Original Article

# Prevalence of Cardiovascular Risk Factors Among Military Personnel in Southern Iran

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**Background:** The incidence of cardiovascular disease (CVD) is rapidly increasing at an alarming rate worldwide and is currently considered as the leading cause of death in both developing and developed countries. The aim of the present study is to determine the prevalence and clear analysis of cardiovascular risk factors among army population and provide a guideline for improving the health status of army personnel.
**Methods:** This is a cross-sectional study on the prevalence of cardiovascular risk factors among 341 male subjects from a military population in southern Iran. Each eligible participant was evaluated in the military clinic in Shiraz, Southern Iran. Information regarding demographic and life style were obtained from each subject**.** Arterial blood pressure**,** weight, height, body mass index (BMI), waist circumference (WC) and hip circumference (HC)**,** fasting blood glucose, lipid profile consisting of total cholesterol, LDL, HDL and triglyceride were measured by standard methods.
**Results:** Mean age of the population under study was 35.1±7.5 years. Twenty-nine (8.8%) individuals were hypertensive whereas 108 (32.9%) had blood pressure in the range of pre-hypertension. According to laboratory investigations, 29 (8.5%) participants had glucose intolerance while 6 (1.8%) of them had diabetes mellitus. On the other hand, prevalence of hypertriglyceridemia and hypercholesterolemia were 104 (30.5%) and 114 (33.4%) respectively. Twenty-eight (8.2%) subjects had criteria for metabolic syndrome.
**Conclusions:** Clinical and Para-clinical data indicated that army population in southern Iran had a low level of CVD risk factors that may be related to their life styles.

**Keywords:** Cardiovascular Risk Factors, Army Population, Prevalence



## Introduction

The incidence of cardiovascular disease (CVD) is rapidly increasing at an alarming rate worldwide and is now considered as the leading cause of death in both developing and developed countries.[1,2] In this setting recent report from population-based studies showed an increasing rate of all the cardiovascular risk factors including hypertension, diabetes, lipid profile abnormalities and obesity in the population of Iran.[3-6] Occupation-related stress has been considered to be a potentially important cardiovascular risk factor and consequently a bulk of recent investigations has focused on the detection of cardiovascular risk factors in certain jobs.[7-9] Among different studies, demanding occupations such as those associated with heavier responsibilities are shown to impose significant adverse effect on the health status of subjects.[10] On the other hand, investigations revealed that army personnel are generally under high pressure of duty-related stress with its biological ill effect and mental strain.[11,12] Whereas members of armed forces with their favorable physical conditions[13,14] are generally considered as one of the healthiest layers of each society, some recent studies reported a trend toward increasing cardiovascular risk factors among military personnel.[15-17] Such tendency is also emerging among the general population in both developed and developing countries. In this regard, data are scarce worldwide[18] and to our knowledge no reliable study on this issue has been reported in Iran. As many of the important risk factors for cardiovascular disease are modifiable by specific

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preventive measures,[19-21] the aim of the present investigation was to determine the prevalence and clear analysis of cardiovascular risk factors among army population and provide a guideline for improving the health status of army personnel.

## Patients and Methods

### Study design and subjects

This investigation was conducted with a cross-sectional design to determine the prevalence of cardiovascular risk factors among 341 military personnel in southern Iran, and approved by the committee of research ethics in Military Service, and University of Medical Sciences, under grant number 8811. The sample size was calculated based on 20% to 33% prevalence of cardiovascular risk factors in Iranian population reported previously, but considering a power of 80% with the first type of error equal to 0.05. After clustering the target population according to their military rank, certain number of subjects was selected randomly from each cluster, considering the predefined sample size of the clusters. Having obtained the informed consent from each personnel, the eligible individuals were enrolled in the study. In the event of excluding any subject, the excluded member was replaced with another person by random selection from the corresponding cluster.

### Measurements

Each eligible participant was examined in the military service clinic in Shiraz Southern Iran. Demographic and life style information including; age, marital status, level of education, military position, duration of physical activity per week, history of smoking, with its frequency were obtained from each individual. Participants were asked to sit in a silent room for 5 minutes before their arterial blood pressure were measured in the right arm two times, by a calibrated digital instrument. Anthropometric

**Table 1**. The frequency of demographic and lifestyle-related characteristics

| Characteristics | | | Number (%) |
|---|---|---|---|
| **Age (Years)** | <30 | | 98 (29.1) |
| | 30-39 | | 145 (43) |
| | ≥40 | | 94 (27.6) |
| **Education** | Primary level | | 44 (13.1) |
| | Secondary level | | 142 (42.1) |
| | Undergraduate University level | | 138 (40.9) |
| | Postgraduate University Level | | 13 (3.0) |
| **Marital Status** | Single | | 31 (9.1) |
| | Married | | 310 (90.9) |
| **Physical Activity (> 30 min three times per week)** | No | | 25 (7.6) |
| | Yes | | 305 (92.4) |
| **Smoking** | Passive smoker | | 82 (24.0) |
| | Withdrawn | | 20 (5.9) |
| | Active smoker | Cigarette | 55 (16.1) |
| | | Hubble Bubble | 14 (4.1) |
| | | Opium | 2 (0.6) |
| **Race** | Fars | | 208 (61.0) |
| | Lore | | 56 (16.4) |
| | Turk | | 52 (15.2) |
| | Others | | 25 (7.3) |

