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VARIA

Determine the medical causes and diseases which led to early and permanent medical disqualification of military cadets

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Abstract: *Background and Aim: Efficient manpower is the most important of military capital, and many studies have shown the relationship between personal health and organizational performance. The preparation of military cadet volunteers to enter aeronautical training and the provision of optimal services in the form of well-trained pilots requires many material spiritual resources that disabilities, make them waste.*

Methods: This is a descriptive, cross-sectional, retrospective study with target population of Iranian air force cadets with early and permanent medical disqualification from 1986 to 2016.

Results: 80 cases were detected, including 25 kills and 55 early and permanent medical disqualification. The main causes were ear, nose and throat, psychiatry and cardiac, respectively. Common diseases include motion sickness, generalized anxiety disorder, adjustment disorder and epilepsy, respectively. The total number of lost service years was 1412 person years and the average of lost service years was 25.67 person years. Most of the lost service years were related to medical causes included ear, nose and throat, psychiatric and cardiac, and diseases included motion sickness, generalized anxiety disorder and adjustment disorder, respectively. Neurologic causes resulted in highest average of lost service years and high blood pressure was the major diseases, respectively.

Conclusions: Due to the lack of similar studies, the results of this study were compared with the data, which extracted from previous studies in the pilot's population. Because of occupational similarity between pilots and cadets, It was expected that the most common causes in pilots and cadets should be the same, but we found that the results are very different.

Keywords: *disabilities, medical disqualification, health, performance, prevention*

INTRODUCTION

Personal resources are the most important capital of armed forces, and many studies have shown the strong links between personal health and organizational performance. In order to increase productivity, organizations have anticipated numerous measures to evaluate pre-employment health and staff health during service. However, health risks remain the most important reducing factor for personal productivity. Disability is defined as the effect of a disorder on physical, mental, and social activity of a person and the work environment and family status are also effective elements. [1, 2, 3] Cadets are the future capital for professional aviation and the sufficient understanding of the medical causes and diseases leading to their early and permanent medical disqualification (EPMD), plays an important role in professional pilot training. According to statics, effective prevention of cardiovascular risk factors in aviation population has a significant role in improving the professional health index of pilots. The study of pilot's work environment and their lifestyle, active intervention, periodic

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regular examinations and screening test for early detection of diseases are among the basic measures. [9] Preparation of cadets to enter pilot's training courses and delivering desirable services in the form of expert military pilots requires 10 million dollars and extreme spiritual costs, and as a result disqualification, it will be a major loss of money and human budget for armed forces [21]. Thus, control of this dilemma has no way except of effective prevention. [1-5]

These days, the economic, mental and social problems caused by morbidity and mortality of armed forces are critical burdens. Regardless of the huge cost to run and maintain of powerful army, the financial and psychological burden of the victims can be devastating for any society. [20] In 1993, the United States army paid 500 million dollars to newly recruited armed forces. [6-7] In a study between 1980 and 1994 on the causes of disability in US air and sea forces, it has been shown that the disable armed forces has led to an excessive cost in about 1.5 million dollars for US army. [1] The federal aviation association(FAA) has conducted a great comprehensive study in 2014 on the causes of medical disqualification for pilots whose results indicate fifteen causes include pectoris angina, bipolar mood disorder, cardiac valve replacement, coronary artery diseases, diabetes mellitus, loss of consciousness with unknown reason, seizure, cardiac replacement, myocardial infarction, permanent pace maker, disabling personal disorder, psychosis, drug abuse and dependency and lack of neural control, respectively. [15] Cadets are the future maker of aviation and can become expert pilots in near future. Unfortunately, so far, there has not been a similar published study in the world, which makes it necessary to accomplish this research more effective and strategic.

The ultimate goal of this study was to determine the causes and diseases which led to EPMD of Iranian Air Force (IRIAF) cadets from 1986 to 2016. Other objectives include determining the exact numbers of cadet and aviation trainee kills in IRIAF, determining the lost service years (LSY) in IRIAF cadets with EPMD (with counting of seven years of aviation training course and a total service duration of 30 years in IRIAF), determination of the average LSY for IRIAF cadets with EPMD and the provision of scientific and practical solution to prevent the EPMD of IRIAF cadets.

