SUPPLEMENT

POSITIONING OF THE INTERNATIONAL FORUM OF INTERNAL MEDICINE ON HABITS, LIFESTYLE MODIFICATIONS AND HEALTHY ENVIRONMENT FOR THE PREVENTION OF CARDIOVASCULAR DISEASES

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Abstract   Position of the international forum of internal medicine on habits, lifestyle changes and a healthy environment for the prevention of cardiovascular diseases

Cardiovascular diseases (CVD), mainly ischemic heart disease and stroke, is the main cause of death worldwide and each year more people die from CVD than from any other cause. These data call for a paradigm shift, where health promotion and cardiovascular prevention will acquire a central role in health policies. From this perspective, dedicating time during the consultation to promoting the acquisition of heart-healthy habits would be indicated in all individuals, regardless of cardiovascular risk classification, the role of the internist being fundamental. This position document from the International Forum of Internal Medicine (FIMI) presents the main indications regarding changes in lifestyle and acquisition of healthy habits to prevent CVD. The different sections will address topics including nutrition, physical activity, sedentary lifestyle, obesity, smoking, alcohol consumption, sleep, stress, environmental problems related to CVD and specific conditions in women. A section is included about starting CVD promotion and prevention measures at an early age, childhood and adolescence, also mentioning epigenetic aspects related to CVD. Social determinants in CVD are also taken into account, since some of these aspects, such as low socioeconomic level, modify cardiovascular risk and should be taken into account.

Key words: cardiovascular prevention, heart-healthy habits, cardiovascular diseases

INTRODUCTION

RODRIGO SABIO, PASCUAL VALDEZ

Cardiovascular diseases (CVD), mainly ischemic heart disease and cerebrovascular accident (CVA), are the main cause of death worldwide and each year more people die from CVD than from any other cause[1,2]. These data are also present in Latin America where CVD represents the first cause of mortality in order of frequency, representing 31% of deaths[3]. On the other hand, stroke is the leading cause of disability worldwide[4].

According to the Global Burden of Disease Study (GBD) 2019, in the evaluation of the period from 1990 to 2019, it is evident that the prevalence of CVD has practically doubled, from 271 million cases in 1990 to 523 million in 2019, and the number of deaths from CVD increased steadily from 12.1 million in 1990, reaching 18.6 million in 2019[5]. Global metrics for disability-adjusted life years (DALYs) and lives lost also increased significantly, and years lived with disability doubled from 17.7 million to 34.4 million during that period[5].

These data underscore the imperative for a paradigm shift, wherein health promotion and cardiovascular prevention take on a central role in health policies. On the other hand, within healthcare institutions, it appears appropriate to enhance the involvement of healthcare professionals, not only in the timely detection and treatment of cardiovascular risk factors but also in the promotion of healthy habits and lifestyle changes for the prevention of CVD.

While intervention strategies are contingent on public policies geared towards making "choosing a healthy lifestyle the easiest option" at the population level, health professionals also play a crucial role in recommending and guiding modifications in lifestyle and the adoption of heart-healthy habits. From this perspective, spending time during the internist's consultation to promote the acquisition of these habits would be advisable for all individuals, regardless of their cardiovascular risk.

During the consultation, when pharmacological treatments for the prevention of CVD are prescribed, medical instructions is usually precisely detailed (dosage, administration methods, etc.). However, when it comes to delineating lifestyle modifications, there is often a tendency to provide less guidance on particular aspects (e.g., quantity and type of daily or weekly physical activity, nutritional recommendations, etc.), that may not truly reflect a

clinical impact, nor lead to sustained changes over time. Conversely, a multidisciplinary approach that incorporates non-medical members of the health team proved to be an effective strategy in managing cardiovascular risk factors and preventing CVD[6].

In primary prevention, the goal is to intervene with individuals who have cardiovascular risk factors but have not yet developed the disease. As 90% of cardiovascular events are attributed to modifiable risk factors directly tied to behavior, interventions at this stage have demonstrated significant utility in controlling cardiovascular risk factors[7]. On the other hand, an optimal approach to prevent cardiovascular disease in the community should extend beyond merely preventing cardiovascular events in patients with risk factors. It should also expand and guide preventive measures concerning the development of these factors, known as primary prevention or the promotion of cardiovascular health[7]. In these latter aspects, particular emphasis will be placed on developing guidelines issued in different chapters with the aim of serving as a practical tool for decision-making when indicating lifestyle modifications for CVD prevention.

The different sections will address topics that include nutrition, physical activity, sedentary lifestyle, obesity, smoking, alcohol consumption, sleep, stress, environmental problems related to CVD and specific conditions in women. Each topic is developed with a brief epidemiological introduction, current state of knowledge, risks, and recommendations with a clinical approach.

This document includes a section addressing the initiation of CVD promotion and prevention measures at an early age, encompassing childhood and adolescence, while also addressing epigenetic aspects. Recognizing that habits are established early in life, achieving significant changes with an impact on CVD control needs the inclusion of health promotion strategies that start in childhood and persist throughout an individual's life[7,8].

Furthermore, a dedicated chapter on social determinants in CVD has been included. This is crucial as certain social factors, such as a low socioeconomic level, can modify cardiovascular risk and should be considered by internists when making individualized decisions.

Various scientific societies and international organizations have developed guidelines and recommendations

addressing different facets of CVD prevention[9-11]. In 2010, the American Heart Association (AHA) introduced the concept of "ideal cardiovascular health," aiming to assess the cardiovascular health of a population based on ideal values of 7 modifiable cardiovascular risk factors and healthy behaviors. These seven crucial points, known as Life's Simple Seven (LS7), encompassed abstinence from smoking, physical activity, a healthy diet, optimal blood pressure levels, normal total cholesterol, absence of diabetes mellitus, ideal body mass index, and finally, the absence of clinical cardiovascular disease[12]. The score derived from this metric not only evaluates the cardiovascular health of a specific population but also exhibits an inverse relationship with the incidence of cardiovascular disease. Recently, this score has been updated by incorporating a new parameter –adequate sleep– and introducing other minor modifications to the previous variables, resulting in a total of eight essential points in this metric[13].

It is important to mention that both cardiovascular risk factors and healthy habits are common to other non-communicable diseases, such as cancer. Therefore, cardiovascular health promotion based on these lifestyle modifications and healthy habits will also yield improvements in other chronic diseases.

A study using data from the Nurses' Health Study (1980-2014; n = 78,865) and the Health Professionals Follow-up Study (1986-2014, n = 44,354) estimated that life expectancy at the age of 50 was 29 years for women and 25.5 years for men who adopted zero low-risk lifestyle factors. In contrast, for those who adopted all 5 low-risk factors, a life expectancy at the age of 50 was projected to be 43.1 years for women and 37.6 years for men. Projected life expectancy at the age of 50 was on average 14 years longer among American women with 5 low-risk factors, compared to those without low-risk factors; for men, the difference was 12.2 years[14].

This document will not address pharmacological treatment in CVD prevention, nor will it elaborate on established cardiovascular risk factors such as high blood pressure, diabetes mellitus, or dyslipidemia as specific chapters. Instead, it focuses on heart-healthy habits that impact on the prevention of their development. Due to the significance and disease burden of high blood pressure, the International Forum of Internal Medicine (FIMI) produced another set of specific recommendations on this matter[15].

For the development of this consensus, the directors selected topics and presented them to the FIMI reference group, who approved them and provided additional thematic suggestions, ultimately approving the current index.

Subsequently, authors of these chapters were selected based on expertise in their respective areas (each group had a director, a secretary, and authors). Writing criteria were established. Each group conducted a literature search in PubMed and selected relevant articles according to their judgment. Once the chapter was drafted, it was assigned to a group of reviewers who either accepted it with or without content modifications. These changes were then sent back to the authors, who incorporated them into the original text. In a second stage, the complete material with consolidated chapters was sent to all authors and authorities of the scientific societies within FIMI for their review and suggestions. Afterwards, the entire document was reviewed and edited by four external reviewers (who did not participate in drafting the original document). The final approval and closure took place at an in-person event in the Argentine Patagonia with the presence of all chapter directors (Summit in the city of El Calafate, November 2022).

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NUTRITION AND CARDIOVASCULAR RISK

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Current state of knowledge

Nutrition is a biological and involuntary process based on the intake of food in response to the body's needs for nutrients. On the other hand, alimentation can be defined as a social and voluntary phenomenon that includes a set of choices such as product selection and preparation. Nutrition is a consequence of alimentation, meaning it depends on the foods that make up the diet and their proportions.

Feeding is the process of ingesting foods that provide nutrients to the body to meet its basic needs. It is considered adequate and healthy when it is sufficient, complete, and varied in its nutrient composition, suitable for different stages and situations that individuals go through and adapted to each person's needs and energy expenditure. This is what is referred to as the laws of alimentation.

According to the Pan American Health Organization, cardiovascular diseases (CVD) continue to be the main cause of mortality and a significant burden of disease and disability at a socio-health and economic level in the Americas. In the world it represents 31% of all registered deaths. More than three quarters of CVD deaths occur in low- and middle-income countries.

Most CVD can be prevented by addressing behavioral risk factors such as tobacco consumption, inadequate diets, obesity, physical inactivity, or alcohol consumption, using strategies that cover the entire population[1].

For individuals with CVD or high cardiovascular risk (CVR) (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidemia), early detection and early treatment are crucial[2].

Prevention is considered a set of coordinated actions aimed at the general population or individually to eliminate or minimize the impact of CVD and the associated disabilities. Adequate lifestyle changes, appropriate nutrition, and physical activity, as well as pharmacological treatment, reduce cardiovascular events and increase the life expectancy of patients[3].

