Artuklu International Journal of Health Sciences

journal homepage: https://dergipark.org.tr/tr/pub/artukluder

Original Article / Araştırma Makalesi

An Evaluation of Cardiovascular Risk Factors Among Military Personnel: A Study Conducted in Turkey

Askeri Personelde Kardiyovasküler Risk Faktörlerinin Değerlendirilmesi: Türkiye'de Yapılan Bir Araştırma

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ARTICLE INFO

Article History:
Received: 07.11.2022
Received in revised form: 27.11.2022
Accepted: 07.12.2022

Keywords:
Cardiovascular disease
Risk factor
Military personnel
Smoking
Mental stress

ABSTRACT

Background: Cardiovascular (CV) risk factors are associated with high morbidity and mortality rates; however, prevalence data for Turkish military members are unknown.
Aim: This study determines how common cardiovascular risk factors are among military members in the Corps Command Military Unit and how they relate to socio-demographic parameters.
Materials and Methods: A cross-sectional research was conducted with 25222 active-duty individuals. A questionnaire was used to assess cardiovascular risk factors. This study included patients with more than two risk factors or current cardiac complaints. ECGs, echocardiograms, and biochemical testing were performed.
Results: The study employed 835 individuals with an average age of 19.43±2.12 years. 19.6% of them had hypertension, 5.6% had dyslipidemia, 39.6% were smokers, 2.4% had diabetes mellitus, and 9.8% had a positive family history. Physical activity frequency was not observed in 54% of the patients before enlisting in the military. There was a significant positive correlation between smoking and mental stress ($r=1.07$, $p<0.001$).
Conclusion: In terms of cardiovascular risk, hypertension and smoking were found to be the most prevalent among the Corps command staff. Therefore, this study provides compelling evidence that military healthcare providers should conduct annual periodic checks on those at risk for cardiovascular diseases.

MAKALE BİLGİLERİ

Makale Geçmişi:
Geliş Tarihi: 07.11.2022
Revizyon Tarihi: 27.11.2022
Kabul Tarihi: 07.12.2022

Anahtar Kelimeler:
Kardiyovasküler hastalık
Risk faktörleri
Askeri personel
Sigara
Zihinsel stres

ÖZET

Giriş: Kardiyovasküler (KV) risk faktörleri yüksek morbidite ve mortalite oranları ile ilişkilidir; ancak, Türk askeri mensupları için yaygınlık verileri mevcut değildir.
Amaç: Kolordu Komutanlığı Askeri Birimi'ndeki askerler arasında kardiyovasküler risk faktörlerinin görülme sıklığını belirlemek ve sosyo-demografik özelliklerle ilişkisini değerlendirmek.
Gereç ve Yöntem: 25222 aktif görevli personel ile kesitsel bir araştırma yapılmıştır. Kardiyovasküler risk faktörleri bir anket ile değerlendirildi. İkiden fazla risk faktörü olan veya aktif kardiyak şikayeti olan hastalar çalışmaya dahil edildi. EKG, ekokardiyografi ve biyokimyasal testler yapıldı.
Bulgular: Çalışmaya yaş ortalaması 19.43±2.12 yıl olan 835 birey dahil edildi. Hastaların %19.6'sında hipertansiyon, %5.6'sında dislipidemi, %39.6'sında sigara, %2.4'ünde diabetes mellitus ve %9.8'inde pozitif aile öyküsü vardı. Hastaların %54'ünde fiziksel aktivite sıklığı gözlenmedi. Sigara içme ile zihinsel stres arasında önemli derecede pozitif bir ilişki bulundu ($r=1.07$, $p<0.001$).
Sonuç: Kolordu komuta personeli arasında kardiyovasküler risk açısından en fazla hipertansiyon ve sigara kullanımı görüldü. Bu nedenle, bu çalışma, askeri sağlık hizmeti sağlayıcılarının kardiyovasküler hastalık riski taşıyan bireyler üzerinde yıllık periyodik muayeneler yapmaları gerektiğine dair ikna edici kanıtlar sunmaktadır.

