

NATIONAL UNIVERSITY OF PUBLIC SERVICE
Doctoral and Habilitation Council

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Occurrence of metabolic disorders among soldiers, with special regard to the role of obesity, the risks of cardio metabolism, and the disease of porphyria

PhD Thesis

Author's Summary

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1. DESCIRTIPION OF THE SCIENTIFIC PROBLEM

In the second half of the 20th century, the development of medical science took a leap never seen before.

Due to the changing environment – primarily the successful treatments of infectious diseases in the developed countries – the mortality structure has changed, the mortality rate of infectious diseases has significantly decreased and has been replaced by growing mortality rate of non-infectious diseases in parallel to the growing average life expectancy.

In these countries, currently the most frequent causes of death include cardiovascular, cancerous, and respiratory diseases regarding both the civilian population and the military forces.

In the background of most non-infectious diseases, we find the same risk factors connected to lifestyle, that can be changed on the individual's level. In particular, smoking, lack of physical activity, unhealthy diet, and extreme consumption of alcohol can lead to obesity, diabetes, lipid metabolic disorders, and high blood pressure, which increase the risks of developing severe cardiovascular diseases.

Even the military forces are not immune to these risk factors: smoking is generally more frequent than among the civilian population, the number of physically inactive, obese and overweight individuals is high as well, although regular exercises and meals are provided. The risk factors of general military responsibilities – such as increased stress level – contribute to the problem as well.

The operating basis of our military forces is that most of the applicants for professional and contractual military services pass the aptitude tests and motivate the already serving individuals to take care of their health and physical condition.

The primary goal of setting the physical competencies in the military and defining body composition has always been to choose and retain the most suitable individuals for military services. As the increasing problem of obesity and overweight effect all age groups, there is a growing number of obese and overweight young adult among those applying for military services.

Researches proved that cardiovascular diseases and cardiovascular-risk relevant metabolic diseases have become more frequent in parallel to growing life expectancy.

The age pyramid has changed and the average age of the military staff has increased due to the termination of compulsory military services in the Hungarian Defence Forces and the postponing retirement age. Therefore, the military staff is impacted by these diseases, too.

Another main topic in my research is the military relevance of porphyria¹, the failure of haemoglobin formation – one of the rare, hereditary metabolism failures – as the disease can be mentioned together with poisoning by heavy metals and certain chemical substances from the perspectives of differential diagnostics.

In either cases, if there is no clear understanding of the symptoms' background, the appropriate treatment will not take place due to the lack of diagnosis. The soldiers will not be able to fulfil their responsibilities, both their capabilities and availabilities in service will decrease.

The conditions of overall and comprehensive diagnostics of porphyria are provided only by the Clinical Chemical Laboratories of the Hungarian Defence Forces Health Centre in the country. However, these opportunities have not been utilized yet by the military health services.

2. RESEARCH HYPOTESIS

1. I postulate that the occurrence of obesity within the military sample in the past two years has increased and the difference of blood pressure and lab results between individuals of normal bodyweight and the obese ones can be demonstrated statistically.
2. I intend to prove that the normal weight individuals and the obese ones differ from each other from the aspects of sociodemographic characteristics, physical expectations of their position, and their health behaviour standards. The observed difference is statistically significant.
3. I postulate that the rate of obese individuals measured by the body mass index is lower among the Hungarian Defence Forces compared to the domestic civil population. This fact is explained by the differing health behaviour standards.

¹ The name of the disease originates from the Greek word “porphuros” (scarlet), as the colour of the urine changes into scarlet.

4. I postulate that the occurrence of diseases related to obesity in the Hungarian Defence Forces does not differ significantly from the frequency experienced in foreign military forces.
5. I postulate that the Hungarian Defence Forces have more soldiers with metabolic risks than soldiers with cardiovascular risks. The health behaviour standards of the individuals of high metabolic risks (exposed to metabolic failures) and the individuals of healthy metabolism significantly differ from each other statistically.
6. I intend to prove that male individuals with acute porphyria fulfilled services during the time of compulsory military service. They missed their schedule due to the disease at significantly fewer occasions than to other reasons.