METHODS

This study is a descriptive-cross sectional-retrospective research that its target population was the IRIAF cadets with EPMD from 1986 to 2016. IRIAF cadets with medical disqualification from 1986 to 2016, that their relevant official documents have been recorded in medical sessions and their medical profiles were included, but cadets with disqualification due to physical or mental illness and death in non-occupational accidents, non-medical reasons, personal requests or disciplinary punishments were excluded from study.

The ethical approval of this study was issued with registration No: 1016794 by the Ethics Committee of the Aerospace and diving medical faculty in Aja University of medical sciences. This study was conducted by the personal expense of the corresponding author and so, no governmental or military fund was not be used at all.

After obtaining administrative licenses (Allow access to information) and ethics approval (being ethical and maintaining the principle of patient privacy) in research ethics council of aerospace and diving medical faculty (which is subset of AJA University of medical sciences) and coordination with relevant authorities in IRIAF department of health, medical education and services for obtain permission of unlimited access to medical profiles and sessions, in order to maintain the medical confidentiality, the archivist assigned a secret and random code to each participant that was recorded on top of the electronic data forms. Required information including age, year of entry to and excite from service, main medical cause and disease which led to EPMD were inserted in an electronic form designed according to the study requirements. An individual archivist was used to enter data and in order to military and national information security, the total number of IRIAF cadets was not stated.

All of the IRIAF cadets were male and, in few cases, which there were more than one reason for EPMD, only the main cause was considered. Like other similar studies, all medical causes and diseases were classified based on the 10th version of international classification of diseases (ICD-10) and the causes in domain of nephrology and urology have been recorded as renal causes. However, possible differences in the statistics of similar studies may be related to their classification methods for causes and diseases. It should be noted that in any armed force, while training or real battle, casualties are inevitable and so killed cadets are not considered to be among the lost years of service. The data was collected and analyzed by the researcher using Microsoft office software (version 2016) and compared with the results of similar studies in pilot's population.

RESULTS

During the period from 1986 to 2016, 80 cases of early and permanent discharges were obtained from all the medical sessions and medical profiles, including 25(31.25%) kills and

55(67.75%) medical disqualification. The kills also included 17 cadets and 8 aviation trainees. This data are given in Table1.

Table1: Study Data

Occupation	Early and Permanent Discharge	Kills
Cadets	55	17
Aviation Trainees	0	8

Common causes of EPMD in IRIAF cadets included ear, nose and throat (ENT), psychiatric and cardiac, respectively. Their prevalence is depicted in Figure1. Common diseases resulted in EPMD of IRIAF cadets included motion sickness, adjustment disorder, epilepsy and, respectively and shown in Table2.

Figure 1: Causes lead to the EPMD of IRIAF cadets

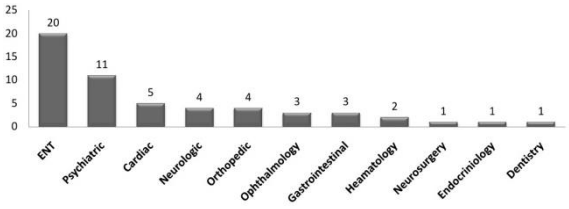

Table 2: Diseases lead to EPMD of IRIAF Cadets

Diseases	Motion Sickness	Generalized Anxiety Disorder	Adjustment Disorder	Epilepsy	High Blood Pressure	Others
N#	18	5	3	3	2	24

As 1412 LSY in IRIAF cadets, the most common causes include ENT, psychiatry and cardiac, respectively. More detail is on Figure2.Common diseases with most of LSY include motion sickness, generalized anxiety disorder, epilepsy, adjustment disorder, and high blood pressure, with detailed statistics in Table 3.