1. Introduction

Cardiovascular diseases (CVD) remain the leading cause of mortality worldwide despite advances in diagnosis and treatment (1). It is believed that there is no cardiovascular risk in professional soldiers. Even if they are carefully chosen, they are not completely free of cardiovascular risk factors (2). Because of the nature of the profession in the military context, missions and lifestyle regimens for CVD and related risk factors may differ (3).

Military duty is essentially associated with rigorous disciplinary processes, long working hours, unsuitable climatic and geographical circumstances, and fright of enemy attack (4). Cardiovascular diseases may impair military personnel's ability to perform essential duties in various military occupations, impacting military readiness, deployment eligibility, and overall retention capability. Therefore, those with risks are unsuited for military service and should be dismissed (5).

Cardiovascular risk factors are becoming more prevalent day by day. Mental stress increased blood pressure rates, and the consumption of alcohol, cigarette, and substance are increasing in developing countries (6,7). With early diagnosis and treatment of individuals who have no obvious difficulties but are at risk for the disease in the future, periodic control, follow-up, and measures will minimize future morbidity and mortality (8).

The purpose of this study was to explore the cardiovascular risk status of Turkish Armed Forces personnel serving actively in a garrison to provide prompt diagnosis and treatment of risky individuals and to take appropriate precautions.

2. Materials and Methods

2.1. Study Design and Subject

This was conducted as a cross-sectional observational study with 25222 active-duty personnel. A questionnaire was used to assess cardiovascular risk factors. Between 2016 and 2022, 835 individuals with more than two risk factors or active cardiac symptoms were included in the study. The cardiovascular risk assessment questionnaire parameters included smoking, hypertension, diabetes mellitus, hypercholesterolemia, sedentary lifestyle, positive family history, pressure chest discomfort or shortness of breath during activity, and fainting history. Legal highs were defined as compounds developed to have comparable effects to illegal narcotics. Physical activity of 60 minutes more than three or more times a week was defined as frequent and less than three as moderate. Written informed consent was obtained from all participants. Data on socio-demographic characteristics, health-related information, and anthropometric profile were collected by trained health professionals using a pre-tested questionnaire. All data were saved in a password-protected, encrypted file. The data-collecting spreadsheet was kept separately from any personally identifiable information.

The local ethics committee (Gazi Yaşargil Training and Research Hospital) approved the study protocol (No: 2022-90). It adhered to the Declaration of Helsinki's ethical guidelines for human experimentation (Date: 20/05/2022) (2013).

2.2. Study Protocol

Blood tests were performed on all patients on a regular basis. Mental stress was evaluated by measuring the cortisol level in saliva, which is one of the autonomic measurement methods. The ECG was performed using an electrocardiograph (model ECG-1350K Nihon-Kohden Corporation) at a rate of 25 mm/s and an amplitude of 10 mm/mV and was examined by a cardiologist who was not aware of the study. Echocardiography was performed (Philips ultrasonography Model HD7 XE).

2.3. Statistics

The analyses were conducted by using SPSS version 24.0, Chicago, Illinois, United States., the initial continuous variables were represented as mean standard deviation or median (interquartile range) based on the dispersion of the data. The frequency and percentage of categorical variables were used to present them. The chi-square test or Fisher's exact test was utilized for categorical variables. The significance threshold was established at $p<0.05$.

3. Results

In this study, 835 individuals with a mean age of 19.43±2.12 years were included. The average body mass index (BMI) was 22 (20.5-26.8) (Table 1).

Table 1. General characteristics of the study participants (N=835)

Parameters	x̄±SD, or[IQR]	Min-Max
Age (years)	19.43±2.12	17-53
Total cholesterol (mg/dl)	189 (172.9-205)	134.1-309.9
LDL (mg/dl)	98 (82.9-112.1)	45.2-199
HDL (mg/dl)	40 (34-48.4)	16.9-79.9
Fasting glucose (mg/dl)	89 (82-95)	71-279
BMI (kg/m²)	22 (20.5-26.8)	17.8-36.7
SBP (mmHg)	117 (112-127)	83-157
DBP (mmHg)	76 (72-84)	48-98
LVSD (mm)	28 (26-28.2)	20-39
LVDD (mm)	46 (45.9-48)	36-56
IVSD (mm)	9 (8-9)	7-13
LAD (mm)	3.38 (31-36)	29-40
EF %	67 (64-69)	37-73

Values are reported as median (interquartile range), and n (%) for categorical variables. LDL: low-density lipoprotein, HDL high-density lipoprotein, BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, LVSD: Left ventricular systolic dysfunction, LVDD: left ventricular diastolic dysfunction, IVSD: Interventricular septum diameter, LAD: Left atrium diameter, EF: Ejection fraction.