features including; weight, height, body mass index (BMI), waist circumference (WC) and hip circumference (HC) were then measured by standard methods. WC was determined by measuring waist diameter at midpoint between iliac crest and lower border of tenth rib, with an average of three measurements considered as WC. Central obesity was WC > 102 cm as defined for male participants. BMI was calculated by weight in kilogram divided by square of height in meter (kg/m$^2$). On the same day 5cc of venous fasting blood was drawn from antecubital area of the subjects. The blood samples, while cooled at -5$^c$, were transferred directly to the laboratory to determine fasting blood glucose, and lipid profile consisting of total cholesterol, LDL, HDL and triglyceride. The cut-off values to include abnormalities were set at <40 mg/dl for HDL, ≥150 mg/dl for triglycerides, ≥126 mg/dl for plasma glucose, ≥200 mg/dl for total cholesterol and ≥140/90 mmHg for hypertension and (120-139)/(80-89) for pre-hypertension.

### Statistical analysis

The data were processed using mathematical methods. All the calculations were performed with the Statistical Package for Social Sciences (SPSS) version 15. Pearson Chi-Square test and Fisher's exact test were applied to identify relationship between cardiovascular risk factors and demographic data. A p value of less than 0.05 was considered statistically significant.

### Results

The participants aged from 20.1 to 54.2 years with mean age 35.1±7.5 years. Further demographic and life style information of the population under study are demonstrated in Table 1. Nine (2.6%) cases were under treatment for cardiovascular diseases and gave no history of major clinical illnesses including; malignancy, renal failure, liver insufficiency, metabolic and hormonal disorders. Twenty-nine (8.8%) individuals fulfilled the criteria of hypertension while 108 (32.9%) exhibited blood pressure in the range of pre-hypertension. There was a significant increase in the number of cases with hypertension, obesity and abnormal Waist/Hip

**Table 2**. Status of blood pressure in relation with other determinants of cardiovascular risk factors

| Cardiovascular Risk Factors | | Hypertension | | | P value |
|---|---|---|---|---|---|
| | | Normal Number (%) | Pre-Hypertension Number (%) | Hypertension Number (%) | |
| **Age** | <30 | 66 (66.0) | 30 (30.9) | 3 (3.1) | 0.002 |
| | 30-39 | 86 (61.0) | 44 (31.2) | 11 (7.8) | |
| | ≥40 | 37 (43.0) | 34 (39.5) | 15 (17.4) | |
| **BMI (kg/ m$^2$)** | <25 | 73 (64.6) | 35 (31.0) | 5 (4.4) | 0.062 |
| | 25-30 | 96 (57.5) | 55 (32.9) | 16 (9.6) | |
| | >30 | 21 (44.7) | 18 (38.3) | 8 (17) | |
| **Waist Circumference (cm)** | <102 | 174 (59.0) | 97 (32.9) | 24 (8.1) | 0.254 |
| | ≥102 | 16 (55.2) | 8 (27.6) | 5 (17.2) | |
| **Waist/Hip Circumference** | <0.9 | 113 (65.3) | 52 (30.1) | 8 (4.6) | 0.010 |
| | 0.9-1.0 | 72 (50.3) | 50 (35.0) | 21 (14.7) | |
| | >1.0 | 5 (62.5) | 3 (37.5) | 0 (0.0) | |
| **Physical Activity (> 30 min three times per week)** | Yes | 174 (59.0) | 98 (33.2) | 23 (7.8) | 0.089 |
| | No | 13 (54.2) | 6 (25.0) | 5 (20.8) | |
| **Smoking** | No | 156 (57.8) | 87 (32.2) | 27 (10.0) | 0.272 |
| | Yes | 35 (60.3) | 21 (36.2) | 2 (3.4) | |
| **Race** | Fars | 117 (57.9) | 64 (31.7) | 21 (10.4) | 0.102 |
| | Lorish | 24 (49.0) | 19 (38.8) | 6 (12.2) | |
| | Turkish | 37 (71.2) | 13 (25.0) | 2 (3.8) | |
| | Other | 13 (52.0) | 12 (48.0) | 0 (0.0) | |

