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Syncope risk factors among military training soldiers; A case-control study

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Original Article

Abstract

BACKGROUND: Syncope is a transient brief loss of consciousness accompanied with loss of postural tone. Of common places in which people experience syncope, military barracks can be named where training soldiers spend their military courses. The current study aimed to assess etiology and risk factors of syncope among military training soldiers.

METHODS: This was a retrospective case-control study conducted on training soldiers of Army-501 hospital in Tehran, Iran, during the years 2017-2018. Cases were consisted of 50 soldiers who experienced syncope during military training, and controls were 150 soldiers who had not experienced syncope during their military training. Demographic data were recorded for cases and controls.

RESULTS: Members of case and control groups were not statistically different regarding age (P = 0.46) and height (P = 0.70). Logistic regression test was performed and considering crude model, weight [odds ratio (OR): 0.94; 95% of confidence interval (95%CI): 0.90-0.98], body mass index (BMI) (OR: 0.72; 95%CI: 0.61-0.85), standing duration (OR: 1.007; 95%CI: 1.00-1.01), history of syncope (OR: 15.47; 95%CI: 4.15-57.60), positive family history of syncope (OR: 5.94; 95%CI: 1.66-21.25), smoking (OR: 3.5; 95%CI: 1.54-7.91), medical problems (OR: 7.97; 95%CI: 1.98-32.17), anxiety (OR: 2.02; 95%CI: 1.13-4.26), stress (OR: 6.68; 95%CI: 3.28-13.57), and depression (OR: 4.25; 95%CI: 2.15-8.39) were detected as significant predictors of syncope occurrence.

CONCLUSION: Based on the findings of this study, lower BMI, positive history of syncope, smoking, depression, and stress were significant risk factors of syncope occurrence among training soldiers. Higher BMI has protective role in syncope occurrence.

Keywords: Syncope, Risk Factors, Case-Control Studies, Military Personnel

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Introduction

Syncope is a transient brief loss of consciousness presentation with concurrent loss of postural tone. This condition occurs due to general interruption in brain blood flow. Cases with syncope may experience prodromal symptoms including mild vertigo, lightheadedness, perspiration, pallor, visual changes, nausea, vomiting, and flushing prior to loss of consciousness.[1-3]

Syncope has been estimated to occur among 20-35 percent of general population with variety of etiologies from negligible reasons to potentially severe life-threatening ones including cardiovascular and neurological disorders, and/or orthostatic hypotension.[4,5]

Cardiovascular etiology is responsible for approximate 10% of syncope cases, although least prevalence, most significant ones. Syncope related to cardiovascular etiologies may occur due to dysrhythmia, cardiac valvular or muscular problems, aortic dissection, and/or vascular occlusion due to thromboembolism.[6] On the other hand, neurological disorders are the most common underlying reason of syncope. This type may occur following exposure to a sensatory situation such as emotional state, exposure to blood, notable pain, or following particular activities such as urination, defecation, and even cough.[7] Stimulation of carotid sinus, specially bilaterally, can induce syncope occurrence.[8] Another etiology of syncope is hypotension that induces syncope following a sudden alteration in postural status. This type, that

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is known as orthostatic hypotension, can occur due to medicines taken by the person or etiologies that poses significant reduction in effective circulatory volume (e.g., severe dehydration, hemorrhage, and sepsis).[9]

Of common places in which people experience syncope, military barracks can be named where training soldiers spend their military courses. This fact that may usually occur during soldiers' long time stance in ranks or line for routine military ceremonies and marches, can potentially cause harm for their health.[10] Studies assessing etiological reasons and prognosis about syncope incidence in military services soldiers are limited; while it seems somewhat necessary to evaluate this potential life-threatening event among this population, who should tolerate long-time military ceremonies.[10,11]

According to limited studies about the etiologies of syncope occurrence among military soldiers and lack of any study in this regard is Iranian military community, the current study aimed to assess syncope etiologies among military training soldiers.

Materials and Methods

After obtaining institutional approval from Ethics Committee of AJA University of Medical Sciences, Tehran, Iran, this retrospective case-control study conducted on training soldiers from June 2017 to April 2018.