Appropriate lifestyle changes significantly reduce cardiovascular risk factors, mainly associated with prediabetes and type 2 diabetes mellitus. There is significant evidence that plant-based dietary patterns, low in saturated fats, cholesterol, and sodium, with high fiber, potassium, and unsaturated fatty acid content, are beneficial and reduce the expression of cardiovascular risk factors. Notable examples in this context include the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet, low-carbohydrate diets, and vegan-vegetarian diets. Additionally, in the relationship between nutrition and metabolic diseases, efforts should focus on preventing weight gain or reducing excess weight in cases of overweight or obesity and individualize treatment to promote the patient's quality and life expectancy[4].

A healthy eating pattern and an appropriate calorie intake level help obtain the necessary nutrition to achieve and maintain a healthy weight, as well as reduce the risk of chronic diseases. The dietary plan should encompass variety, quantity, and nutrient density, including all food groups while limiting added sugars, saturated fats, and sodium content, to meet nutritional needs and maintain appropriate calorie balance. Supporting healthy eating is a social responsibility[5].

Recommendations

Healthy recommendations should be the same for controlling any risk factor for primary and secondary prevention of CVD, based on gathered evidence regarding lifestyle changes such as diet and physical exercise[6]. Emphasis should be placed on the most important dietary patterns for cardiovascular prevention.

The concept of dietary patterns has been established in recent years as a model for the relationship between nutrition and health, serving as an educational tool for the population. This has shifted the traditional paradigm that the basic nutritional unit of the diet is not nutrients (such as fatty acids), but rather the foods containing them (oils, nuts, red meats, dairy products, etc.). These foods have diverse components capable of interacting synergistically or antagonistically on metabolic pathways crucial for cardiovascular health[6].

There is strong evidence that plant-based dietary patterns, low in saturated fats, cholesterol, and sodium, with a high content of fiber, potassium, and unsaturated fatty acids, are beneficial and reduce cardiovascular risk factors. Notable examples in this context are the mediterranean diet and the DASH diet. Data from large cohort studies, and the randomized clinical trial PREDIMED for the mediterranean diet, indicate that adherence to these dietary patterns provides a clear cardiovascular benefit[7]. In contrast, the low-fat diet is currently under scrutiny for its limited cardiovascular protective potential. Regarding edible fats, virgin olive oil is the most effective culinary fat in preventing CVD[8]. The PREDIMED study demonstrated over approximately five years that participants assigned to the mediterranean diet supplemented with extra virgin olive oil or nuts experienced an average reduction of 30% in major cardiovascular events and a reduced risk of type 2 diabetes (T2DM)[7,9].

Evidence regarding meats suggests that the consumption of white meat, lean red meat, or fish, three to four servings per week, does not increase CVR, unlike the consumption of processed meats (sausages or cold cuts) containing harmful additives such as salt and nitrates, which increases overall mortality.

Concerning dairy products, is desirable to consume at least two daily servings due to its essential role in calcium metabolism and its richness in high-quality biological proteins. Restricting whole-fat dairy products does not seem to be a suitable strategy for reducing CVR, although habitual consumption of dairy with added sugars is discouraged. For cardiovascular prevention, it is advisable to reduce the consumption of concentrated dairy fats such as butter or cream.

Current scientific evidence suggests that egg consumption is not harmful in the context of a healthy diet. Both the general healthy population and individuals with cardiovascular risk factors can consume up to one egg per day without affecting their cardiometabolic health[4].

Legumes and whole grain cereals contain multiple healthy nutrients, and their frequent consumption is associated with a reduction in CVR factors and disease. It is recommended to consume one serving of legumes at least four times per week. The recommended consumption of whole grains is four servings per day.

Regarding the consumption of fruits and vegetables, based on existing scientific evidence, four to five servings per day of a combination of fruits and vegetables are recommended as it reduces overall and cardiovascular mortality. Furthermore, the beneficial effect of fruits and vegetables is dose-dependent and is more evident in cerebrovascular disease than in coronary artery disease. The consumption of tubers like potatoes is not associated with an increase in cardiovascular disease.

Frequent consumption of nuts (equivalent to a serving of 30 g) is associated with cholesterol control, reduction on coronary disease, and overall mortality[7]. It is advisable to consume them raw and unpeeled (not roasted or salted), as most antioxidants are found in the skin.

Cocoa is a seed with abundant nutrients, and the consumption of its main derivative, chocolate, improves risk factors and is associated with a reduction in cerebrovascular accident (CVA) and T2DM, exhibiting hypocholesterolemic and antihypertensive effects, and improving insulin resistance. Thus, dark chocolate ($\geq$ 70% cocoa) without added sugar can be consumed in a healthy diet.

There are numerous functional foods aimed at reducing CVR, mainly through the reduction of cholesterol levels. The cholesterol-lowering effectiveness of plant sterols and soluble fiber preparations at the intestinal level has been widely demonstrated. Likewise, there is consistent evidence that omega-3 fatty acids at pharmacological doses decrease plasma triglycerides.

Excessive salt intake is associated with CVD and mortality from cardiometabolic causes. A low-salt diet (< 5 g/day) is recommended at the population level and is especially indicated for those diagnosed with hypertension and their relatives. An alternative to salt is using lemon juice, garlic, or aromatic herbs.

It is reasonable to think, supported by recent evidence, that there is no standard model of a healthy diet. Biological responses vary among individuals, especially due to individual differences in the genome and microbiome. In the coming years, personalized and precision nutrition, along with other sciences such as chronobiology, where each person adopts the diet that is personally most beneficial, will be a challenge for the scientific community[10]. Finally, one of the most complex issues in the relationship between individuals and their diet is adherence, which depends on various factors related to the patient, family, health team, and the healthcare system. Therefore, it is essential to implement healthcare strategies to achieve adherence[11].

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PHYSICAL ACTIVITY AND CARDIOVASCULAR HEALTH

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Current state of knowledge

Physical activity (PA) is defined as any body movement produced by the contraction of skeletal muscles that increases caloric requirements with respect to rest[1]. PA, in general terms, includes any movement that enhances energy expenditure; in contrast, exercise is a more specific form of physical activity that is structured and designed to improve physical fitness[2].

PA plays an increasingly significant role in the prevention and treatment of multiple chronic diseases, health issues, and their associated risk factors[3]. It is considered an essential component of cardiovascular health, along with a healthy diet, nicotine cessation, and maintaining healthy sleep, weight, blood pressure, and serum glucose and lipid levels[4].

Numerous epidemiological studies document the inverse relationship between PA and the incidence of cardiovascular diseases (CVD), CVD-related deaths and all-cause mortality[2,3,5,6]. Higher levels of PA or cardiorespiratory fitness provide additional health benefits[7]. Approximately one-third of the global population is estimated to be physically inactive, a condition that increases with age, is more prevalent in women, and in countries with higher incomes[8].

The following effects are some of the cardiovascular health benefits of PA[2, 3, 9-11]:

1) Cardiovascular and respiratory function

• Decrease in heart rate and blood pressure, reduction in myocardial oxygen consumption, and decrease minute ventilation.

• Increase in maximum oxygen consumption.

• Increase in the exercise threshold for the accumulation of lactate in the blood.

• Increase in the exercise threshold for the appearance of signs or symptoms of disease (e.g., angina, ischemic ST segment depression, peripheral arterial claudication).

• Improvement of endothelial function through increased nitric oxide, reduction of oxidative stress, increased circulating endothelial progenitor cells, inhibition of proinflammatory cytokines, and increased expression of various regulators of endothelial function[12].

2) Risk factors for CVD

• Reduction of resting systolic and diastolic blood pressure.

• Increase in high-density lipoproteins and decrease in blood triglycerides.

• Reduction in total body fat and visceral fat.

• Reduction in insulin requirements, improvement in glucose tolerance, and reduction of inflammatory markers.

3) Reduction in morbidity and mortality

• Primary prevention: Higher levels of activity or physical fitness are associated with lower rates of death from coronary heart disease and lower incidence of CVD, coronary artery disease, ictus, type 2 diabetes mellitus, and metabolic syndrome.

• Secondary prevention: Cardiovascular and overall mortality are reduced in patients with acute myocardial infarction (AMI) who participate in cardiac rehabilitation exercises.

Muscular strength training improves cardiometabolic risk given the benefits in body composition, glycemic profile, insulin sensitivity, dyslipidemia, and blood pressure[2,13-17], which is associated with fewer non-fatal cardiovascular events[13] and lower mortality risk from all causes. In adults with type 2 diabetes mellitus, the combination of aerobic and strength training achieves better glycemic control and reduction in cardiovascular events[18].

PA in the elderly reduces the risk of CVD, improves glucose tolerance and bone mineral density, reduces inflammation and oxidative stress, improves mitochondrial biogenesis and protein synthesis in skeletal muscle. Even engaging in regular leisure activities provides cardiovascular benefits in frail older adults; however, moderate to vigorous aerobic activities have a more significant reduction in mortality[19].

Sarcopenic obesity is a global health phenomenon due to the aging population combined with the obesity epidemic. The loss of muscle mass, associated with the increase in adipose tissue, leads to a vicious cycle that promotes an unfavorable metabolic state, with increased insulin resistance, pro-inflammatory cytokines, increased oxidative stress and mitochondrial dysfunction, all of which increases the risk of atherosclerosis and cerebrovascular

disease. Hence, the importance of promoting physical activity programs in older adults[20].

Risks

In general, the benefits of regular PA far outweigh the risks[2,11,21]. However, participation in PA or exercise is associated with an increased risk of musculoskeletal injuries (MSIs)[22] and potential cardiovascular complications[13]. The latter are much less common than MSIs but can lead to long-term morbidity and mortality[21].