Figure 2: LSY of IRIAF cadets with EPMD according to causes

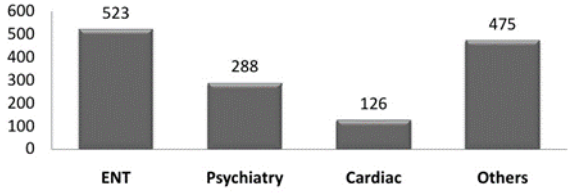

Table3: LSY of IRIAF Cadets with EPMD According to Diseases

Diseases	LSY
Motion Sickness	468
Generalized Anxiety Disorder	137
Epilepsy	82
Adjustment Disorder	74
High Blood Pressure	57
Others	594

The average of LSY in IRIAF cadets with EPMD was 25.67 person years (p/y), the frequency o which based on common causes, including neurology, psychology and ENT with comprehensive information shown in Figure3.

Common diseases resulted in the highest average of LSY in IRIAF cadets with EPMD including high blood pressure, occupational hearing loss, generalized anxiety disorder, epilepsy, and borderline personality disorder, as shown in Table4.

Figure 3: Average LSY of IRIAF cadets with EPMD according to causes

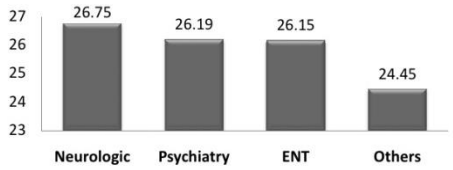

Table4: Average LSY of IRIAF Cadets with EPMD According to Diseases

Diseases	Average of LSY
High Blood Pressure	28.5
Occupational Hearing Loss	27.5
Generalized Anxiety Disorder	27.4
Epilepsy	27.33
Borderline Personality Disorder	26.5
Others	24

DISCUSSION

So far, there has been no investigation into the causes and diseases that lead to EPMD of military or civil cadets in Iran or the world. Therefore, in order to compare the results of this study, the studies in civil and military pilot's population were used, because cadets and pilots have similar occupational and social status. The main reasons for EPMD in IRIAF cadets during our study included ENT, psychiatric, and cardiac, respectively. In the study of Whitton-1984 on United State Air Force (USAF) pilots and navigators, common causes were cardiac and neurologic [16], while in the same

study of Mc Crary-2002, the most common causes in 1995 to 1999, include cardiac, musculoskeletal, neurologic and endocrinology. [11] Also, in the study of Montazeri-2005, the most common causes of EPMD in IRIAF pilots included cardiac and musculoskeletal. [19] In the study of Ghazizade-2010 on the same population in 1992 to 2003, cardiac, nervous-skeletal and gastrointestinal were the most common causes. [18]

In the Dark study with the help of FAA, on medical disqualification of American airlines pilots in 1983 and 1984, the most commonly reported causes were cardiovascular and Neuropsychiatric events. [18] In the Nakanishi study on permanent disability of 260 Japanese crews, significant causes include malignancies, neurodegenerative, cardiovascular, gastrointestinal and musculoskeletal disorders. [8] In the review of trained pilots on Commonwealth countries from 1994 to 2004, the causes of cardiovascular were prevalent. [18] In the Arva study on 257 Norwegian civil pilots, the main causes were cardiovascular, neurologic, musculoskeletal and psychiatric disorders. [10] In the studies of Mitchell-2004 and Evan-2006 on sudden incapacitation of British civil pilots, 36 cases have been diagnosed and half of them were due to cardiac and cerebrovascular disorders and psychiatric disorders have been one of the leading causes. [12, 13] In the Nezami study on 200 civil pilots of Vnukovo airport in Moscow, cardiac, neurologic and digestive have been the main causes of medical disqualification. [9] Common diseases resulted in EPMD of IRIAF cadets, including motion sickness, generalized anxiety disorder, adjustment disorder, epilepsy and high blood pressure. In the Mc crary's review on USAF pilots and navigators in 1995 to 1999, more common diseases were ischemic heart diseases, high blood pressure, back pain, inter vertebral disc disorders and migraine. [11] In the study of Nezami on 200 civil pilots of Vnukovo airport in Moscow, ischemic heart diseases, myocardial infarction, high blood pressure, cerebrovascular sclerotic lesions and peptic ulcer have been common. [9]