3. RESEARCH GOALS

I. In the course of examining in details the risk factors of metabolism diseases occurring in the staff of the Hungarian Defence Forces and its connection with the cardiovascular risks:

1. To survey the frequency of obesity and overweight individuals within the military sample representing the staff of the Hungarian Defence Forces based on the data of body mass index. In connection with the body type, to evaluate the lab results and blood pressure.
2. To define the sociodemographic characteristics of obesity, to survey the health behaviour standards, and to draw conclusions regarding the full staff of the Hungarian Defence Forces.
3. To compare the frequency of obesity occurring within the military sample, and the soldiers' health behaviour standards with the domestic population per relevant age and gender.
4. To compare the frequency of obesity and the soldiers' health behaviour standards within the domestic and foreign military forces. To evaluate the Hungarian results by having the knowledge of the international military specialized literature.

5. To explore the risk factors of cardiovascular and metabolic diseases occurring in the military sample. To evaluate the sociodemographic characters and health behaviour standards among those individuals considered healthy from the aspect of metabolism and those individuals of high-risk (exposed to metabolism failures).

II. In the course of examining the military relevance of porphyria – one of the hereditary metabolic diseases, diagnosed by special lab tests:

6. To prove that during the time of compulsory military services – in the absence of diagnosis – a high number of male individuals with porphyria carried out services. On these grounds, to recommend that the disease already known and diagnosed should not be a factor for health exemption at the aptitude test in the application for professional or contractual military services.

4. RESEARCH METHODS

I started out my research with implementing an individual academic and research plan according to the PhD school principles.

I have chosen secondary research methods to investigate obesity, related diseases, cardiovascular and metabolic risks: through my work, I studied the domestic and international databases, continuously gathered, organized and studied the most current, relevant and available, domestic and international literature.

By retrospective analyses, I applied the data registered electronically in the database through the medical screening carried out in the staff of the Hungarian Defence Forces in 2009 and in 2011. I highlighted the sociodemographic and health behaviour characteristics relevant to the metabolic and cardiovascular risk factors, as well as the medical and laboratory testing results.

I applied primary research methods to retrospectively process the subject of male individuals with acute porphyria fulfilling compulsory military services: I used quantitative data collection by telephone calls and interviews. I asked pre-recorded questions about the fulfilment of compulsory military services, or its cancellation and the reason for that.

5. SUMMARY OF THE ANALYSES BY CHAPTERS

In the first chapter, I provide a historical overview about the eligibility criterias for military services, the institutional background of the aptitude tests, and the orders regulating health eligibility from 1840 up to now. I review the disease of porphyria and its military relevance from 1889, when the first publication of acute porphyria was issued. I also present the domestic evolution of its diagnostics and its treatments.

In the second chapter, I review the literature relevant to obesity and connecting diseases in the civil and the military sphere. I evaluate the occurrence of obesity based on the reports prepared by WHO and the OECD countries, and compare the results with data of the international and domestic civil population. In this chapter, I discuss the domestic health behaviour standards. I review the background of developing obesity, its role in developing the connecting diseases, and the body indexes most frequently used for describing nutritional conditions. Based on the publications of international military literature, I present the occurrence of obesity in the military forces, the effect of connecting diseases on the military carrier model, and the possibilities of obesity prevention on social and individual level.

In the third chapter, I describe the epidemiology of cardiovascular diseases, its reasons, the factors of its development, its risk factors identified by follow-up and vertical section analyses, and the methods of definition. Following this, I review the cardiovascular diseases and risk factors published in the domestic and international military literature, then the community analyses aiming to reduce cardiovascular risks and failures.

In the fourth chapter, I describe the epidemiology, symptoms, diagnostics, and treatments of porphyria, one of the rare metabolic diseases. I analyse the possibilities of differential diagnosis of acute porphyria and porphyria with skin symptoms, as possibly occurring diseases in the military services.

In the fifth chapter, I assess the frequency of obesity occurring in the staff of the Hungarian

Defence Forces. I assess the nutritional condition based on the categories of body mass index used for defining body fat. In this perspective, I examine the sociodemographic and health behaviour characters. I compare the results with the matching age and gender data of the domestic civil population. I also compare these data with the international military results, and explore the cardiovascular and metabolic risks in the staff.