Adverse cardiovascular events, such as sudden cardiac death (SCD) and AMI, are generally associated with vigorous exercise in individuals with pathological cardiovascular conditions[23,24].

In athletes and young individuals, the most common causes are congenital and hereditary disorders (mainly hypertrophic cardiomyopathy, anomalies of the coronary arteries, and aortic stenosis)[21]. The incidence of SCD in young athletes varies among studies but is estimated to be up to 2 per 100,000 athletes per year[25].

In adults, exercise-related SCD is more often attributed to acute complications of atherosclerosis[21,26] (over 80% in those older than 35 years and 95% in those older than 40 years)[27-30]. There is an acute and transient increase in the risk of SCD and AMI in individuals who are usually inactive, diagnosed, or hidden CVD, and engage in infrequent or unusually intense exercise[23,31,32]. Even though the risk increases with age[21,23], it decreases with the long-term adherence to a gradually increasing regular exercise regimen (cardiovascular rehabilitation programs)[21,33].

Recommendations

- Adults should move more and sit less during the day. For sedentary individuals, PA of any intensity can provide health benefits, even after a single session of less than 10 minutes[2].

- Promoting active transportation has health benefits[34] and can significantly increase physical activity levels at the population level[35, 36]. Community-based interventions are effective in improving PA levels among residents, with more pronounced effects in the first two years. Therefore, it is important to sustain these interventions over time and institutionalize them within cardiovascular disease control and prevention programs, particularly in low- and middle-income countries where they have proven to be cost-effective[37].

- For substantial health benefits, adults should engage in at least 150-300 minutes per week of moderate-intensity exercise, or 75-150 minutes per week of vigorous-intensity aerobic exercise, or an equivalent combination, preferably distributed (in different sessions) throughout the week.

- Additional health benefits are obtained by engaging in PA beyond the equivalent of 300 min of moderate-intensity PA per week.

- Adults should also perform muscle-strengthening activities that involve all major muscle groups at least twice a week.

- As a strategy to reduce adverse cardiovascular events during exercise[21], everyone should participate in pre-exercise assessment to help identify individuals at risk[33, 38] and determine the need for medical clearance. Additionally, physically active individuals should modify their exercise program in response to variations in their exercise capacity, usual activity level, and environment. They should be aware of prodromal cardiac symptoms (e.g., excessive and unusual fatigue and chest or upper back pain) and seek immediate medical attention if they occur.

- While there was evidence until a few years ago that aerobic exercises had greater benefits than resistance exercises in overweight, hypertensive, dyslipidemic, and hyperglycemic patients[39], recent years have shown that insulin sensitivity in adults with overweight or obesity, insulin resistance, prediabetes, or diabetes improves with any modality of exercise. However, intensive interval training often results in more MSIs than moderate training[40]. The combination of aerobic exercise with strength and muscle resistance training had the greatest reduction in disease and death[41].

- There is evidence that exercise improves glycemic control, reduces cardiovascular risk factors, contributes to weight loss, and enhances the well-being of diabetic patients. Diabetic patients should engage in 150 minutes of aerobic activities per week, distributed over at least 3 days. Baseline PA and sedentary time should be evaluated to promote non-sedentary activities such as walking, yoga, household chores, gardening, swimming, and dancing[42].

Conclusion

There is strong evidence that regular PA is necessary for improving cardiovascular health. PA reduces all-cause mortality, improves cardiorespiratory and metabolic health, promotes weight loss, enhances muscle health, and improves sleep quality. However, there is a risk of cardiovascular complications in individuals with CVD engaging in unusual vigorous efforts. Therefore, it is recommended to undergo a pre-participation assessment accordingly and gradually increase the volume of PA.

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SUPPLEMENT

SEDENTARISM AND CARDIOVASCULAR RISK

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Current state of knowledge

Physical inactivity (PI) has become one of the most important risk factors in the development of chronic non-communicable diseases (NCDs) worldwide[1]. The prevalence of a high sedentary lifestyle ranges between 60 and 71% worldwide[2].

Being inactive is defined as <150 min of physical activity (PA) of moderate or vigorous intensity per week or its equivalent to perform < 600 Metabolic-energy-equivalents [METs]/minute/week. There are different questionnaires to detect a sedentary lifestyle within primary care consultations, such as the International Physical Activity Questionnaire (IPAQ)[3].

PI has been established as a risk factor that explain the development of 6 to 10% of obesity, type 2 diabetes mellitus (T2DM), high blood pressure (HBP), metabolic syndrome, cardiovascular diseases (CVDs), breast and colon cancer. and mortality[4-7]. PA benefits also include prevention of falls and osteoporosis; reduction in depression, anxiety disorders; improvement on sleep quality, memory, and general feeling of well-being[8].

PI refers to activities such as prolonged sitting, watching television, driving, among others[9]. It is globally estimated that between 55% and 70% of the daily activities are sedentary (without considering the time spent sleeping)[4,10,11].

Approximately 9% of premature deaths are associated with PI. This is equivalent to 5.3 million deaths per year[12]. From an economic perspective, the global cost associated with PI in 2013 was 53.8 billion dollars (53.8 billion)[13].

Finally, despite of the amount of scientific evidence that confirms the benefits of regular practice of PA, currently, 31.1% of the adult population worldwide does not meet the minimum recommendations[1,14].

Regular PA and exercise training (ET) induce a wide range of direct and indirect physiological adaptations and pleiotropic benefits for general human and cardiovascular health[15].

Risks

The increase in time devoted in sedentary activities correlates with an increase in cardiovascular and metabolic risk factors. This effect is independent of sociodemographic factors, diet, body mass index (BMI) and PA, as it would not be modulated by greater caloric intake, but rather by reduced energy expenditure.

This may be related to the excessive time spent on sedentary activities, where energy expenditure is less than 1.5 kcal/kg/h[16].

• There is an inverse relationship between PA and obesity, T2DM, HBP, and metabolic syndrome[12,14,17].

• There is a linear relationship between sedentary lifestyle behavior and HBP risk[18].

• There is a linear relationship between sedentary lifestyle and higher likelihood of presenting metabolic syndrome[19, 20].

• There is a linear relationship between sedentary lifestyle and the risk of development T2DM, independent of the demographic characteristics of age, sex, race/ethnicity, and socioeconomic status[7, 21-23]. The greatest harmful effects of a sedentary lifestyle were observed in markers of diabetes mellitus, including blood glucose, insulin, and markers of insulin resistance[24].

• Regular PA significantly impacts the cardiometabolic status of patients with T2DM by reducing daytime hyperglycemia, supporting the recommendation, even during postprandial periods[25].

• For each extra hour of sedentary activity per day, there is a corresponding rise of 0.06 mmHg in systolic blood pressure (SBP) and 0.20 mmHg in diastolic blood pressure (DBP). Time spent in sedentary behaviors is also associated with the development of cardiovascular disease[12].

• There is a linear relationship between sedentary behavior and a greater likelihood of developing fatal and non-fatal CVD[26-29]. The association between sedentary behavior and the incidence of CVD does not appear to be appreciably altered by the inclusion of BMI as a covariate[27].

• Various prospective cohort studies have shown significant associations between sedentary behavior and mortality risk. Deaths from all causes, CVD, cancer, and other causes of mortality were significantly related to sedentary activity[30-32].

Recommendations

Interventions should focus on reducing **sedentary time**. Strategies should concentrate on addressing the **sedentary behavior** directly rather than relying on the incidental impact of heightened PA[33,34]. Interventions should primarily address environments most associated with sedentary behavior: watching television and the workplace (prolonged sitting)[35].

In this regard, there are many workplace interventions that have implemented workstations designed to facilitate PA, effectively curbing sedentary behavior by providing office workers with the option to stand, walk, or pedal while engaging in their routine computer and desk-related tasks. The installation of such workstations can lead to substantial reductions in sedentary time[36].

The recommendations for adults to modify sedentary behavior, are to perform moderate aerobic PA for at least 150 to 300 minutes; or vigorous aerobic PA for at least 75 to 150 minutes; or an equivalent combination of moderate and vigorous activities throughout the week. They should also engage in moderate or more intense muscle-strengthening activities that exercise all major muscle groups for two or more days a week, as such activities provide additional health benefits. Older adults should perform varied PA with different components, emphasizing functional balance and moderate to high-intensity muscle strength training three or more days a week to improve functional capacity and prevent falls.

Finally, to achieve additional health benefits, it is recommended to extend moderate aerobic PA beyond 300 minutes, engage in vigorous aerobic activities for more than 150 minutes, or pursue an equivalent combination of moderate and vigorous activities throughout the week[37].

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OBESITY AND CARDIOVASCULAR RISK

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Current state of knowledge

The World Health Organization (WHO), according to the International Classification of Diseases, defines obesity as the abnormal or excessive accumulation of fat, resulting from an interaction of genotype and the environment, creating an energetic imbalance that involves the integration of social, behavioral, cultural, physiological, metabolic, and genetic factors[1].

The World Obesity Federation (WOF) has characterized it as a chronic, recurrent, and progressive disease, emphasizing the need for immediate action for prevention and control[2].

According to world data from the WHO, the prevalence of obesity has tripled since 1975. 39% of the population over 18 years of age is overweight and of these, 13% are obese[3]. Data from Latin America, in the Argentine Republic, the prevalence of excess weight by self-report (overweight and obesity together) in the 4th Edition of the National Survey of Risk Factors (ENFR) was 61.6%, comparatively higher with respect to previous editions[4]. In the 2020 European Health Survey, in Spain the prevalence of obesity is 16% and overweight is 37.6% and increases in all age groups up to 75 years[5].