**Table 3.** Frequency of the risk factors for metabolic syndrome based on the age group

| Risk factors for metabolic syndrome | | Age | | | P value |
|---|---|---|---|---|---|
| | | <30 Number (%) | 30-39 Number (%) | ≥40 Number (%) | |
| **Waist Circumference (cm)** | <102 | 90 (29.9) | 125 (41.5) | 86 (28.6) | 0.458 |
| | ≥102 | 7 (23.3) | 16 (53.3) | 7 (23.3) | |
| **Blood Pressure** | Systolic ≥ 130 or diastolic ≥ 85 mm Hg | 85 (31.4) | 120 (44.3) | 66 (24.4) | 0.011 |
| | Systolic < 130 or diastolic < 85 mm Hg | 13 (20.6) | 23 (36.5) | 27 (42.9) | |
| **Triglycerides** | ≥ 150 mg/dL | 77 (32.9) | 94 (40.2) | 63 (26.9) | 0.062 |
| | < 150 mg/dL | 21 (20.4) | 51 (49.5) | 31 (30.1) | |
| **HDL Cholesterol** | ≥ 40 mg/dL | 66 (36.7) | 69 (38.3) | 45 (25.0) | 0.005 |
| | < 40 mg/dL | 32 (20.4) | 76 (48.4) | 49 (31.2) | |
| **Fasting Blood Glucose** | ≥ 100 mg/dL | 90 (29.9) | 129 (42.9) | 82 (27.2) | 0.580 |
| | < 100 mg/dL | 8 (22.9) | 15 (42.9) | 12 (34.3) | |

circumference ratio (p=0.002, p=0.009 and p=0.001 respectively) with advancing age. The relationship between blood pressure with other cardiovascular risk factors is demonstrated in Table 2. Laboratory investigations showed that 29 (8.5%) participants were pre diabetics and 6 (1.8%) suffered from diabetes mellitus. On the other hand prevalence of hypertriglyceridemia and hypercholesterolemia were 104 (30.5%) and 114 (33.4%) respectively. Twenty-eight (8.2%) subjects had criteria for metabolic syndrome. Table 3 shows age distribution of the risk factors for metabolic syndrome.

## Discussion

To the best of our knowledge this is the first report from Iran which shows the status of cardiovascular risk factors in an army population. The present study indicates that prevalence of different cardiovascular risk factors is considerably lower than previous reports on civilian population in Iran.[22-23] In a recently published national survey for risk factors of non-communicable disorders, the prevalence of diabetes, hypertension, obesity, and central obesity was reported to be 8.7%, 26.6%, 22.3% and 53.6% respectively[24] while the data of our investigation indicated a lower frequency for all such cardiovascular risk factors. This great discrepancy can be explained in terms of specific occupation-related life style, as constant physical activity and prohibition from smoking and opium ingestion is strictly observed by the members of armed forces. Furthermore, the mean age of the population under investigation was lower than those reported in national studies. There are limited reports on the prevalence of cardiovascular risk factors among army people worldwide. Although in review of literature the prevalence of cardiovascular risk factors vary significantly across the world, the available few data from military personnel are in favor of overall low level of cardiovascular risk factors among the members of army.[25,26]

Metabolic syndrome is a cluster of metabolic abnormalities which correlates with several health consequences that include increasing risk of coronary heart disease and diabetes. Current evidence from studies conducted in Iran indicates a relative high prevalence of this syndrome.[27] The results from our survey showed a relatively low prevalence for this syndrome among studied groups compared with civilian populations. Considering that the members of armed forces are expected to be one of the healthiest populations, this low risk for cardiovascular disorders among them cannot be overlooked. Therefore, routine monitoring of military personnel is needed to show if there is an increasing trend for cardiovascular risk factors. Besides, it seems that this type of job cannot be considered as a high risk for cardiovascular diseases although certain level of job-related stress has been reported for military personnel.[9,10]

According to the current data it is suggested that routine blood pressure, lipid profile and anthropometric measurements be added to the strategies for health surveillance of the country's military

force. One of the helpful anthropometric features which can be easily measured and was claimed to be a good predictor for development of other cardiovascular risk factors, such as dyslipidemia, diabetes type 2 and hypertension,[28,29] is Waist/Hip circumference ratio. Our findings, as shown in Table 2, confirm such claims. It seems that this index is more precise to predict presence of cardiovascular risk factors than some anthropometric tools such as BMI and Waist circumference that estimate overweight, obesity and central obesity. Thus, the evaluation of Waist/Hip circumference ratio can be routinely applied to the members of armed forces.

As routine health check is costly and may not be carried out for every one, we believe that the main attention should be paid to those who reach their third decade of life. Interestingly, as shown in Table 3, the components of metabolic syndrome were more prevalent in the subjects aged between twenty and thirty. This finding is in contrast with previous reports on significant increase in metabolic syndrome by advancing age.[30-32] This finding might be described by a higher number of participants in this age group or more unhealthy behaviors such as lesser physical activity or higher rate of smoking. Additionally, the role of education in prevention of cardiovascular disease is well-established.[33] As our data show significant numbers of military staff in Iran have relatively low educational level which can be a potential threat in regard to future surge of cardiovascular disorders among them. Hence, we believe that educational interventions should be implemented simultaneously with goal-directed screening and risk factor monitoring.

Our study suffers from some drawbacks. One limitation of this study is that we do not know how much of the reported history for smoking, alcohol and opium consumption by the subjects can be reliable as there is hesitancy by the army personnel to divulge such behaviors as it might endanger their position in army. Additionally, we could just show the frequency of the risk factors in limited number of army personnel and by these results we cannot generalize our conclusion about increasing or decreasing trend in foregoing risk factors among army population. Therefore, we strongly recommend for future prospective and multicentre investigations to have clear estimates for future interventions.

**Acknowledgment**

This study is supported by AJA university of medical sciences. We appreciate close collaboration of the Shiraz Army centre.



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