6. SUMMARY OF CONCLUSIONS

The worldwide occurrence of obesity – as a result of inactive lifestyle and unhealthy diet – has an inevitable impact on the military community as well. The average age in the Hungarian Defence Forces has grown as the compulsory military services had been discontinued. Due to the more frequently occurring obesity and the changes in the age pyramid, the cardiovascular and metabolic risks have become more prevalent in the population relevant to the defence forces. These issues with their consequences – growing rate of chronic, non-infectious diseases – present greater challenges to the military health services.

Based on the results of the two-year health assessment, the goal of my research was to explore whether the frequency of obesity has changed in the defence forces, what the relevant sociodemographic and health behaviour characters are, and how it is connected to the cardiovascular and metabolic failures, and other known risk factors. I aimed to compare the bodyweight characters and health behaviours standards of the civil and the military population. Then I evaluated these data by the results of the relevant age and gender groups in the civil population. I compared the obesity factors, the health behaviour standards, and the occurrence of cardiovascular and metabolic failures on the grounds of the test results concluded in the defence forces of several nations.

Knowing the prominently high rate of cardiovascular failures in the Eastern- European mortality results, I consider it necessary to assess the risks that our soldiers face regarding these diseases.

My goal was to assess the characters of compulsory military services among men with acute porphyria registered at the Hungarian Porphyria Centre: did they fulfil services, did they know about their illness while serving, did they get discharged in connection with their

illness? My objective was also to call attention to porphyria, as an option of differential diagnostics, by examining the opportunities of military healthcare applications of the laboratory background.

1. As a summary, the frequency of obesity grew in the past two years, and the health indicators of obese soldiers became worse.
2. More commonly among men than women, as they get older their weight increases as well. The number of obese individuals is significantly higher among those with jobs where they sit most of the time – T1 physical expectation level. Among soldiers with normal weight, the rate of those doing sports is higher. While among the ones with a body mass index higher than 25, especially among the obese ones, there are significantly more who do not do sports. The assessment of smoking habits show that smoking is more frequent among man with normal weight, while there is more obesity among the ones that gave up smoking. Sleep disorders occur significantly more often among obese, or extremely obese man, and among overweight women.
3. Among female soldiers and male soldiers older than 30, obesity is less frequent than in the civil population of the same age. However, among male soldiers younger than 30, there are more obese ones than in the civil population. Soldiers do significantly more sports on daily and weekly bases than civil individuals.
4. Statistically proven that the occurrence of obesity and the connected diseases in the Hungarian defence force does not differ considerably from the frequency experienced in the international defence forces.
5. The lowest risks of cardiovascular and metabolic failures are experienced at normal body weight. But they grow as becoming older. The tests did not prove that health behaviour standards are not relevant to body weight. Those with healthy metabolism have normal body weight, while the obese and overweight ones with metabolic risks present different physical activities and smoking habits. The difference of physical activity levels is connected to the bodyweight, not the metabolic risks. The rate of individuals not doing sports is higher among the obese and overweight ones with higher metabolic risks. The ones doing sports generally exercise rarely and randomly. Among the individuals with normal weight and low metabolic risks, there are significantly more that exercise randomly. The excess weight and the physical inactivity, or lack of exercise reduce the abilities of military service and weakens the ability of survival. The soldiers' capacity and the time of active service decrease.

6. Individuals with severe metabolic disease are not considered eligible for military service at the health assessment. In the absence of diagnosis, many men with acute porphyria fulfilled compulsory military service without complaints. As the diagnosis of domestic porphyria developed, more cases of acute porphyria became apparent. Therefore, unsuitability for military services became significantly more frequent only in the two youngest generations.

7. NEW SCIENTIFIC RESULTS

1. I reviewed and compared the occurrence of metabolic failures (obesity, fat metabolic failures, diabetes type II mellitus) within the Hungarian Defence Forces and the nations of NATO. I confirmed that the indicators of the Hungarian soldiers do not differ from the indicators of member nations, thanks to the structure of health and suitability tests.
2. I compared the cardiovascular and metabolic risks the staff faces. I concluded that the risk is the highest among male soldiers (both professional and contractual), above 40, with BMI higher than 25 kg/m².
3. I analysed the risk characters based on the BMI categories. I concluded that in the Hungarian Defence Forces there are more overweight soldiers with no other metabolic risks other than obesity (healthy metabolism) than overweight soldiers with other metabolic risks. However, one-fifth of all soldiers belong to this group.
4. I prepared the first epidemiology assessment among Hungarian men with acute porphyria of compulsory military services. Based on the high rate of compulsory military services completed, I intend to prove that acute porphyria is not a reason of exemption for military services.