Overweight and obesity are associated with increased morbidity and mortality and increasing health costs, mainly in low- and middle-income countries[4].

In 2010, it was estimated that globally, overweight and obesity caused 3.4 million deaths, 3.9% of years of life lost, and 3.8% of disability-adjusted life years (DALYs)[6].

Numerous studies have shown a relationship between obesity and cardiovascular diseases (coronary heart disease, acute myocardial infarction, heart failure, cardiac arrhythmias) and that weight loss in overweight and obese people, reduces cardiovascular disease risk factors such as diabetes, hypertension, dyslipidemia, and sleep apnea, among others[7].

Obesity can contribute to elevated cardiovascular morbidity and mortality through both direct and indirect mechanisms. Directly, it triggers structural and functional adaptations to accommodate excess body weight, fosters the development of an inflammatory and prothrombotic state. Indirectly, it amplifies the risk through associated factors like insulin resistance, type 2 diabetes, visceral adiposity, hypertension, and hyperlipidemia[8].

Enhanced cardiac imaging techniques allow early detection of altered heart structures and functions in patients with obesity, enabling the treatment of subclinical medical conditions and, therefore, preventing cardiovascular events.

The WHO defines CVD as the leading cause of death worldwide, with a rate of 17.7 million deaths per year, and obesity as an independent risk factor for CVD and mortality from all causes[9].

The goal of a proper evaluation of a patient with obesity is to gather information to confirm the diagnosis, determine the severity of the disease and related comorbidities, identify triggers and drivers, and guide appropriate care in an unbiased and stigma-free clinical setting.

Healthcare professionals should initiate patient-centered care, discussing values and treatment goals, fostering reflection, and encouraging responsibility to promote long-term improvements.

Diagnosis and evaluation

The rise in non-communicable diseases (NCDs) compounded by an aging population is leading to a surge in healthcare demands. Within the scope of obesity, the intricate nature of the disease, characterized by multifaceted factors, poses a challenge in seamlessly integrating knowledge, research findings, and translating them into comprehensive clinical care[10].

The diagnosis of obesity is established with a body mass index (BMI) $\geq$ 30 kg/m^2. Although BMI is a highly useful, simple, and easy-to-apply assessment method, it serves as a surrogate measure for fat mass, with adiposity being the truly critical body compartment regarding the development of comorbidities[11].

The INTERHEART study demonstrated that central obesity is more strongly linked to cardiovascular risk than total adiposity expressed by BMI[12].

For most populations, the presence of overweight (BMI ≥ 25 kg/m^2) represents a higher risk and requires additional evaluation of other anthropometric, hemodynamic, and biochemical parameters.

Considering the limitation of BMI in determining fat composition and distribution, the use of waist circumference (WC) has been recommended as a surrogate measure of abdominal or visceral fat, as there is epidemiological evidence suggesting that WC can help identify individuals at higher risk of cardio-metabolic disease. Currently, the recommended WC cutoffs should be adapted to the ethnic group and geographical area. In general, they should be < 90-94 cm in males and < 80 cm in females[13]. Higher values suggest a greater risk of visceral adiposity and the development of cardio-metabolic comorbidities[13].

WC is not a direct measure of visceral fat and requires considerable training and standardization among different healthcare team members conducting the measurement and analysis to ensure reproducibility.

Thus, recognizing the coexistence of various obesity phenotypes based on body composition and cardio-metabolic risk profiles is crucial. This includes individuals who are obese but have a normal weight, exhibiting greater visceral adiposity, hyperinsulinemia, insulin resistance, dyslipidemia, and elevated circulating proinflammatory cytokines. Identifying this type of obesity early is exceptionally important because patients and doctors may underestimate cardiovascular risk due to the normal weight, overlooking potential metabolic cardio risks. Early intervention for these patients can be beneficial in treating and preventing complications related to obesity, possibly leading to changes in adipose distribution before a significant alteration in body weight or BMI occurs[15].

The initial approach, communication, and attitude of the physician during an evaluation of a patient with obesity is a significant determinant of the success of treatment and the patient's health.

Individuals grappling with obesity often encounter weight bias in their surroundings, leading to feelings of discrimination and, consequently, a reluctance to seek treatment and defer preventive care. Stigmatization contributes to unfavorable outcomes, fostering disordered eating, heightened depression rates, and reduced levels of physical activity[16].

The use of structured interview formats (such as Obesity Canada's 5As of Obesity Management ™) helps facilitate discussions about obesity in primary care. An adaptation of the 5As template has been developed by Obesity Canada for use in clinical practice. The main components of this framework include:

1. (ASK) ASK permission to discuss weight and exploring readiness;

2. (ASSESS) Evaluating risks related to obesity and the underlying causes of obesity;

3. (ADVICE) ADVICE on health risks and treatment options;

4. (AGREE) AGREE on health outcomes and behavioral goals;

5. (ASSIST) Assisting in accessing appropriate resources and providers.

Using and analyzing the information collected in the obesity assessment, the Edmonton Obesity Staging System (EOSS) was developed to understand the severity of the disease and guide the intensity of treatment required.

The EOSS has been proposed to guide clinical decisions based on the evaluation of obesity and in each BMI category, it is a measure of the mental, metabolic and physical impact on the patients' health and uses these factors to determine their stage of obesity. It utilizes these factors to determine the obesity stage (from stage 0 with no obesity-associated risk factors to stage 4 with obesity associated with severe disability).

Finally, when conducting an obesity assessment and aiming for long-term success, it is important to evaluate each patient's needs, readiness for change, intrinsic motivation, and values and goals when initiating a personalized treatment plan[17].

Recommendations

Research has primarily focused on inadequate food intake and reduced physical activity as postulated causes for the increasing prevalence of obesity. However, this simplistic approach does not recognize the possibility of diverse contributions. For example, in some individuals, an increase in food intake may predominate, while in others, decreased energy expenditure may prevail.

Increased hunger may result from heightened orexigenic signals dominating over anorexigenic signals in the hypothalamus, as well as emotional eating triggered by stress-related events and psychological aspects. In addition to perceived hunger and stress influencing eating behavior, at the other end of energy homeostasis, a decrease in resting energy expenditure, as well as a low adaptive thermogenic response, can also determine an obesity phenotype[18].

In some people living with obesity, elevated nutrient absorption may predominate due to hormonal changes, gastrointestinal secretion, and anatomo-histological characteristics, while in others, increased fat accumulation through adipogenesis may prevail.

Changes in the quantity and diversity of the intestinal microbiome can disturb homeostatic humoral and neural pathways, digestion, and absorption, requiring detection by the intestine's endocrine cells, activation of neuroendocrine pathways to regulate gastrointestinal motor, secretory, and absorptive functions, as well as metabolic

control. The specific characteristics and quantity of individual adipose tissue, type, distribution, and function must also be considered[19, 20].

Therefore, the individual's genotype, adipose tissue type, enteral cells, and microbiome interact with macronutrient intake, appetite, metabolism, and thermogenesis. The interplay between genetic makeup and individual characteristics shapes personalization and responses to macronutrients, dietary patterns, habits, and lifestyle. These factors are pivotal for a holistic and comprehensive grasp of energy homeostasis, a consideration crucial in the age of precision medicine.

The evaluation components for a patient with obesity to assess treatment include:

- *A history centered* on obesity, must include a clinical interview, medical and surgical history, medications, allergies, and social and family history. Key elements include the detection of sleep disorders, sexual disorders, and psychological abuse, description of eating patterns, physical activity, screen time, internalized weight bias, mood, and anxiety disorders, as well as substance abuse. Medications that may increase body weight should be identified.

It is crucial to assess the evolutionary history of weight in patients with obesity, along with their nutritional history related to eating habits and regular physical activity.

The evaluating physician should also identify and document the patient's values and goals regarding treatment.

- *A physical examination* focused on obesity with routine measurements and anthropometrics, including height, weight, BMI, and waist circumference. Blood pressure should be measured with an appropriately sized cuff based on the patient's arm circumference. Neck circumference and airway permeability are also useful for estimating the risk of sleep apnea, in addition to routine cardiorespiratory and gastrointestinal examinations along with a general skin examination to rule out findings (dermatitis, intertrigo, erysipelas). Joint and gait examinations are recommended to assess mobility barriers. A superficial endocrine examination includes palpation of the thyroid gland and detection of signs of Cushing's syndrome and polycystic ovary syndrome. If these signs are present, should be followed by additional biochemical studies.

- *Diagnostic tests* are commonly ordered during the initial assessment of obesity to identify metabolic problems and tailor therapy. Screening for metabolic syndrome with HbA1c or fasting glucose, complete blood count, kidney function, total cholesterol, LDL, serum triglycerides and HDL, uric acid, and transaminases is recommended in most patients. Those at high risk of fatty liver disease, including those with type 2 diabetes or metabolic syndrome, should be examined with an abdominal ultrasound.

- *Additional tests:* ECG. Echocardiogram is recommended for personalized evaluation.

- *Other studies:* Exercise test, polysomnography, and image and laboratory studies according to the patient's clinical evaluation[17, 21].

Interventions in patients with obesity are based on the following strategies:

A. **Habit changes** are enhanced with specific techniques such as those developed in motivational interviewing. It is a patient-centered counseling approach aimed at improving positive behavior change. The stages of change that can be assessed during motivational interviewing include pre-contemplation, contemplation, preparation, action, maintenance, and relapse.