Table 2. Distribution of cardiovascular risk factors in the military population

		RANK				
		Recruits	Non-commissioned	Officer	X^2	P-value*
Hypertension, n (%)	No	532 (78.8)	119 (86.9)	20 (87)	5.32	0.07
	Yes	143 (21.2)	18 (13.1)	3 (13)		
Dyslipidemia, n (%)	No	650 (96.3)	131 (95.6)	7 (30.4)	1.05	0.589
	Yes	25 (3.7)	6 (4.4)	16(69.6)		
Smoking, n (%)	No	416 (61.6)	78 (56.9)	10 (43.5)	3.86	0.145
	Yes	259 (38.4)	59 (43.1)	13 (56.5)		
Diabetes mellitus, n (%)	No	662 (98.1)	133 (97)	20 (86.9)	3.13	0.209
	Yes	13 (1.9)	4 (3)	3 (13.1)		
Physical activity, n (%)	None	367 (55.2)	69 (50.4)	15 (65.2)	2.81	0.587
	Moderate	212 (31.9)	51 (37.2)	5 (21.7)		
	Frequent	86 (12.9)	17 (12.4)	3 (13)		
Positive family history, n (%)	No	610 (90.4)	126 (92)	17 (73.9)	1.02	0.601
	Yes	65 (9.6)	11 (8)	6 (26.1)		

*Calculated using chi-square test.

Table 3. Socio-demographic characteristics of the military population

		RANK				
		Recruits	Non-commissioned	Officer	X^2	P-value*
Maritus status, n (%)	No	611 (90.5)	97 (70.8)	6 (26.1)	75.85	<0.001
	Yes	64 (9.5)	40 (29.2)	17 (73.9)		
Mental stress, n (%)	No	618 (91.6)	105 (77.2)	13 (56.5)	45.43	<0.001
	Yes	57 (8.4)	31 (22.8)	10 (43.5)		
Education status, n (%)	High school	259 (38.3)	49 (36)	-	18.16	0.052
	Associate degree	244 (36.1)	39 (28.6)	-		
	Master's degree	148 (21.9)	42 (30.8)	20 (86.9)		
	Doctorate	24 (3.5)	7 (5.1)	3 (13)		
Alcohol, n (%)	No	618 (91.6)	105 (76.6)	13 (56.5)	36.72	<0.001
	Yes	57 (8.4)	32 (23.4)	10 (43.5)		
Legal highs, n (%)	No	638 (94.5)	126 (92)	21 (91.3)	1.62	0.445
	Yes	37 (5.5)	11 (8)	2 (8.7)		

*Calculated using chi-square test.

4. Discussion

According to this study finding, were the most common cardiovascular risk factors among military personnel were smoking and hypertension. Considering the age distribution of the participants, it was discovered that there was a density around the age of 19. It should be recognized that persons of this age should be especially protected from cardiovascular risk associated with military occupation.

Hypertension usually does not cause symptoms, although it might induce severe symptoms unexpectedly (9). It has been observed in 17% of the 18-39 age group in the United States of America and 33% in South Korea (10). Similarly, it was observed at a rate of 24% in Portugal and 42% in China (11). A study conducted in Saudi Arabia revealed that the prevalence of hypertension was 33% and that body fat increased with age (12). Hypertension was seen at a lower rate in our study compared to other studies. It is usually caused by genetics in young people, but low physical activity rate and being overweight or obese are other common causes of hypertension (13).