The LSY was 1412 (p/y) and the highest was related to ENT, psychiatric and cardiovascular causes, respectively. Diseases with the highest LSY included motion sickness, generalized anxiety disorder, epilepsy, adjustment disorder and high blood pressure. The average of LSY was 25.67 (p/y) and the highest was related to neurologic, psychiatric and ENT causes, respectively. Diseases with the highest average of LSY included high blood pressure, occupational hearing loss, generalized anxiety disorder, epilepsy and borderline personality disorder. In the study of Montazeri-2005, the mean LSY of IRIAF retireds with EPMD was 6.5(p/y). [19] In the Ghazizade study on IRIAF medical disables from 1992 to 2003, the mean LSY was 6.14 (p/y) and the highest was 10 (p/y). [18]

This study, like other studies, has limitations that include: 1) the lack of a comprehensive electronic system for record of medical profile, 2) the possibility of oriented malingering in disorders which have not specific objective diagnostic methods and their detection are subjective, such as motion sickness, migraine, irritable bowel syndrome and etc, and 3) flying device factors(ergonomics and exhaustion), operational and airbase factors(work and rest schedule), Personal factors(life style, physical and psychological capabilities, socioeconomic state, use of legal and illicit drugs and habits), medical factors(medical and psychological advices and hygiene education) are important items which have effective influence on cadets health.

The present study has important benefits such as: 1) at yet, this is the first study on EPMD of military cadets in the world, 2) it has the longest cross-sectional period (35 years) that other longest studies has a period of 10 years, and 3) data presentation in order to kills of cadets and aviation trainees.

At the end, we are suggested that, while it is necessary to conduct similar studies in military and civil cadets and pilots (ever-in non-pilots' flight crew), this advises were recommended to prevent the recurrent medical dispensation of military cadets:

1) Facilitate the comprehensive electronic system for record military cadets' medical profile
2) Upgrading of on-the-job examinations of cadets based on the real requirements
3) Sufficient periodic in-service examination of cadets
4) Lifestyle modifications (habits, nutrition, smoking, use and abuse of drugs and substances, physical exercise etc)
5) Use of medical and psychological counseling (motivation, stress management, high-risk behaviors, risk aversion)
6) Hygiene and health education
7) Regular fitness-based training
8) Updating of flying systems, operational devices and air base facilities (ergonomics, work and rest schedule)
9) Effective and powerful preventive systems with regular updating
10) Improvement of services, which provide with occupational health centers.

List of Abbreviations

Early and Permanent Medical Disqualification (EPMD)
Permanent Medical Exchange in Service categories (PMES)
Iranian Air Force (IRIAF)
Lost Service Years (LSY)
Person Years (p/y)
Federal Aviation Association (FAA)
Myocardial Infarction (MI)

10th International Classification of Diseases (ICD-10)
Generalized Anxiety Disorder (GAD)
Post Traumatic Stress Disorder (PTSD)
Ear, Nose and Throat (ENT)
United State Air Force (USAF)

Declarations

Ethics approval and consent to participate:
The ethical approval of this study was issued with registration N# 1016794 by the Ethics Committee of the Aerospace and diving medical faculty.

Consent for publication:
I (Dr HamzeShahali as Corresponding Author), on behalf of the authors, expresses my satisfaction with the publication of this study in that valuable journal.

Availability of data and materials:
All the data of this study is available and could be accessible for publication by that valuable journal.

Competing interests:
I declare that there is no competing interest about the authors of this study, at all.

Funding:
This research was my special doctorate thesis and so, all the expenses were paid personally. I declare that I did not use any government funds to conduct this study, at all.

Authors' contributions:
Title Presentation, basic researching, approval the research subject, obtaining the necessary permits, collecting data and writing the paper was conducted by Dr HamzeShahali as Corresponding Author and Data analysis, editing and writing part of the article was done by Dr AzadeAmirabadi Farahani as Co-Author, too.

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