The general principles of motivational interviewing include empathy (creating a space for communication, understanding, collaboration, support, encouragement, and listening), avoiding arguments (recognizing types of resistance, arguing, denying, ignoring, and then moving forward through reflection; shifting the focus, reframing), developing discrepancies (developing mismatch between where I am today and where I want to be in the future), resolving ambivalence, and addressing uncertainty through the desire for change; and supporting self-efficacy is affirming favorable outcomes by focusing on the patient's successes and highlighting their skills and strengths. The eating behavior in individuals with increased body fat often reflects the imbalance of physiological forces that strongly resist weight loss and weakly support weight gain. Eating behavior is affected by the 5 senses (sight, smell, hearing, taste, and touch) and can also be influenced by mental stress, emotions, habitual time signals, environment, information gap, and reward factors. Eating behavior can be affected by eating disorders (e.g., binge eating disorder and bulimia nervosa).

B. **Obesity nutritional treatment** is more effective when dietary interventions are evidence-based, whether quantitative or qualitative, and enhance patient adherence.

The most suitable nutritional therapy for weight loss is one that is safe and effective, considering eating behaviors, meal patterns, cultural backgrounds, traditions, food availability, time constraints, financial issues, nutritional knowledge, culinary skills, and medical conditions potentially affected by the nutrition plan.

Fat restriction in the diet leads to a greater reduction in total cholesterol and LDL, while carbohydrate restriction in the diet leads to a greater reduction in serum triglycerides and an increase in HDL cholesterol. Carbohydrate reduction may lead to a greater reduction in serum glucose and hemoglobin A1c.

The patient should be encouraged to:

• Eating patterns that maximize satiety, such as meal timing, nutrient composition (high fiber, moderately high protein, moderately low glycemic load, higher volume), and appetite awareness training.

• Consumption of proteins and healthy fats, vegetables, green leafy vegetables, fruits, berries, nuts, legumes, and grains.

• Dairy products (taking into account caloric content).

• Read labels rather than marketing claims.

• Avoid eating for reasons other than hunger.

• Avoid frequent snacking.

• Use portion control.

• Being habitually aware of food stimuli may allow a better opportunity for stimulus control.

The changes in body composition associated with **physical activity** in subjects with obesity are based on the decrease in the percentage of fat mass, which in principle requires a negative energy balance.

Routine physical activity can strengthen body composition, endocrine and immune adipocyte body processes; improve musculoskeletal metabolism, cardiovascular, pulmonary, mental, sexual, and cognitive health. Dynamic training promotes weight loss and can help prevent weight gain or regain. Resistance training can improve body composition, prevent loss of muscle mass during weight loss, and increase resting energy expenditure.

The prescription of physical activity should be personalized with an ideal standard of 30 min/day 5 days a week for overweight and obese patients, with a progressive increase in volume and intensity.

Aerobic physical activity can be combined with 2-3 sessions of resistance exercise at least twice a week comprising 8 to 10 exercises involving large muscle groups.

Monitoring of physical activity can be done through a variety of activity logs as well as body composition measurements by a reliable technician. Physical inactivity behavior may be related to comfort, lack of time, fatigue, disinterest, and environment[22].

C. **Pharmacological treatment** is based on complementing nutritional, physical activity and behavioral therapies. The indication for pharmacological treatment is based on patients with BMI>30 kg/m^2 or BMI>27 kg/m^2 with comorbidities.

Biological and behavioral phenotypes define the heterogeneity of obesity and pharmacological treatment can be directed to improve weight loss[23].

Patients have an average weight loss of around 5 to 10%, with greater weight loss in hyper-responders and less than 5% weight loss (or even weight gain) in hypo-responders and no clinical improvement. (e.g., at least 3-5% loss of initial body weight) after 12 to 16 weeks on an anti-obesity medication. Alternative medications may be considered, or dosage increased if appropriate or discontinuation of treatment, it should always be evaluated in a personalized way according to the characteristics of the individual[23, 24].

The objectives:

• Treat the disease.

• Facilitate the management of eating behavior.

• Slow progression of weight gain/recovery.

• Improve health, quality of life and body weight of overweight or obese patients.

• Bariatric surgery can be an effective complement to improve weight loss or prevent weight regain.

The medications currently supported by evidence for treating obesity include the following (please refer to their approval status in each country):

1. Orlistat is a gastrointestinal lipase inhibitor, taken in 3 tablets of 120 mg per day, it is contraindicated in patients with chronic malabsorption syndrome and cholestasis.

2. Liraglutide is a glucagon-like peptide 1 (AGLP1) receptor agonist at a dose of 3.0 mg per day subcutaneously for the treatment of obesity contraindicated in patients with a personal or family history of medullary thyroid cancer or multiple endocrine neoplasia syndrome type 2.

3. Naltrexone/bupropion is a combination of an opioid antagonist and an antidepressant; it is contraindicated in patients with uncontrolled hypertension, chronic use of opioids, seizure disorders, and withdrawal of alcohol, benzodiazepines, barbiturates, and antiepileptic drugs.

4. Semaglutide AGLP1 approved at a dose of 2.4 mg weekly in adults who are obese or overweight and with comorbidities such as type 2 diabetes, high blood pressure or high cholesterol. Has similar contraindications to liraglutide[26].

5. Tirzepatide glucose-dependent insulinotropic polypeptide and AGLP1 approved for the treatment of obesity by the FDA. The most frequent adverse effect has been gastrointestinal (nausea, diarrhea, or constipation)[27].

D. **Bariatric surgery** (BS) is the most effective and efficient treatment for people suffering from severe obesity, in the medium and long term, with evidence that demonstrates a strong impact on the comorbidities of obesity (type 2 diabetes, high blood pressure, sleep apnea, hepatic steatosis, etc.) and reduction in mortality from all causes, improvement in life expectancy and quality of life. The main health effects are related to the induction of substantial weight loss and not to the surgery per se. BS is considered on an individual basis when conventional treatment fails[28].

Patients with indications for BS should be referred to specialized centers, where they can be fully and objectively informed, psychologically prepared and treated by a dedicated and accredited multidisciplinary team.

Patients treated with this method require lifelong follow-up and additional medical management. Eating habits need to be adapted to the new gastrointestinal physiology, and nutritional deficits often arise, depending on the type of bariatric procedure, due to restriction of food intake after any BS procedure, as well as malabsorption of nutrients induced by long-term bypass procedures (e.g., proteins, various vitamins, minerals, and trace elements). Therefore, multivitamin supplements should be prescribed according to the surgical procedure used and

periodic laboratory monitoring is recommended to avoid nutritional deficiencies.

The management of diseases associated with obesity must be adapted according to weight loss.

Finally, there may be relapse in body weight gain that generally occurs after 10 years.

Adequate medical management of post-bariatric follow-up requires much attention. The provision of a multidisciplinary post-bariatric follow-up program is an integral part of the clinical pathway in BS centers[16].

Careful patient selection is critical to the success of the treatment, the indications being the following:

- Body mass index (BMI) greater than 40 kg/m^2 with or without comorbidities.

- BMI greater than 35 kg/m^2 with one or more comorbidities, in patients in whom weight loss could improve this condition: type 2 diabetes, arterial hypertension, dyslipidemias, Pickwick's syndrome, non-alcoholic fatty liver disease (NAFLD), obstructive sleep apnea-hypopnea syndrome (OSAHS), cardiorespiratory diseases, gastroesophageal reflux (GER), significantly impaired quality of life and severe psychological disorders related to obesity, among others.

BS covers different surgical techniques, the four most applied procedures are the Roux-en-Y gastric bypass (PGB), laparoscopic vertical gastrectomy or gastric sleeve (GV), the laparoscopic adjustable gastric band and the biliopancreatic diversion. The most used in our environment are GV and BPG. In the first, a restrictive mechanism predominates, whereas gastric bypass generates a greater disabsorptive metabolic action[29].

Most studies and meta-analyses that demonstrated benefits with BS refer to an age between 18 and 65 years. In people under 18 and over 65, the risk-benefit must be evaluated since the primary objective is to improve quality of life.

Contraindications for BS are:

• Presence of major psychiatric disorders (psychosis; manic, hypomanic, mixed, or depressive episode), mental retardation and bulimia nervosa.

• Presence of death and/or suicidal ideation.

• Abuse of alcohol or other psychoactive substances.

• Short-term life-threatening illnesses term.

• Patient who cannot understand medical directives or nutritional and/or psychological guidelines.

• Pregnancy.

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TOBACCO AND CARDIOVASCULAR DISEASE

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Current state of knowledge

Smoking is the leading cause of preventable death in the world, responsible for approximately 7 million deaths per year[1,2]. There are almost 1 billion smokers in the world, the majority of whom are men and live in low- and middle-income countries. Significantly, the incidence of tobacco use among women has been increasing in recent decades, reaching a level of similarity with men in certain regions or countries. The main causes of smoking-related deaths are atherosclerotic cardiovascular disease, chronic obstructive pulmonary disease, and cancer.

Risks

Smoking is a major independent risk factor for cardiovascular mortality, coronary heart disease, cerebrovascular disease, peripheral vascular disease, and heart failure[3,4].

• Smoking 20 cigarettes/day increases the risk of suffering myocardial infarction six times in women and four times in men, compared to those who never smoked[5,6].

• Female smokers have a 25% higher risk of suffering from coronary heart disease than male smokers[7] and they also have a greater likelihood of serious adverse events after an acute coronary syndrome than men[8].

• Smoking or having smoked more than 15 pack-years is associated with more than twofold increase in the risk of developing heart failure compared to never smokers in black people[9].

• Smoking increases the chance of suffering from peripheral vascular disease. Furthermore, patients with peripheral vascular disease that continue smoking have a higher risk of requiring hospitalization due to complications[10].

