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Article

Cardiovascular risk in young adult people: a research protocol

Anila Imeshtari[1]*, Valentin Imeshtari[1]

[1]Department of Public health and Infectious Diseases, Sapienza university of Rome

*Correspondence: Anila Imeshtari. E-mail: anila.imeshtari@hotmail.it

Abstract: *Background*: Cardiovascular diseases are a group of disorders of the heart and blood vessels. They are the most frequent cause of death in Italy and in the world. While the CV risk has been reduced in adults and the elderly thanks to increasingly innovative therapies, there seems to be an increase of this risk among young adults. CDVs affect not only global mortality rates, but also the quality of life of the population. The World Health Organization (WHO) has stated that more than 75% of fatal outcome CVDs could be prevented by implementing appropriate lifestyle changes. That is why it is important to measure this risk. *Objective*: The purpose of this work is to map the 10-years cardiovascular risk in health care workers of the Umberto I polyclinic and to identify the factors associated with it in order to be able to design and implement interventions in the working environment that can lead to a reduction of this risk. *Methods*: The information will be collected through the compilation of the medical record through anamnestic narration and laboratory haemato-biochemical analyses. The collected data will be entered into a database and analyzed with the help of statistical software SPSS for Windows10, version 25.0 (IBM, Armonk, NY, USA). Univariate, bivariate, and multivariate analysis will be performed. *Conclusions*: This research protocol will be useful for assessing CV risk in 10-years and its possible related factors in young people. This information will be used to implement appropriate prevention measures in order to reduce this risk.

Keywords: cardiovascular risk, coronary heart disease, Framingham score, score CUORE, prevention

Background

Cardiovascular diseases (CVD) are a group of disorders of the heart and blood vessels and include: coronary heart disease, cerebrovascular diseases, peripheral arteries diseases, congenital and thromboembolic heart diseases[1]. Acute coronary events and cerebrovascular events frequently occur suddenly and are often fatal before medical treatment can be provided[2].

According to the 2011 World Health Report[3], an estimated 17 million people worldwide die of CVD each year, equal to 30% of all global deaths, mainly caused by ischemic heart disease and acute vascular cerebropathy. In fact, about 7,3 million of these deaths are due to coronary heart disease and 6,2 million are due to acute vascular cerebropathy.

As far as Italy is concerned, CVDs are still the main cause of death, accounting for 35,8% of all deaths (32,5% in males and 38,8% in females). Actually, according to Istat data from 2017, ischemic heart disease is responsible for 10,4% of all deaths (11,3% in males and 9,6% in females), while cerebrovascular accidents are responsible for 9,2% of deaths (7,6% in males and 10,7% in females)[4].

CVDs affect not only global mortality rates, but also the quality of life of the population. They are responsible for 151.377 million of life years with major disabilities, of which 41,34% is due to coronary heart disease and 31% to cerebrovascular disease. Moreover, 90% of all CVD deaths occur in low- and middle- income countries.

For all these reasons CVDs are considered a global public health problem.

Risk factors include blood pressure, cigarette smoking, high levels of total, HDL and LDL cholesterol and diabetes. Factors such as obesity, left ventricular hypertrophy, family history of premature coronary heart disease and estrogen replacement therapy have been considered to define the risk of coronary heart disease[5].

Recently, many studies have shown that psychosocial stress is a (non-traditional) risk factor for cardiovascular diseases both in patients with established disease and in non-sick individuals as it seems to contribute to all the mechanisms underlying cardiac events, in particular[6]:

- Grouping of traditional cardiovascular risk factors
- Endotelial dysfunction
- Myocardial ischemia
- Rupture of the plaque
- Thrombosis
- Malignant arrhythmias

Several prospective studies highlight the relationship between work-related stress and CVDs.

A definition of work-related stress is provided by the National Institute for Occupational Safety and Health[7]: Work-related stress can be defined as a set of harmful physical and emotional reactions that occur when the demands made by work are not commensurate with the worker's abilities, resources or needs." This can contribute to the establishment of various pathologies, aggravate their course or trigger their symptoms[8].

A 2006 study provides quantitative estimates from a meta-analysis. This study shows that workers exposed to stress in the workplace have an average of 50% more risk of developing CVD than those who do not experience this type of stress.

The summary estimates adjusted by age and sex of the relative risk of CHD in 10 individual studies on work-related stress was 1.4 (95% CI 1.2 – 1.8). Summary estimates of studies using other conceptualizations of work-related stress had similar attitudes; 1.6(95% CI 0.8 – 3-0) for the imbalance between commitment and reward at work and 1.6 (95% CI 1.2 – 2.1) for organisational injustice. The same results were obtained in a 2012 study that took into account the 2006 study and prospective studies published until December 2011[9].

Moreover, a 2016 study states that, not only do workers exposed to work-related stress have 10-40% risk in developing CVD compared to those who are not exposed to work-correlated stress, but work-related stress (measured by the JDC or ERI model) in employees with established CVD has been associated with an excess risk of 65% developing recurrent CVD events[10].

A large number of studies suggest that, in contrast to the overall improvement in cardiovascular health among middle-aged and older individuals around the world over the past two decades, young adults have tended to develop an increasingly unhealthy cardiovascular risk profile, in terms of increased prevalence of being overweight or obese.

Moreover, the rate of diabetes, substance abuse and e-cigarette use has increased in this young segment of the population. The trends reported about the incidence of CVD in young adults over the last two decades are mostly stable or slightly increasing (particularly for heart failure), in contrast to the decrease in trends observed in the elderly.