Cases were consisted of 50 soldiers who experienced syncope and referred to Army 501 hospital during study duration from. Controls were 150 age-matched training soldiers. Both groups were included through convenience sampling.

Soldiers with documented presentation of syncope, and those who declared their willingness to study participation were included, and those with incomplete medical records (more than 20% defect in their records) and with any history of neurological disorders and cardiac syncope were excluded. Participants were informed about all of the process of the study, and were reassured about confidentiality of their information. Then, they signed consent form of participation in the study. This study was approved based on IR.AJAUMS.REC.1396.51 code from Research Council and Ethics Committee of AJA University of Medical Sciences.

Demographic data including age, educational level, body mass index (BMI), previous history of syncope experience, family history of syncope, smoking, alcohol consumption, drug history, duration of standing prior to syncope occurrence, and presence of dehydration/emotional stress before syncope were recorded in a checklist. Then, all cases underwent electrocardiography (ECG), head-up tilt test (in cases with suspicion of syncope occurrence), and measurement of blood pressure and pulse rate. In addition, prodromal symptoms were asked from cases.

Control group was provided with similar checklist, blood pressure and pulse rate were measured for them as well. Mental health problems including stress, depression, and anxiety in both case and control group were measured by the validated Chinese version of Depression Anxiety Stress Scales (DASS21).[12] The 21-item instrument (including three subscales, 7 questions each) asked respondents to rate the presence of these items of symptoms over the past week from 0 to 3 (0: not at all; 1: some of the times; 2: a good part of the time: and 3: most of the time). According to DASS21 guidelines, the score of each subscale was summed up, and then was multiplied by two. Scores were ranged from 0 to 42. Cut- off scored for each subscale used according to previous studies, depression: normal 0-9 and abnormal 10-42, anxiety: normal 0-7 and abnormal 8-42, and stress: normal 0-14 and abnormal 14-42.[13,14]

Thereafter, obtained data were gathered in checklist and entered SPSS software (version 22, IBM Corporation, Armonk, NY, USA) for analysis. For presentation of continues and categorical variables mean ± standard deviation (SD) and absolute number (percentages) were utilized respectively. Independent t test was used for analysis of continuous variables. Categorical variables were analyzed using chi-square and Fisher's exact tests if necessary. Logistic regression test (Forward LR method) was used to evaluate association between risk factors and syncope occurrence. Variables including weight, BMI, systolic blood pressure (SBP), diastolic blood pressure (DBP), duration of standing, stress, anxiety and depression scores, positive history and family history of syncope, and history of smoking and medical problems were inserted in the model. Thereafter, statistically non-significant ones were eliminated during 1st to 3rd stages. P-value of less than 0.050 was considered as level of significance.

Results

This study was conducted on 50 cases and 150 controls with mean age of 22.94 ± 2.69 and 22.61 ± 2.75 years, respectively. 90% of cases presented history of long-time standing prior to syncope occurrence.

Table 1. Comparison of quantitative demographics information among study groups

Variable	Group		P
	Case (n = 50) (Mean ± SD)	Control (n = 150) (Mean ± SD)	
Age (year)	22.94 ± 2.69	22.61 ± 2.75	0.460
Height (cm)	177.56 ± 4.80	175.98 ± 5.54	0.070
Weight (kg)	69.32 ± 4.95	73.74 ± 10.35	0.004
BMI (kg/m^2)	21.97 ± 1.16	23.79 ± 3.02	< 0.001
SBP (mmHg)	117.42 ± 5.58	119.35 ± 12.32	0.040
DBP (mmHg)	75.64 ± 5.91	76.60 ± 7.79	0.420
Standing duration (minutes)	457.40 ± 71.28	416.46 ± 78.03	0.001
Sleeping duration (minutes)	457.40 ± 49.14	449.86 ± 48.17	0.270

SD: Standard deviation; BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure

In addition, 64% of syncope occurred in summer (18% in spring, 14% in fall, and 4% in winter). Vertigo (70%), light headedness (54%), and nausea (54%) were among the most common symptoms of patients. Other symptoms included sweating (40%), vomiting (36%), and head pressure (34%).