• The increased risk of cardiovascular disease among smokers compared to non-smokers is observed even with the consumption of very low doses of tobacco (1 cigarette/day), and it escalates in a dose-dependent manner[9, 11-13].

• Second-hand smoking (also called passive smoking) increases the risk of coronary heart disease by at least 20% to 30%, in a dose-dependent manner[14-17].

Recommendations

The benefits of smoking cessation on cardiovascular risk are well established. Among people who do not have coronary heart disease, there is a reduction in the risk of a cardiac event after quitting tobacco, from 7% to 47%[18-20]. The decrease in the risk of cardiac events becomes noticeable shortly after quitting and continues to improve until around 15 years post-cessation. At this point, the cardiovascular risk for former smokers aligns with those who have never smoked[21]. A reduction in the risk of overall death, cardiovascular death, acute myocardial infarction, stroke, and heart failure is achieved with tobacco cessation.

The approach to the problem of smoking is developed across different levels of intervention and is multimodal. The strategy to address the complexities of smoking unfolds across different layers of action and adopts a multimodal approach. It initiates at a foundational level with public policies curbing the production, marketing, advertising, and consumption of tobacco-derived products. It culminates with clinical practice guidelines, informed by evidence, offering recommendations for healthcare practitioners directly engaging with patients who smoke.

Internists intervention has proven to be effective in the treatment of smoking cessation. The stepwise approach of the five "A" steps[22-25] is recommended and outlined as follows:

• "Ask". Question about consumption and exposure to tobacco products (first and second hand) at each consultation.

• "Advise". Advise to quit tobacco, with a short, clear, and personalized message.

• "Assess". Always evaluate the degree of dependence on nicotine and preparation for quitting tobacco.

The Transtheoretical Model of Change[26] can be used, which enables the identification of motivational stages:

pre-contemplation, contemplation, preparation, action, maintenance.

• "Assist". Help/assist smokers to quit the addiction. The implementation of behavior modification counseling, plus pharmacological therapy, is recommended in the majority of patients. In the first line of treatment the following drugs are available (see approval for use in each country):

o Varenicline

o Nicotinic Replacement Therapy in its five presentations: patch, gum, lozenge, nasal spray, inhalation spray.

o Bupropion

o Cytisine, although it is not available in some countries, can be considered an effective, safe, and economical alternative to first line therapy[27, 28].

The choice of medication should be made based on patient preferences, availability, costs, previous experiences, and safety profile of the drugs. Combined therapy of two or more drugs is recommended in severe cases or relapses. There are special considerations to consider in certain populations (pregnant women, patients with psychiatric illness, adolescents, hospitalized patients, etc.).

• "Arrange". Agree on follow-up with the objective of monitoring the process, reinforcing counseling, and rearranging pharmacological treatment.

In summary, smoking poses a significant challenge to health systems, leading to substantial cardiovascular illness and mortality in the population. Quitting smoking is beneficial in any situation or medical condition. Various health interventions have demonstrated their effectiveness in reducing smoking prevalence. Internists have access to reliable and safe tools proven to be effective in addiction treatment. Therefore, their understanding, continuous learning, and practical application in the care of patients who smoke are crucial.

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SUPPLEMENT

ALCOHOL AND CARDIOVASCULAR DISEASE

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Current state of knowledge

Alcohol is a toxic and mind-altering substance that leads to dependence. The term "social use" often downplays the health and social harm it causes or contributes to. "It plays a crucial role in more than 200 diseases and disorders[1].

In 2016, 32.5% of people worldwide were current drinkers (defined as individuals aged 15 or older who reported consuming alcohol in the last 12 months), with 25% being women and 39% men. On a global scale, the average daily alcohol consumption was 0.73 standard drinks for women and 1.7 for men. It's important to note that various types of beer, wine, and spirits have different alcohol content levels. An average of 10 grams of pure ethanol per serving is considered a 'standard drink,' which is roughly equivalent to 200 ml of beer, 100 ml of wine, or 30 ml of spirits.

Alcohol consumption contributes to 3 million deaths each year worldwide (5.3% of all deaths), causing disabilities and health problems (mental disorders, non-communicable diseases such as cirrhosis, neoplasms, and heart disease) for millions of people. It is responsible for 5.1% of the global burden of disease (7.1% in men and 2.2% in women), calculated in terms of disability-adjusted life years (DALYs)[1].

The percentage of deaths attributable to alcohol consumption among men is 7.7% of all deaths, while it is 2.6% in women[1].

In a comprehensive analysis of 694 sources of alcohol consumption data, along with 592 prospective and retrospective studies[2], it was found that alcohol consumption ranked as the seventh risk factor for both mortality and years lived with disability. It accounted for 2.2% of female deaths and 6.8% of male deaths. Among the population aged 15-49 years, alcohol consumption emerged as the primary risk factor, contributing to 3.8% of female deaths and a significant 12.2% of male deaths. A significant proportion of the disease burden attributable to alcohol consumption consists of intentional or unintentional injuries (traffic incidents, violence, and suicide), generally in relatively younger age groups[1].

Alcohol is the leading risk factor for premature mortality and disability among people aged 15 to 49 years (10% of all deaths in this age group). Among people aged 20 to 39, 13.5% of total deaths are attributable to alcohol[1]. During pregnancy, it can cause fetal alcohol syndrome and prenatal complications[1].

Alcohol consumption results in significant social and economic losses for both individuals and society as a whole[1].

Besides chronic consumption, there is a phenomenon known as excessive episodic alcohol consumption (EEAC), which is defined as the consumption of five or more standard drinks for men or four or more for women in a span of two hours or less, within the last 30 days. This pattern of consumption heightens the risk of enduring structural and functional brain damage, as well as an increased likelihood of traffic accidents, public violence, and engaging in unprotected sexual activity. Young individuals engaging in this type of consumption are four times more likely to develop dependence compared to those who commence drinking in adulthood[3].

Risks

In several studies, the J curve determines cardio protection at low consumption levels compared to non-consumers, and when consumption is high, there is a clear association with elevated risk. However, there is some controversy about the initial assertion.

In a study from Lancet[2], the amount of alcohol intake that reduced harm to health outcomes was ZERO standard drinks per week. This contradicts guidelines advocating for cardiovascular health benefits linked to consuming up to two standard drinks per day. However, these results imply that alcohol control policies should be reconsidered globally, emphasizing efforts to decrease/eliminate overall consumption in the population, echoing other studies[4,5]. The study[2] findings indicate that alcohol consumption (irrespective of quantity) results in health decline across all populations. Although some protective effects were found for ischemic heart disease and diabetes among women,

these effects were diluted compared to general health risks due to the strong association between alcohol consumption and the risk of cancer, injuries, and transmissible diseases. These findings emphasize the importance of evaluating how alcohol consumption affects the health of the population throughout life and leaving aside the classic concept of risky or harmful consumption (more than two average standard drinks per day in men and more of one in women.).

From a cardiovascular point of view, consumption is associated with atrial fibrillation[6] and to a lesser extent, with sinus tachycardia, and a reduction in physiological respiratory arrhythmia (due to autonomic imbalance). It is also linked to sudden cardiovascular death (ventricular arrhythmia due to ischemia or alcoholic cardiomyopathy).

A comprehensive review of 44 observational studies[7], encompassing almost a million patients and nearly 40,000 coronary events, compared moderate consumers (those consuming less than two standard drinks daily) with non-consumers, was unable to conclude a beneficial effect for all consumers.

A meta-analysis[8], encompassing 45 studies and involving 3 million patients with 65,000 deaths, revealed an overall lower risk among moderate consumers compared to non-consumers. However, this pattern has not been consistently demonstrated in studies of higher methodological quality or those evaluating global cardiovascular health.

Two European studies[4,9], involving a total of 315,000 cases, failed to establish a causal link between alcohol consumption and cardiovascular protection.

13% of asymptomatic alcoholic patients have subclinical cardiomyopathy[10].

The clinical manifestations of alcoholic cardiomyopathy are typically observed in alcoholic patients over 35 years of age with a daily alcohol intake between 112 and 380 grams (mean 185 ± 52) over a period ranging from 10 to 40 years (mean 23 ± 7)[11].

Alcoholic cardiomyopathy accounts for 21-32% of dilated cardiomyopathies, although this figure could be higher in countries with a higher rate of alcoholism[12].

Recommendations

There are population-level and individual level interventions.

From the population-level, reducing the burden of harmful alcohol consumption, public health measures are proposed that are beyond the scope of this document[3].

From an individual level, different clinical situations that all involve problematic alcohol consumption must be considered[1,2,13,14]:

• Dependence or alcoholism or alcohol addiction (main reason for addiction consultations).

• Regular or chronic risky consumption without dependency.

• Consumption in vulnerable populations such as adolescents or pregnant women.

• Episodic excessive alcohol consumption (EEAC).

What tools should doctors apply in the consultation to reduce alcohol consumption?[3]. Firstly, terminology must be handled carefully. It would be more prudent to speak about problematic consumption to acknowledge that this issue is difficult to define, and represents a social problem with multiple dimensions, that require a multidisciplinary approach. The significance of alcohol as a psychoactive drug, akin to marijuana and cocaine, should not be overlooked due to its pervasive presence in people's lives. It is crucial for internists and other healthcare professionals to be cognizant of the detrimental effects associated with problematic alcohol consumption. This awareness enables them to seamlessly integrate discussions on alcohol-related issues into their routines and provide appropriate guidance to their patients.

The patient can consult for:

• Addictive behavior.

• Problems directly related to alcohol.

