



ORIGINAL ARTICLE

Epidemiology of Physical Injuries in Iranian Soldiers During Military Training Courses

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ABSTRACT

Physical injuries are one of the main issues for military recruits specifically during the military training course. The aim of this study was to determine the epidemiology of physical injuries during a military training course and its risks in Iranian soldiers. This cross-sectional study has been done in land force soldiers of 14 military training garrisons of Iran from March to November 2012. 5 garrisons were selected based on stratified random sampling method. Data were gathered by a verified demographic questionnaire and a checklist about the happened trauma that surveyed life-threatening issues in traumas and examining body systems regarding trauma (airway trauma, chest wound, vessels trauma and bleeding). Data were analysed by SPSS 18 software using Kendall and Chi square statistical tests. Most of the traumas were happened in the morning practices and training fields (51.3%) and sport field (17.6%) and due to falling from height (16.9%). There were no significant relations between happenings of trauma in studied soldiers and their age, marital status, education but body mass index had a significant relation ($p=0.03$) with the incidence of blister in lower parts. There was a significant difference between the number of referring to clinic between 5 garrisons and garrisons E (309 cases) and C (184 cases) had significantly more and garrison D (44 cases) had significantly less number of accidents. The incidence of more injuries in the course of military training is of crucial importance requiring more care. Through proper planning and implementing military training courses can be reduced to a minimum.

Keywords: Assessment, Military Training, Physical Injuries, Epidemiology, Accident

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INTRODUCTION

In all around the world armies, military training is a necessity and is aimed to improve physical preparedness and military strength in order to fulfill the soldiers' assigned duty in wartime and performing acceptable maneuver. The soldiers' physical preparedness have crucial effect on their victory or failure [1]. There is a direct relationship between soldiers' physical fitness and their military competence [2]. Although primary military training improves soldiers' tolerance effectively, but can be harmful during jumping activities [3] which are inevitable because performing difficult physical exercises can enhance the required features and capabilities in military forces.

During military training, all soldiers reach a desired level of preparedness proportionate to the training situations. However, thoughtless pursuit of these aims can endanger military capabilities of the forces such as their physical efficiency and health [4]. Trauma and musculoskeletal injuries are among common problems of soldiers during military training and for athletes during exercises. Thus knowing the different aspects of these problems such as their frequency and risk factors are of crucial importance. The term "trauma" means acute physiological or structural change in the body. This change occurs when the amount of input energy can not keep pace with the speed at which the body burns or tolerates [5]. Military training for soldiers is considered as a tough physical activity and there is a direct relationship between physical injuries and physical activities [6].

It has been shown that primary military trainings have just one positive effect and that is enhancing soldiers' stamina. Of course, low preparedness will heighten the risk of injuries during training [3].

Education has an important role in preventing and reducing physical injuries in soldiers and usually those gone through training have experienced less musculoskeletal injuries [7] and formulated programs to impede soldiers' injuries can protect their body against injuries. Parkkari *et al.* have argued that training can considerably reduce the injuries in upper parts of the body and ankles in trained soldiers [8].

Physical injuries are the most widespread reason of military recruits especially soldiers to see a doctor during military training in Iran and other parts of the world. Zambraski contends that the injuries in military recruits may be the result of direct war incidents, non-military incidents, transfer, other military operations, or even the accidents occurring during training courses. These injuries can lead to loss of physical strength, hinder fulfilling one's duty, incur remedial expenses and affect the individual's quality of life [9]. According to Najafi *et al.* the most common reason of referring to the clinics in training garrisons in Iran are physical injuries [1]. The incidence rate of trauma in the US soldiers during a two-month military training course was 29% in men and 53% in women, in 2002. The risk factors of injuries in military recruits during military practices are being female, having too low physical flexibility, having insufficient physical activities, smoking, having scarcely or extremely curved legs, having Knee Q Angle more than 15 degrees, having Genoa Valgus, having low level of muscular tolerance, being old, BMI more than normal, and having light skin [2]. In fact, risk factors of physical injuries in soldiers during military training are divided into two categories; personal and impersonal [7].

Kaufman *et al.* state that physical injuries occurring during military training leads to the waste of training and practicing time and decreasing soldiers' military preparedness and eventually results in spending enormous expenses on training. The incurred injuries in individuals have a direct relationship with factors such as weak physical condition, lack of prior physical preparedness, prior experience of injury, too much exhausting training during the course, smoking and biomechanical factors [10]. Some studies have shown that the less educated the soldiers are, the more they experience the incidence of backache. Similarly, the lower their physical preparedness is, the more they suffer from backache [11].

