown that different social, psychological and certain occupations may influence development and progression of hypertension.[7,9] Ohin, *et al*, in a 6.5-year prospective study on 448 middle-aged men and women in Sweden reported that job strain significantly predicts an increase in systolic and diastolic BP in men, but not in women.[17] Guimont, *et al*, carried out a prospective study on 8395 white-collar workers in Canada and concluded that exposure to cumulative job strain had a modest significant effect on systolic BP in men.[18] However, Laflamme, *et al*, in another Canadian investigation on white-collar workers showed the effect of job strain on BP only in female workers.[19]

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We conducted this study to assess systolic and diastolic BP as well as various cardiovascular risk factors in three occupations.

Materials and Methods

Subjects

All patients who attended in the year 2009 to one of medical educational centers affiliated to Shiraz University of Medical Sciences and who were teacher, military personnel or housekeeper were invited participate in this study by coming to Shiraz University of Medical Sciences Heart House. A qualified nurse interviewed all participants and completed a questionnaire. A total of 4960 participants (2740 teachers, 366 military personnel, and 1854 female housekeepers) accepted to take part in the study. Each participant gave an informed written consent to participate in the study. The study protocol was approved by the Shiraz University of Medical Science Ethics Committee.

Anthropometric measurement

Using standard protocols, anthropometric parameters including body weight, height, and waist circumference were measured in all participants using standard protocols. Height, body weight, and waist circumference were measured with subject dressed in light clothing after an overnight fast. Waist circumference was measured at the level of the umbilicus (at the level midway between the lower rib margin and the iliac crest). Body weight was measured with a standard scale to an accuracy of 0.1 kg. A stadiometer was used for measuring height. BP was measured twice while patient was seated and rested for 15 min, using a standard mercury sphygmomanometer. The interval between each BP measurement was at least 15 min, during which time patient was resting (no heavy activities); the mean of the two measurements was taken as the BP.

Routine Biochemical Analysis

A full fasted lipid profile including serum total cholesterol, triglycerides, HDL-C, and LDL-C, was measured for each subject. Following venipuncture of an antecubital vein, blood samples were collected into tubes and centrifuged. After

Table 1: Mean±SD of measured parameters among three studied occupation groups

Parameter	Female teachers (n=1671)	Housekeepers (all female) (n=1854)	P value	Male teachers (n=1069)	Military Personnel (all male) (n=366)	P value
Age (yr)	41.6±6.4	45.5±12.8	<0.001	42.6±6.3	34.8±7.5	<0.001
Systolic BP (mm Hg)	115.8±15.8	125.3±18.8	<0.001	118.2±18.3	116.3±11.9	0.636
Diastolic BP (mm Hg)	74.9±12.2	77.9±12.2	0.047	77.8±12.6	75.5±9.4	0.585
LDL-C (mg/dL)	104.3±27.3	108.3±42.4	<0.001	105.3±26.2	113.8±27.5	<0.001
HDL-C (mg/dL)	44.1±9.8	51.6±20.5	0.630	38.2±8.2	38.4±8.4	0.001
Triglyceride (mg/dL)	117.3±66.6	143.5±84.5	<0.001	172.3±107.9	132.4±83.8	<0.001
Total cholesterol (mg/dL)	190.4±37.8	193.5±44.8	0.453	191.6±38.8	182.5±37.4	0.010
FBS (mg/dL)	90.7±25.6	104.0±40.3	0.002	92.9±30.5	86.4±17.0	0.851
Waist circumference (cm)	90.7±10.5	97.1±11.5	0.004	90.5±10.0	88.7±9.9	<0.001
BMI (kg/m^2)	26.4±3.9	27.6±4.5	<0.001	25.0±3.3	26.3±3.5	0.758
Waist circumference/hip circumference	0.88±0.07	0.93±0.19	0.085	0.91±0.06	0.89±0.5	0.381

BP: Blood pressure; LDL-C: Low-density lipoprotein cholesterol; HDL-C: High-density lipoprotein cholesterol; FBS: Fasting blood sugar; BMI: Body mass index.

separation, aliquots of serum were frozen at 20 °C until analyzed. Serum lipid and fasting blood sugar (FBS) concentrations were measured by enzymatic methods.

Statistical Analysis

The data were analyzed by SPSS ver 14. Analysis of covariance (ANCOVA) was used to study differences after adjustment for confounding variables including age, lipid profile, FBS, waist circumference, body mass index (BMI) and occupation. A p value <0.05 was considered statistically significant.

Results

General characteristics of three sample group

The studied participants aged between 21 and 80 years. The demographic, clinical, biochemical and anthropometric parameters for the studied participants are shown in Table 1. The mean of all cardiovascular risk factors was higher in female housekeepers compared to female teachers, especially for TG (P<0.001), FBS (P=0.002), waist circumference (P=0.453), BMI (P<0.001) and waist to hip ratio (P=0.085). However, the difference in some risk factors was not significant. The only risk factor which was more favorable in female housekeepers compared to female teachers was HDL-C (P=0.630) (Table 1).