• Problems where alcohol arises from the interview and physical examination (tremors, tachycardia, hypertension, rhinophyma, parotid hypertrophy, telangiectasias, hepatomegaly, splenomegaly, polyneuritis) or other findings from complementary methods (macrocytosis -with or without anemia-, increased transaminases, increased gamma glutamyl transpeptidase, ultrasound with fatty liver)[15].

Alcohol problematic consumption can occur even if the preceding situations are not present, raising the question of how to identify an alcoholic patient. Tools to identify it are CAGE and AUDIT questionnaires, both validated in primary care. Health professionals must ask about the presence and type of consumption. It should be suspected in patients with mood changes, weight loss or other symptoms without adequate explanation[15].

Once chronic consumption has been identified, the presence of physical and psychological dependence and target organ damage must be evaluated.

Consider that those with a family history of alcoholism, tobacco use, trauma, traffic incidents, or those taking medications that interact with alcohol (paracetamol, NSAIDs, anti H2, isoniazid, phenytoin, warfarin, sulfonylureas, benzodiazepines, methotrexate, opioids, tricyclic antidepressants, metronidazole) may have an increased risk either of developing alcoholism or experiencing interactions with alcohol[15,16].

Questionnaires such as CAGE (detects issues related to abuse and dependence)[17], and AUDIT (identifies disorders related to alcohol intake)[18] should be used. There are other less commonly used methods (Trauma test, T-ACE, TWEAK, RAPS4). These questionnaires, especially AUDIT, are useful for detecting low-risk consumption,

excessive or risky consumption, and dependence or alcoholism[18,19].

Simple advice and brief interventions prove to be effective measures in reducing alcohol consumption and mitigating associated risks. For individuals with low-risk alcohol consumption, it is crucial to consistently counsel them on the perils of alcohol intake while operating machinery or vehicles, in conjunction with specific medications, during pregnancy, and in adolescence. In cases of risky consumption, brief interventions are recommended. These are concise (lasting 3 to 5 minutes) and low-intensity actions that involve providing feedback, along with simple advice, to enhance motivation for reducing or ceasing alcohol consumption. Patients may not always comprehend the potential harm of alcohol consumption, making the intervention by healthcare professionals particularly effective. For individuals with alcohol dependency, a more intensive treatment approach is necessary. This could involve outpatient treatment or, in severe cases, may require hospitalization depending on the specific circumstances. Physical withdrawal (tremor, anxiety, seizures, delirium, autonomic hyperactivity) may or may not be present in a patient with alcohol dependence, and if present, requires immediate pharmacological intervention. Consider hospitalization in cases of severe depression, particularly when suicidal ideation is present, severe co-existing psychiatric disorders, insufficient family support, or if outpatient management proves ineffective[15,20,21].

Available drugs can be fundamentally grouped into those used for the treatment of alcohol withdrawal and dependence, and those used for the prevention of complications related to nutritional deficiencies associated with chronic alcohol consumption[15, 20, 22,27].

Administration of thiamine with or without magnesium replacement is recommended for the prevention or treatment of neuropathies and Wernicke's encephalopathy.

The objective of treating alcohol withdrawal is to prevent the occurrence of seizures, delirium tremens, and alleviate withdrawal symptoms. Benzodiazepines are the primary medications used in the first line, with antipsychotics employed as adjuvant drugs (especially in cases of delirium, always in conjunction with benzodiazepines to mitigate the risk of seizures by lowering the seizure threshold). Beta-blockers may be used in instances of autonomic hyperactivity, while carbamazepine or valproic acid may be considered for cases with mild or moderate symptoms.

For individuals with alcohol dependence, there are anticraving medications designed to reduce the urge to drink. Naltrexone is the preferred choice, with acamprosate being an alternative in the absence of naltrexone or if there is some degree of liver damage. In certain cases, aversive drugs like disulfiram can be employed,

particularly for highly motivated patients aiming to maintain abstinence.

There are other drugs under study (topiramate, nalmefene, serotonin reuptake inhibitors, ondansetron).

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SLEEP AND CARDIOVASCULAR DISEASE

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Current state of knowledge

Sleep medicine has become an increasingly prominent field in routine clinical practice. Among the various conditions it addresses, insomnia stands out as the most prevalent disorder. According to the DSM-V[1], insomnia is characterized by dissatisfaction with the quantity or quality of sleep, meeting one or more of the following criteria: difficulty initiating sleep, difficulty maintaining sleep (frequent awakenings), or early awakening, occurring at least three times a week for a duration of three months, despite having the opportunity to sleep. The disturbance in sleep causes distress or clinically significant impairment in daytime functioning, as evidenced by at least one of the following criteria: fatigue, daytime sleepiness, alterations in attention, concentration, or memory, changes in mood or behavior, and a decline in work or academic performance or in social and family relationships.

Chronic insomnia affects 10% of the general population, while 25-35% experience it as a temporary symptom[2]. Its prevalence is higher among the elderly (57%), women, and individuals facing unemployment, lack of a partner, and a low socioeconomic level[3].

The DSM-V classification encompasses dyssomnias, including circadian rhythm disorders, parasomnias like sleepwalking, and secondary sleep disorders linked to neurological, psychiatric conditions, or medical illnesses, the latter being of particular significance. In chronic insomnia, it is crucial to take into account medications, drugs, and, notably within our clinical domain, systemic diseases that may manifest with this symptom.

Over the past decade, there has been a growing body of evidence associating insomnia with cardiovascular diseases and heightened mortality rates[4].

It is crucial to obtain a comprehensive medical history, where information regarding the duration of insomnia and its nature –whether it involves difficulty falling asleep, maintaining sleep, early awakening, or a global pattern– is documented. Additionally, details about the sleep-wake cycle, such as bedtime and wake-up hours, latency period (typically less than 30 minutes), daytime sleep, and the use of medications, coffee, alcohol, or drugs, should be recorded.

Risks

For several decades, it has been reported that the duration and quality of sleep are associated with increased mortality and reduced quality of life[5].

• Prolonged insomnia is linked to a higher risk of experiencing new episodes of major depression and can serve as an independent risk factor for cardiovascular disease, hypertension, and diabetes, especially when combined with sleeping less than 6 hours[6].

• Insomnia increases the risk of hypertension (HTN), heart failure (HF) and coronary heart disease, especially when sleep duration is short (< 6 hours)[7].

• Individuals diagnosed with insomnia have a 21-24% higher risk of developing HTN compared to those who do not have insomnia[8, 9].

• The cumulative number of insomnia symptoms is associated with an increased risk of incident heart failure[10, 11].

• There is an important correlation between insomnia with increased arterial stiffness and carotid atherosclerosis[12].

• A significant correlation exists between insomnia and increases arterial stiffness and carotid atherosclerosis. Individuals with insomnia symptoms have a 41-55% higher risk of myocardial infarction, stroke, and coronary artery disease. Moreover, they are more likely to experience cardiovascular disease-related mortality[13, 14].

Recommendations

The first and foremost intervention involves ensuring that general practitioners and internists are well-versed in the subject, capable of diagnosing the underlying causes of insomnia, and proficient in formulating treatment strategies.

• Management of medical and psychiatric comorbidities, modifying medications or substances that alter sleep and optimizing sleep conditions.

• Sleep hygiene measures[15](Table 1).

TABLA 1.– *General measures considered in sleep hygiene are described (modified from López de Castro[15])*

- Behavior modification strategies and lifestyle changes[15]
- Cognitive behavioral therapy: The psychotherapeutic approach to insomnia is primarily grounded in behavioral and cognitive-behavioral interventions, with a sufficient level of evidence supporting their benefits[15].
- Pharmacological therapy: the main medications used in general have weak recommendation weight and low quality of evidence and are the following: benzodiazepine receptor agonists such as eszopiclone, zaleplon and zolpidem, frequently used for sleep onset, in the case of zolpidem for sleep maintenance and new benzodiazepines such as triazolam for sleep onset and temazepam for sleep maintenance[16].

Napping in the afternoon should be avoided, especially if one has had insufficient sleep during the night, or at the very least, it should not exceed 45 minutes.

The timing for both waking up and going to bed should be consistent.

"Heavy" foods should be avoided at dinner, as well as an excess fluid, alcohol, caffeine, nicotine.

Intense activities preceding bedtime should be avoided.

The sleep environment should ideally have low lighting and minimal noise.

One should go to bed only when sleepy.

It is advisable to establish a pre-sleep routine, such as enjoying a warm beverage while avoiding caffeine.

Reading, watching television, using a cellphone, or listening to the radio should be avoided in bed.

If sleep is not achieved within 45 minutes, it is acceptable to leave the bed and engage in a simple activity until sleep is regained.

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SUPPLEMENT

STRESS AND CARDIOVASCULAR DISEASE

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Current state of knowledge

The World Health Organization (WHO) defines the Stress Syndrome as the set of physiological reactions that activate an individual's biological survival system, preparing it for action. It notes that during the COVID-19 pandemic, there was a 25% increase in the prevalence of the General Adaptive Stress Syndrome in the global population[1].

This phenomenon is determined by the escalation of environmental and physiological stressors, as well as individually perceived threatening conditions. When these surpass the adaptive capacity of the organism, it leads to the loss of homeostasis and the onset of pathological states[2].

The well-documented effects of acute and chronic stress serve as contributing factors in the precipitation of cardiovascular events, such as arrhythmias, acute myocardial infarction, and hypertension, through the brain-heart axis connection[3].