8. PRACTICAL USAGE OF RESEARCH RESULTS, RECOMMENDATIONS

The cardio-metabolic risks in the Hungarian Defence Forces have grown due to its male dominance (given the characters of military responsibilities), the changes in the age pyramid, and the high rate of abnormal BMI. Therefore, I find it important to carry out triglyceride and HDL-cholesterol level analyses for the full staff as part of their health assessment because – by knowing these parameters – the metabolic risks can be more precisely defined and prevention on the individual's level can take off in time.

I find it important to determine the body fat percentage for soldiers with high BMI through the health assessments, in order to differentiate the excess weight originating from greater mass of muscles or greater mass of body fat. In case of the later group of soldiers, I recommend follow-up and participation in the Body Program of the Defence Force in case of increasing BMI.

In case of the obese and overweight soldiers with further metabolic risks, I find it necessary to motivate them to participate in the Body Program of the Defence Force because this way their metabolic parameters can be expected to improve besides losing weight and this can postpone or slow down the development of connected diseases. All of these will help to protect the soldiers' health which is fundamental for efficient military operations.

During service, in case of *unclarified* abdominal pains or skin symptoms I recommend laboratory tests for porphyrin metabolism that will help with further differential diagnostics in case of porphyria and poisoning caused by heavy metals and chemicals, which induce biochemical changes – similar to porphyria – in healthy individuals as well.

Based on the high ratio of man with acute porphyria having completed compulsory military service with no complaints, I concluded that their illness did not hinder them in fulfilling their military service. I recommend that the illness should not be a reason of exemption for the applicants for professional military carrier. The monitoring of metabolic conditions is continuously provided both by the specialists and the laboratories in the Hungarian Defence Forces Health Centre.

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PROFESSIONAL RESUME

I was born on August 1st 1964 at Székesfehérvár. After high school, I attended and graduated from the Medical University of Pécs, Faculty of General Medicine in 1988. From October 1988 to April 1989, I worked as an assistant physician at the Department of Internal Medicine of Fejér County Szent György Hospital. Then transferred to Department III. of Internal Medicine at Budapest MÁV Hospital and Clinic in April 1989. I earned my licensing examination in internal medicine in 1994. I started examining and treating patients of porphyria in 1995. As part of further individual trainings, I studied the methods of neuropathic examination with the guidance of professor Dr. Péter Kempler at the Semmelweis Medical University in 1997. Following this, I studied neuropathic cases occurring among patients of acute porphyria.

In 2000, I started working as an associate professor at the Porphyria Division of the Department I. of Internal Medicine.

In the same year, I earned my licensing examination in infectology. At his point, I became responsible for the infectology area at the MÁV Hospital and became the head of the Infection-control committee.

In 2007, I transferred to the National Health Centre and got appointed as the leading head-physician of the National Porphyria Centre. Since 2013, I have been the leading head-physician at the National Porphyria Centre located at the Hungarian Defence Forces Health Centre.

The centre has been part of the European Porphyria Network (EPNET) since 2007. I have been regularly attending the meeting of this network since its establishment in 2007.

I have been actively participating in establishing the professional protocol of acute porphyria in Hungary. I am a guest speaker at the courses of Haematology license examinations organized by the Semmelweis Medical University.

I am a member of the Hungarian Internal Medicine Society, the Hungarian Infectology and Clinical Microbiology Society, the Board of the Hungarian Porphyria Association, and the Board of the Porphyria Foundation.

I have an intermediate language certificate in English (complex C type) and a first degree certificate in Russian (complex C type)

Between 2010 and 2013, I attended – as a doctoral student – the Doctoral School of Military Sciences at the National University of Public Service.

Publications:

Chapters in revised books (2 in Hungarian, 2 in foreign languages).

In revised journals published in Hungary (10 in Hungarian, 4 in foreign languages).

In revised journals published abroad (1 in foreign languages).

In scientific conference publications in Hungary (14 in Hungarian, posters, presentations).

In scientific conference publications abroad (6 in foreign languages, posters, presentations).