Age, TG, total cholesterol, FBS and waist circumference were higher in male teachers than in military personnel (all male) (Table 1). Serum HDL-C level in both groups of male teachers and military personnel was almost similar. Serum LDL-C, BMI and waist to hip ratio were higher in male teachers compared to military personnel (Table 1). All the studied cardiovascular risk factors were almost similar among male and female teachers, except for HDL-C and TG which were significantly more unfavorable in male teachers (Table 1).

Association between BP and occupation in males and females:

After adjusting of confounding variables, the mean systolic and diastolic BP was found to be significantly (P<0.001, and P=0.047, respectively) higher in female housekeepers than female teachers. Neither systolic (P=0.636) nor diastolic (P=0.585) BP had association with the type of occupation in men (military personnel vs. male teachers).

Discussion

Relation between occupation and BP in women

In the present study, we found that systolic BP of the housekeeper women was significantly higher than female teachers. Considering the direct relation between several types of job stress and systolic BP, our findings were not consistent with results of previous western investigations.[29-30] This discrepancy may be attributed to the different social and psychological characteristics of the two studied societies. Although housekeeper women in Iran are presumably not exposed to job-related stress, their physical inactivity and unhealthy diet may result in elevated systolic BP. Lack of social activity, lower educational level and routine duty of Iranian female housekeepers might be other factors which lead to increased systolic BP in Iranian female housekeepers. Atallah, *et al*, proved that systolic BP is higher in unemployed Caribbean residence of France.[31] Setiati, *et al*, also found that unemployment is associated with hypertension development in Indonesian adult population.[32]

Several studies have suggested that cardiovascular metabolic risk factors are associated with an increased risk of elevated systolic and diastolic BP.[33,34] We found that almost all cardiovascular risk factors of housekeeper women were considerably higher than female teachers. There is also other evidence which reflects worse cardiovascular risk factors status among Iranian housekeeper women compared with female teachers.

It is postulated that regular social activity of Iranian women in educational work places which have relatively lower professional stress may modify cardiovascular risk factors. Significant difference between TG, waist circumference and FBS of housekeeper women is the factor which might prone them to development of metabolic syndrome and consequent elevated systolic BP. We found that studied Iranian female housekeepers were generally overweight or obese. The strong correlation observed between body weight and BP develops early in life, and obesity in adult life is a good predictor of hypertension. Obesity is an independent risk factor for CHD but it is closely associated with several other coronary risk factors such as TG.[36] Accumulative poor cardiovascular risk factors of female housekeepers in our study require emergent preventive interventions. We highly recommend extended social programs to modify Iranian housekeeper women life style to reduce subsequent CHD occurrence. Further prospective studies may highlight the importance of these social programs.

The only cardiovascular risk factor which seems

to be more favorable in housekeeper women compared to female teachers is higher HDL-C. Serum level of HDL-C is affected by oral contraceptive (OCP) consumption.[37] It is assumed that difference in OCP consumption rate between two female groups resulted in considerable dissimilarity in average of serum HDL-C concentration. Several Iranian studies have shown that decreased HDL-C is an important cardiovascular health problem in Iranians.[38,39] Data from Framingham study suggest that a 1.17 mg/dL increase in HDL-C levels is associated with a 3% decrease in the incidence of CHD in women compared with a 2% decrease in men [40]. Lower level of HDL-C in female teachers should be considered. We highly recommend more healthy diet in this group of Iranian population. In cross-sectional studies, a significant negative correlation between serum HDL-C and dietary glycemic index has been reported.[41,42]

Association between several cardiovascular risk factors and level of diastolic BP in female housekeepers and also its moderate relation with housekeeping carrier underline the necessity of more attention to cardiovascular prevention. Schulte, *et al*, have shown a graded and continuous positive interaction between BMI, age and serum total cholesterol, LDL-C, and diastolic BP in women.[43]

Relation between occupation and BP in males

In the present study, we did not find any difference between male teachers and military personnel in terms of level of systolic and diastolic BP. Due to the direct effect of stress on the level of BP it seems that the level of stress among these two jobs in Iranian men does not differ significantly. It is important to note that the mean age of the male teachers was significantly higher than military personnel. This important difference can be considered as a factor which may affect the results. This factor could result in worse status of almost all analyzed cardiovascular risk factors in male teachers compared with military personnel. Military carrier seems to be more stressful than teaching, but the higher age of the studied teachers might be a confounding factor. FBS increased with age in men.[43] Significant higher level of FBS in male teachers could be related to the higher age of this group. A positive association between the elevated level of the underlying mechanism of cardiovascular disease which exacerbate the traditional known risk factors and increased age have been previously reported.[44]

Khosropanah, *et al*, compared the cardiovascular risk factors of the same population of teachers in the same region (Shiraz) with the general population of Iran and concluded that teachers residing in Shiraz have a relatively lower rate of CHD risk factors which might be related to their higher education level and healthier life style.[45] However, Aghasadeghi, *et al*, reported from the same population that a large number of people with hypertension are left undignosed.[46]

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