In Spain, the prevalence of overweight and obesity was observed in 6,124 individuals and overweight was diagnosed in 74% of them (14). Similarly, the prevalence of overweight and obesity was 34% among the American population (15). These results were akin to those of the British Army, where 44.7% of active personnel were overweight and 12.0% were obese (16). For instance, 40.4% of Nigerian military personnel, 36% of Brazilian military personnel, and 53.3% of the United States Navy population were overweight (17,18,19). Similarly, the prevalence of obesity was 18% in the Republic of Benin, 13.6% in Ghana, and 19.2% in Tanzania (20,21,22). Obesity and overweight are significantly linked to age, male sex, low rank, and insufficient physical activity. The Turkish military population appears to be better physically than any other Western military population. In our study, the prevalence of obesity was 1.9% and 14.5% of individuals were overweight. In a study

conducted by Varma et al., healthy Indian military soldiers were shown to have a higher incidence of hypercholesterolemia (23). The frequency of metabolic syndrome was 11% among male Iranian military personnel (24). The corresponding prevalence among the Chinese military population was 35%, whereas it was 17% in the general population (25). The prevalence of metabolic syndrome among Brazilian servicemen was 39%, while it was 15% among pilots of the Royal Jordanian Air Force (26).

Youth consumption of alcohol and cigarettes is increasing daily. Smoking and alcohol consumption are significantly correlated with age, male sex, low rank, and mental stress. Stress often manifests in maladaptive coping behaviors such as new smoking among never-smokers or smoking recidivism among past smokers. Smoking has been recognized as a cause of syncope attacks in New Zealand recruits during military training (27). It also increased health expenditures as it caused serious injuries. According to Quednow et al., 69% of the Swiss population used alcohol and tobacco (28). In our study population, this rate was found to be 11.8% and 39.6%, respectively. Forty-nine percent of youth over the age of 20 consumed legal highs, and >10% of legal highs were synthetic (29). This may jeopardize the post-military health of recruits. Substances are easier to obtain and more socially acceptable in the United States. The use of legal highs is more common between the ages of 18 and 30 (30). A higher risk of cardiovascular disease is related to a lower rank in the British Army (31). In autopsy studies, severe coronary stenosis was found in approximately 15% of soldiers who died during the Korean War and in 5% of the Vietnam War victims (32). Therefore, military physicians should be aware of this increasing concern and provide information and training regarding alcohol consumption or smoking in health centres.

Although the current healthy lifestyle system in the military is in place, the significant burden of CVD risk factors, as demonstrated by this study, indicates the need for a priority-based public health approach. The majority of these diseases remain concealed and undetected until catastrophes occur. Turkish Armed Forces personnel are subject to periodic inspections within the scope of periodic inspections, necessary actions are taken against those who are found to be sick or malfunctioning, their place of duty is changed, when necessary, they are retired or they are followed up and treated (33). However, among the cardiovascular risk factors that are the subject of our study, lifestyle changes such as being overweight, smoking, and having sedentary life constitute a significant proportion, apart from conditions such as diabetes and hypertension that require medical treatment. Although these conditions are detected in periodic examinations, they are ignored by authority because they do not prevent work. In this context, paying attention to the regular sports habits of the personnel, setting aside a part of the working time for this purpose if necessary, and starting the smoking cessation campaigns in the army with the leadership of the higher commands can be important steps.

5. Conclusion

Hypertension and smoking were common cardiovascular risk factors among military personnel. It has been demonstrated in the military that both mental stress and alcohol usage increase with rank.CV risk assessment and reduction strategies, including as smoking and alcohol cessation, hypertension treatment, and mental stress reduction are needed in this population.. As a result, annual periodic examinations of personnel at risk of CVD may provide a better focus on health protection.

5.1. Limitations of the Study

Our investigation was severely limited by the lack of a random stratified sample. In addition, the demographic composition of the Turkish Armed Forces resulted in a population dominated by young men.

Conflict of Interest: The authors report no conflicts of interest for the content and writing of the paper.

Financial Support: The author did not receive any financial support for the review article, authorship and/or publication of this article.

Ethics Committee Approval: The local ethics committee (Gazi Yaşargil Training and Research Hospital) approved the study protocol (No: 2022-90). It adhered to the Declaration of Helsinki's ethical guidelines for human experimentation (Date: 20/05/2022) (2013).

Authorship Contribution:

SG: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, roles/writing - original draft, writing - review and editing.

MZK: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, roles/writing - original draft, writing - review and editing.

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