Quantitative demographics information of participants are shown in table 1. Cases and controls were significantly different regarding weight, BMI, SBP, and duration of standing prior to syncope occurrence, while other variables including age, height, DBP, and sleeping duration were not statistically different between the two groups.

Table 2 is demonstrating the prevalence of variables among cases and controls. There were significant differences between cases and controls regarding positive history of syncope, family history of syncope, smoking, medical problems, anxiety, depression, and stress that all were statistically more common among those presented syncope.

Table 3 is demonstrating syncope risk factors. Logistic regression test was performed and considering crude model, weight, BMI, standing duration, history of syncope, positive family history of syncope, smoking, medical problems, anxiety, stress, and depression were detected as significant predictors of syncope occurrence. Based on model 1, by adjusting BMI, SBP, and smoking, BMI, standing duration, positive history of syncope, positive family history of syncope, smoking, medical problems, anxiety, stress, and depression were statistically significant. Model- 2 was performed by adjusting family history, anxiety, stress, and depression. This model showed significant outcomes of BMI, positive history of syncope, smoking, stress, and depression.

Table 2. Comparison of qualitative demographics between cases and controls

Variable		Group		P
		Case (n = 50) [n (%)]	Control (n = 150) [n (%)]	
Positive history of syncope		12 (24.0)	3 (2.0)	< 0.001
Positive family history of syncope		7 (14.0)	4 (2.7)	0.002
Positive history of smoking		14 (28.0)	15 (10.0)	0.002
Positive history of alcohol use		4 (8.0)	4 (2.7)	0.180
Marital status	Single	13 (26.0)	42 (28.0)	0.770
	Married	37 (74.0)	108 (72.0)	
Educational status	Less than high school	11 (22.0)	29 (19.3)	0.800
	High-school graduation	27 (54.0)	89 (59.3)	
	College education	12 (24.0)	39 (26.0)	
Occupational status	Student	28 (56.0)	91 (60.7)	0.940
	Farmer	6 (12.0)	13 (8.7)	
	Worker	7 (14.0)	19 (12.7)	
	Jobless	3 (6.0)	11 (7.3)	
	Self-employed	6 (12.0)	16 (10.7)	
Medical problems	Yes	7 (14.0)	3 (2.0)	0.003
	No	43 (86.0)	147 (98.0)	
Anxiety	Abnormal	32 (64.0)	67 (44.7)	0.018
	Normal	18 (36.0)	83 (55.3)	
Stress	Abnormal	28 (56.0)	24 (16.0)	< 0.001
	Normal	22 (44.0)	126 (84.0)	
Depression	Abnormal	33 (66.0)	47 (31.3)	< 0.001
	Normal	17 (34.0)	103 (68.7)	

Table 3. Crude and adjusted odds ratio for predicting syncope occurrence

Risk factor	OR (95%CI)		
	Crude model	Model 1	Model 2
Height (cm)	1.057 (0.99-1.24)	1.04 (0.98-1.11)	1.02 (0.94-1.09)
Weight (kg)	0.94 (0.90-0.98)*	1.05 (0.97-1.14)	1.01 (0.92-1.11)
BMI (kg/m^2)	0.72 (0.61-0.85)*	0.72 (0.60-0.86)*	0.75 (0.61-0.90)*
SBP (mmHg)	0.98 (0.95-1.01)	1.01 (0.97-1.04)	0.99 (0.95-1.04)
Standing duration (minutes)	1.01 (1.00-1.01)*	1.01 (1.00-1.01)*	1.01 (1.00-6.88)
Positive history of syncope	15.47 (4.15-57.60)*	14.85 (3.82-57.70)*	11.98 (2.42-59.29)*
Positive family history of syncope	5.94 (1.66-21.25)*	4.85 (1.28-18.38)*	2.45 (0.55-10.91)
Positive history of smoking	3.50 (1.54-7.91)*	3.13(1.33-7.36)*	4.09 (1.53-10.93)*
Medical problems	7.97 (1.98-32.17)*	8.12 (1.39-47.33)*	3.99 (0.66-23.89)
Anxiety	2.02 (1.13-4.26)*	2.24 (1.10-4.55)*	0.44 (0.15-1.27)
Stress	6.68 (3.28-13.57)*	7.08 (3.24-15.47)*	7.00 (2.43-20.17)*
Depression	4.25 (2.15-8.39)*	4.29 (2.06-8.93)*	2.86 (1.21-6.77)*