These observations suggest a growing burden of cardiovascular disease in the future, as this young segment of the population ages, unless adverse trends in the prevalence of these factors can be reversed.

Although not specifically covered in this review, it has been noticed that ischemic stroke rates have been rising in young adults in Denmark, France, Sweden and the United States over the past two decades[11].

The World Health Organization (WHO) has stated that more than 75% of fatal outcome CVDs could be prevented by implementing appropriate lifestyle changes: therefore, a comprehensive national assessment of cardiovascular risk factors, their control and lifestyle determinants are considered critical to the launch of realistic prevention programs[12].

Objective

The purpose of this work is to present a research protocol in order to map the 10-years cardiovascular risk in health care workers of the Umberto I polyclinic and to identify the factors associated with it in order to be able to design and implement interventions in the working environment that can lead to a reduction of this risk.

Methods

Setting and population

The research will be conducted among the health care workers of Umberto I polyclinic in Rome during the period march 2021-march 2022. The CV risk will be calculated using the Framingham Score and Score CUORE. Also, socio-demographic data and other data that may constitute a probable risk factor for CV diseases will collected.

Inclusion criteria

Umberto I polyclinic health care workers in Roma;
Individuals of both sexes;
Age between 20 and 40 years old

Exclusion criteria

Individuals who are participating in other studies
Individuals with CV pathologies in progress

Research protocol to calculate CV risk

The CV risk will be calculated using two risk scores:

A) Framingham Score, adopting the mathematical equation of Framingham's study reported by Wilson et al. [13] The biochemical and clinical data will be converted into points and then added up: these will determine the total score, which will then be converted into a percentage of the cardiovascular risk expected for the next 10 years (CHD risk).

The information will be collected through the compilation of the medical record through anamnestic narration and laboratory haemato-biochemical analyses. The parameters evaluated will be:

• Resting systolic blood pressure, detected in two consecutive measurements a few minutes apart. The value taken into account will be the average of the two measurements.

• Total cholesterolemia: peripheral venous blood sample performed fasting for at least 12 hours; <200 mg/d normal value; 200-239 mg/dl borderline values; ≥240 mg/dl high levels[14].

• HDL cholesterolemia: peripheral venous blood sample performed fasting for at least 12 hours

• Triglycerides: peripheral venous blood sampling performed fasting for at least 12 hours. <150 mg/dl optimal levels; ≥ 150 mg/dl high levels[15].

• Blood glucose: peripheral venous blood sampling performed fasting for at least 12 hours; ≤110 mg/dl normal value indicator of good health; 111-125 mg/dl altered fasting glucose; ≥126 mg/dl high glucose levels. According to the GUIDELINES ESC/EASD, 2007, it is possible to diagnose diabetes if fasting glucose > 126 mg/dl in two successive measurements, if >200 mg/dl in a random measurement or after 120 minutes of oral glucose administration.

• Smoking: years of smoking habits and average number of cigarettes smoked per day. Smokers are defined as people who smoke regularly every day (even a single cigarette) or have stopped for less than 12 months. Non-smokers are considered to have never smoked or stopped for more than 12 months.

• Pharmacological history: the taking of antihypertensive drugs, oral hypoglycemic drugs or insulin therapy will be investigated.

Other data collected will be: age, gender and weight.

B) Individual Score CUORE according to the CUORE algorithm CHE USA LE CARTE DI RISCHIO CV[16]. This is applicable to men and women who have not had a previous cardiovascular event. The variables gender, age, smoking habit, systolic blood pressure, total cholesterol and HDL, the presence of diabetes and the regular use of antihypertensives will be collected in order to build the individual score[17].

Age will be classified into 9 classes: ≤ 34, 35 – 39, 40 – 44, 45 – 49, 50 – 54, 55 – 59, 60 – 64, 65 – 69, ≥ 70.

Blood lipid levels will be classified into 5 classes and will take into account the following limit values:

• Total cholesterol: < 160, 160 – 199, 200 – 239, 240 – 279, ≥280 mg/dl

• LDL –C: <100, 100 – 129, 130 –159, ≥160 mg/dl

• HDL -C: <35, 35 – 44, 45 – 49, 50 – 59, ≥60 mg/dl

LDL cholesterol values will be obtained using the Friedewald equation [LDL (mg / dL) = Total cholesterol (mg / dL) - HDL (mg / dL) - Triglycerides (mg / dl) / five] although this is not reliable if the triglycerides are >400 mg/dl.

Blood pressure will also be classified into 5 classes:

• Optimal: systolic< 120 mmHg and diastolic < 80 mmHg

• Normal: systolic 120 – 129 mmHg and diastolic 80 – 84 mmHg

• At the upper limits of the standard: systolic 130 – 139 mmHg and diastolic 85 – 89 mmHg

• Stage I hypertension: systolic 140 – 159 mmHg and diastolic 90 – 99 mmHg

• Stage II – IV hypertension: ≥ 160 or diastolic ≥ 100 mmHg

When systolic and diastolic blood pressure fell into different categories, the higher category will be selected for classification purposes.

With regard to variables "diabetes" and "smoking", the categories will be interpreted as follows:

• Diabetes will be considered present if the participant is being treated with oral hypoglycemic agents or insulin or if the basal fasting blood glucose will be ≥126 mg/dl

• Smoking habits will be considered present or absent on the basis of self-reported information.

Also, a bivariate analysis will be performed to assess the relationship between Framingham and CUORE risk scores. This relationship will be done using a scatter plot.

Conclusions

This research protocol will be useful for assessing CV risk in 10-years and its possible related factors in young people.

This information will be used to implement appropriate prevention measures in order to reduce this risk.

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