One of the common encountered problems for soldiers is performing military services in hot regions. The injuries caused by the hot temperature usually affect those non-native soldiers whose physiological conditions cannot adapt to this climate. Preventing heatstroke involves educating and using of preventive and adaptive methods [12]. The results of a study on 2391 male and female soldiers in the US revealed that at the end of a 19-weeks training course, those who were older were more susceptible to injuries than others. This indicates the low stamina and physical strength of the older soldiers [13]. Carrying unnecessary, heavy equipments during hiking and military trainings is another harmful activity, which can have undesirable effects on soldiers' health. Qu has revealed that a heavy backpack can hinder soldiers' walking and also bring about incidents like falling [14].

Considering the necessity and significance of recognizing the frequency of traumas during the military training course, this study was aimed to determine the epidemiology of physical trauma during military training courses in selected garrisons of Iran.

METHODS

This cross-sectional study has been done in land force soldiers of 14 military training garrisons of Iran from March to November 2012. 5 garrisons were selected based on stratified random sampling method and all their soldiers who had referred to the doctor complaining of musculoskeletal injuries were studied as the available samples.

Data were gathered by a verified demographic questionnaire (age, marital status, education, weight, height, athletic background, ... name if there are other parameters) and a checklist about the happened trauma (the time when the trauma occurred, the place where the trauma occurred, the previous address, the previous job, trauma mechanism, type of activity and military training) that surveyed life-threatening issues in traumas and examining body systems regarding trauma (airway trauma, chest wound, vessels trauma and bleeding). The validity of the instruments were approved by 10 related faculty members. The reliability was confirmed by Cronbach's alpha method in a test-retest pilot study in 30 soldiers ($r=0.89$).

After taking the ethical permissions of performing the study from the Committee of Research Ethics of Baqiyatallah University of Medical Sciences, the researchers have gone to 5 selected garrisons one by one and were resided in the clinic of the garrisons for 45 to 60 days during the performing of military training courses. These courses had different theoretic and practical content of military education and training; cultural and ideological lessons, sports and fitness, firearms and shooting, self-defence training, military exercises, compass training, night manoeuvre, long walks in the mountains and field, first aid and health. During this period, each referred soldier who had complained of musculoskeletal injuries was studied and the demographic questionnaire and the checklist were filled for them.

Data were analyzed by SPSS 18 software using Kendall (for Blister & BMI variable) and Chi square (for blister & Sport variable) statistical tests. P value less than 0.05 considered as significant.

RESULTS

Overall, 705 individuals (%14.9 of total soldiers) referred to the garrisons' doctors due to the trauma occurring in the course of military training. Most of the traumas were happened in the morning practices and training fields (51.3%) and sport field (17.6%) and due to falling from height (16.9%).

There were no significant relations between happenings of trauma in studied soldiers and their age, marital status, education but body mass index had a significant relation ($p=0.03$) with the incidence of blister in lower parts (Table 1).

Table 1) Frequency distribution of subjects according to demographic parameters and its significance in relation with happenings of trauma during military training courses

Parameter	Absolute Frequency	Relative Frequency	p Value
Age			
Less than 20	494	70	p>0.05
20 and more	211	30	
Marital Status			
Single	607	86	p>0.05
Married	98	14	
Education			
Diploma and less	469	66.5	p=0.208
More than	236	33.5	
Diploma			
BMI			
Less than 25	490	69.5	p=0.03
25 and more	215	30.5	

Musculoskeletal pains (72.3%) were the most frequent cause of referring to garrisons' clinics and sensory disorders (12.7%), muscle strain (5.2%), mobility disorders (5%), feigning illness (3.4%) and Dyspnea (1.4%) were the next referring causes, respectively.

Most of the traumas (51.3%) had occurred due to the military practices and the next accidents causes were sports (17.6%), falling (17%), fight (6.2%), weapon related injuries (4.5%), motor accidents (2.3%), burning (0.7%) and finally self-beating (0.4%), respectively. The majority of the injuries, with the frequency of 90.9%, were of non-penetrating type.

The lower limb extremities (462 cases), upper limb extremities (87 cases) and skin (47 cases) were the most injured parts of the body.

There was a significant difference between the number of referring to clinic between 5 garrisons and garrisons E (309 cases) and C (184 cases) had significantly more and garrison D (44 cases) had significantly less number of accidents ($p<0.05$; Table 2).