OR: Odds ratio; 95%CI: 95% of confidence interval; BMI: Body mass index; SBP: Systolic blood pressure
Model 1: Adjusted for BMI, SBP, and Smoking; Model 2: Further adjusted for family history, anxiety, stress, and depression
* Significant at level of 0.050

Discussion

Syncope is a relevant reason of referring to emergency rooms worldwide accounting for 1-3 percent of patients' referrals.[1] This condition occurs routinely among training soldiers standing for long duration in ranks and lines. Syncope is a usual etiology of cardiologist referral of military services officials, and has the third rank following palpitation and cardiac attack respectively.[10,15]

This condition occurs mostly among younger military populations (10-30 years old). The range of age is consistent with the most common age that participants of military training services have.[16]

Based on our searches, this case-control study is the first one in community of Iran that compared demographic etiologies of syncope among military training soldiers. In addition, it tried to assess risk factors of syncope occurrence among training soldiers.

According to findings of the current study, cases presenting syncope had significant less BMI and also SBP, while significantly experienced more duration of standing and presented higher scores of depression, anxiety, stress, and total score of DASS21. Other findings with significant higher prevalence among those with syncope presentation were history of syncope in family members and themselves, history of other medical problems, in addition to history of smoking. Marital, educational, and occupational statuses were among factors that were not associated with syncope incidence.

Gender distribution of syncope has been assessed previously, and no difference has been found.[10,17] Because of rules in Iran, all studied population of current study was men. Other factors that have been evaluated previously and found to be in association with re-experience of syncope included previous history of syncope occurrence in the self and their family members.[16,18]

The ratter factor that has been found to be significantly higher among those with presentation of syncope in comparison to control group was emotionally-related factors. Variety of studies has presented association of stress, anxiety, and depression with syncope, vasovagal type in special.[1,19,20]

Prodromal symptoms of syncope commonly known as presyncope was evaluated in the current study as well; while of limitations of our study was lack of assessing occurrence of syncope after presyncope/near syncope among our cases. Most common prodromal symptom was vertigo, followed by nausea, and lightheadedness. These symptoms were presented in other studies conducted by Peeters et al.,[1] Rubenstein and Josephson,[21] Gracie et al.,[22] and others, as well.

The ratter variables evaluated in our study were risk factor in association with syncope occurrence among training soldiers. Our study showed that higher BMI was in association with less probability of syncope. This factor was presented in the study of Basavarajegowda that presented this effect in vasovagal (neurocardiogenic) type of syncope,[23] and Christou and Kiortsis that declared this association with orthostatic type of syncope, also can be considered in association with neurocardiogenic type.[24] Of most considerable limitations of our study was lack of assessment of syncope type and its relations with risk factors.

Standing duration was another factor associated with syncope occurrence among soldiers. Wieling et al. reported this association as a risk factor of orthostatic, autonomic dysfunction, and vasovagal syncope.[25]

History of syncope in soldier and his family were other risk factors of syncope among troops which have been well-documented previously as well.[16,20,26] Colman et al. declared that 42% of patients with history of syncope may re-experience it within a year after first time, and 36% within the second year.[18]

Among emotional statuses, depression was the only statistically significant predicting risk factor of syncope occurrence in the current study. There are several studies that have stated this association with vasovagal type.[22,27-29] Bhangu et al. emphasized that treatment of depression can potentially prevent syncope occurrence.[30]

Of limitations of the current study was small number of cases and assessment of neurally-mediated syncope. Thus, further studies with larger sample size and assessment of all types of syncope are recommended.

Conclusion

This is a case-control study conducted on training soldiers experiencing syncope.

Based on findings of this study, higher BMI has protective role in syncope occurrence while depression and smoking are risk factors that make a person prone to syncope occurrence.

Thus controlling risk factors of syncope occurrence among training soldiers prior to their dispatch is strongly recommended. On the other hand, as some of them are modifiable, potential treatments are suggested, in addition, changing training course emotional state to a milder condition can help these cases.

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Conflict of Interests

Authors have no conflict of interests.

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