Table 2) Number of traumas according to garrisons (A to E) and the cause of happening

Parameter	A	B	C	D	E	P Value
Bullet and gun	4	6	14	5	3	0.74
Falling from height	24	37	19	7	32	0.08
Fighting	12	8	4	5	15	0.22
Motor accidents	4	1	7	3	1	0.14
Sport field	25	7	42	10	40	0.01
Morning practices and training fields	21	19	97	12	213	0.001
Burn	0	0	1	0	4	0.66
Self-hurt	0	0	0	2	1	0.98
Sum	90	78	184	44	309	0.001

DISCUSSION

The rampant spread of physical injuries in soldiers during the military training course threatens their health. Furthermore these injuries incur military, economic and social consequences for the armies and families. Factors such as improper physical preparedness, lack of physical fitness, climate inadaptability, soldiers' lack of knowledge on the one hand and discrepant management policies, improper execution of educational plans and lack of safety equipment for the soldiers on the other hand can lead to physical injuries [15].

Regarding the results achieved through this research, the injuries are usually insignificant, superficial, and non-penetrating. At the same time the frequency of the soldiers referring to doctor due to trauma is still high and better consideration and preventive actions is needed to decrease the amount of injuries.

Kaufman *et al.* have reported the injury rate among male soldiers during their military training within one month as 6-12% and show that factors such as low physical preparedness, previous job, amount of weekly exercises, previous injuries and long distance running have relation with injuries of soldiers [10]. In the study conducted by Rosendal *et al.*, the incidence of injuries in soldiers during their military training courses within 12 weeks has been reported as 28%. They have shown a significant relationship between the incidence of injuries and the soldiers' physical fitness ($p < 0.0001$). The comparison between the result of Rosendal *et al.* and our research reveals that they are different in terms of the injury incidence rate, the reason of which seems to be the inequality of the training period; although, there is a significant relationship between physical fitness and the incidence of injuries [3].

The results of the present study showed that more than half of the injuries occurred due to the military practices. This result demands careful examination to clarify why military practices mechanism and lower parts injuries had more frequency. Why did trauma with this mechanism have a higher frequency in garrison E and C. Various factors are involved here including the difference in training methods and exercises of the trainers, non-native soldiers in this course in garrison.

The results of the present study showed that most injuries in terms of the type and anatomic location had affected lower parts of the body. The higher frequency of injuries in lower parts can also result from factors such as incorrect exercises such as running for a long time on hard surfaces, jumping, moving ahead while sitting on feet, not observing safety principles, not having physical fitness, having problems in lower parts of the body and wearing inappropriate shoes.

According to our results, the most common cause of soldiers' complaints and referring to doctor was musculoskeletal pains (72.3%) resulting from physical injuries, which is in agree with Jannesari *et al.* that have reported this as the most common cause (71.6%) [15]. This is also in agreement with Njafi *et al.* that report superficial musculoskeletal injuries as the most common injuries (42.1%) and lower parts around the ankles (27.6%) as the mostly hurt part [1].

Our findings clarified that there was a direct and significant relationship between the body mass index and the incidence of blister in lower parts of the body ($p < 0.05$). On the other hand, with the increase in weight, the incidence rate of the injuries rises. This agrees with the results of Cowan *et al.* that concluded those who were extremely fat experienced musculoskeletal injuries more [16].

Bullock *et al.* have introduced a strategic plan to prevent physical training-related injuries that the most important are "educating and informing soldiers about the risks and the necessity of having physical preparedness", "avoiding tough and dangerous exercises", "doing practices reinforcing agility", "using protective tools for susceptible parts such as ankle brace", "wearing special shoes and socks preventing blisters" and "eating food compensating the lost energy for one hour after sever activities" [17]. Similarly, "educating soldiers about physical fitness", "correct principles of exercising and nutrition", "avoidance of smoking" and "proper stress management" are among necessary educational requirements for military recruits to prevent injuries [18]. Thus, recognizing susceptible individuals at the beginning of the training course in terms of soldiers' primary risk factors (i. e., overweight and obesity, anomalies in the lower parts, smoking experience, weakness and lack of proper physical preparedness to endure exercises) is recommended. To prevent injuries, creating required fitness and physical preparedness before entering into practical and field stage in military training and practices, learning and observing the principles of safety/hygiene and self-aid for soldiers, observing safety principles and avoiding tough and sometimes unnecessary practices as well as providing more security equipments and facilities for the soldiers, carrying out military training courses in local garrisons for native soldiers for more climate adaptability and finally revising and formulating educational programmes of training garrisons with scientific and principled approach and homogenizing these programmes in all garrisons to reduce these injuries are recommended.

CONCLUSION

The incidence of more injuries in the course of military training is of crucial importance requiring more care. Through proper planning and implementing military training courses can be reduced to a minimum.

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