Physiological manifestations due to stress result from a complex response involving various systems such as the central nervous system, autonomic nervous system, endocrine system, and immune system. If stressors are excessively intense, frequent, or persist for extended periods, the adaptive capacity becomes saturated, causing a dysregulation of organic homeostasis with a clinical impact on health[3]. Sustained stress states that exceed the regulation and adaptability of the organism lead to oxidative stress, producing reactive oxygen species that activate the inflammatory process. This modifies gene methylation, alters protein transcription, affecting metabolic response, neuroendocrine feedback, and collaborates in the long term with the presence of disorders such as atherosclerosis, insulin resistance, endothelial dysfunction, ultimately resulting in cardiovascular, renal, and metabolic diseases as complications[4].

Risks

Psychosocial factors and stress have been significantly linked to the risk of major cardiovascular events, which is why they have recently been included along with mental disorders and depression within the group of "cardiovascular risk modifying factors". that can increase the cardiovascular risk of patients beyond the classic risk factors.

• Chronic stress can lead to greater progression of the atherosclerosis process, probably due to excessive activation of the sympathetic nervous system, expressing an exaggerated response in heart rate and blood pressure, as well as endothelial dysfunction through activation of pro-inflammatory mediators[4].

• Even when there are no significant lesions in the coronary arteries, in the face of intense physical or mental stress, large amounts of catecholamines are released, which can cause changes in vascular tone, peripheral vasoconstriction, arterial hypertension, alterations in coronary circulation or coronary spasm, and even cause Takotsubo syndrome or stress cardiomyopathy[5].

• The heightened activity of the sympathetic system in response to stress can cause, over the long term, dysfunction of the vascular endothelium, increased platelet aggregation and favor a prothrombotic state, structural changes at the level of the myocardium such as left ventricular hypertrophy, increased of myocardial oxygen consumption, and alterations in coronary circulation. An increased activation of the renin angiotensin aldosterone system, greater insulin resistance and lipid alterations are also described[6,7].

• High demands at work that generate stress significantly increase the risk of death from cardiovascular disease[8]. A meta-analysis pooled the results of five observational studies in which patients with chronic coronary heart disease (n = 555) were analyzed in a laboratory to detect myocardial ischemia induced by mental stress. Subsequently, these patients were followed prospectively. The risk of subsequent events of coronary artery disease (e.g., myocardial infarction or unstable angina) or mortality was twice as high in patients with myocardial ischemia induced by mental stress[9].

Recommendations

Programs that provide tools for managing stress are aimed at improving people's overall lifestyle and include

strategies adapted to everyone: eating plan, physical exercises, and physical relaxation techniques (respiratory exercises, yoga), interventions with mental health professionals, improvement of Quality of sleep and practicing meditation constitute the bases of non-pharmacological treatment.

Undoubtedly, transcendental meditation and the practice of Yoga contribute to controlling the impact of traumatic stress and the dysregulation of the body's homeostasis. However, maintaining a proper diet and engaging in exercise with an increased heart rate for 30 minutes are efficient and influential in gene demethylation, reducing oxidative stress, controlling the inflammatory process, limiting endothelial damage-essential factors in proteome production and determinants in the generation of the metabolome. These elements have a significant impact on the overall association with mortality and death from cardiovascular diseases[10,11].

Regarding meditation, it has its origins in Eastern philosophies such as Vedanta and Buddhism, with techniques centered on directing attention inward by fully focusing on respiratory movements, words, or some form of visualization and bodily perception. Mindfulness, a practice centered on present-focused attention, stands out as one of the most extensively studied techniques. Within this approach, every thought, feeling, or sensation that emerges in the attentional field is acknowledged without engaging in analysis, all the while fostering a state of bodily relaxation[12]. A recent meta-analysis concludes that these interventions may yield a favorable impact on patients with high blood pressure, demonstrating a significant reduction in blood pressure. They are considered as an additional beneficial effect alongside standard pharmacological treatment for managing these patients[13].

Transcendental meditation is a technique worth considering for stress reduction, as studies indicate reductions in both systolic and diastolic blood pressure. It is currently viewed as an additional resource to lower blood pressure, complementing pharmacological treatment[14-16]. Concerning the benefits of these techniques, it's noteworthy that they require minimal prior training, are cost-effective, and are simple to perform.

They are practiced with the individual seated, with the back resting on the back of the seat, with the body relaxed and eyes closed. No other external conditions are necessary, just knowing the technique and setting the time for completion. Meditation can be considered as a complement to cardiovascular risk reduction interventions that are currently used according to treatment guidelines and recommendations in this regard[17].

On the other hand, in terms of secondary prevention, meditation could potentially increase physical and mental relaxation, which would lead to better outcomes after a cardiovascular event[18].

Doctors should keep in mind during the evaluation of the patient, the type of personality based on the anamnesis and history, with identification of stressful situations to provide appropriate and broader care that includes relaxation therapies, meditation and corresponding referral to mental health professionals if required to provide a comprehensive approach.

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SUPPLEMENT

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ENVIRONMENT, CLIMATE CHANGE, AND CARDIOVASCULAR HEALTH

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Current state of knowledge

Environmental pollution is a significant contributor to diseases and premature deaths. It constitutes a major part of the global disease burden, with cardiovascular diseases being particularly prominent. Particulate matter (PM), one of the most extensively researched air pollutants, is classified based on its aerodynamic size. The categories include 1 μm, 2.5 μm, and 10 μm. These particles are predominantly associated with the combustion of fossil fuels and biomass[1].

Using satellite estimates and ground-level chemical transport models, global average concentrations of particles with an aerodynamic diameter less than 2.5 μm (PM 2.5) and ozone are calculated with an approximate resolution of 11 km. x 11 km.

Smaller fractions exert greater effects due to their ability to penetrate deeply into the lung alveoli and from there, into the bloodstream. Urban PM has a complex and varied composition, including elemental carbon, ammonium, nitrates, sulfates, ozone (O3), organic compounds and heavy metals[2,3]. Exposure to PM can be acute (24 hours or less) or chronic (annual)[4].

The United Nations characterizes climate change as enduring alterations in temperature and weather patterns. Since the 19th century, these changes have been primarily driven by human activities, particularly the combustion of fossil fuels like coal, oil, and gas. The primary cause of climate change is linked to these fossil fuels, which emit greenhouse gases and short-lived climate pollutants[5]. Climate change triggers environmental disasters such as large-scale fires and heatwaves, which increase PM 2.5 levels or lower, leading to harmful effects[6].

From a societal perspective, the rise in poverty poses a risk, as the most vulnerable populations often reside in areas with higher environmental risks. These are areas often lacking in basic living conditions, including access to clean drinking water, are typically overcrowded, high unemployment and scarce community infrastructure, directly impacting the community development and increasing the levels of inequality and inequity[7].

Risks

Research has identified significant links between exposure to urban PM and cardiovascular diseases, including myocardial infarction and stroke. PM has both acute effects, such as changes in heart rate and elevated blood pressure, and chronic impacts on the cardiovascular system, such as the exacerbation of atherosclerosis. These effects encompass vascular dysfunction, heightened susceptibility of the heart to ischemic damage, and an increased tendency for thrombosis[8].

Exposure to air pollution has been associated with a heightened risk of arteriosclerosis, as evidenced by premature aortic and coronary calcification. Short-term spikes (lasting hours) in air pollution levels have been linked to an increased risk of myocardial infarction, stroke, and acute heart failure[9,14]. Extreme air pollution conditions have adverse effects on blood pressure and insulin resistance[15].

Several distinct biological pathways seem to underpin these effects, with oxidative stress and inflammation being central. From a pathophysiological perspective, once PM (2.5 or less than 1 μm) enters the bloodstream via reactive oxygen species, it triggers endothelial dysfunction, monocyte activation, and proatherogenic changes in lipoproteins, which initiate plaque formation. Additionally, air pollution promotes thrombus formation due to an increase in coagulation and platelet activation factors [8, 9].

The findings indicate that while humans can adapt to varying climatic conditions, extreme temperatures and elevated levels of air pollution may impact health outcomes. In such scenarios, climate change adversely affects the cardiovascular system, with individuals at high risk of cardiovascular diseases being the most vulnerable[16].

Mortality rates progressively rise when the external air temperature deviates above or below 20-25 degrees Celsius. A study investigating the correlation between daily mortality and daily temperatures in the Netherlands from 1979 to 1987 found that 57% of the "unexplained" cold-related mortality and 26% of the "unexplained" heat-related mortality were attributable to cardiovascular diseases[17].

In a separate study conducted across 652 cities in 24 countries, it was found that, on average, a rise of 10 µg per cubic meter in PM 10 concentration, representing the average of the current and previous days, was associated with a 0.44% daily increase in all-cause mortality, a 0.36% daily increase in cardiovascular mortality, and a 0.47% daily increase in respiratory mortality[18].

Exposure to household air pollution was linked to a higher prevalence of Chronic Obstructive Pulmonary Disease (COPD), especially among women. This is likely to be a significant population-attributable risk factor for COPD in low-resource settings[19].

To mitigate the health impacts of these phenomena, it's crucial to consider different populations based on their unique characteristics and/or existing comorbidities, which expose them to specific risks[11]. When faced with average PM 2.5 values of 35 µg/m^3 or more over a 24-hour period, these populations face increased cardiovascular and cerebral risks. They are classified as follows[4]:

- Very High Risk: cardiovascular disease, recent hospitalization for acute coronary syndrome, COPD or asthma.

- High Risk: diabetes or kidney disease stage III or higher.

- Special populations: older adults, pregnant women, transplant recipients.

Climate change also impacts cardiovascular health due to the stress induced by environmental changes (such as severe storms, fires, loss of water sources, habitat loss, and migrations), the effects of heatwaves, and the combined impact of air pollution and heat[20,21]. These changes can lead to new diseases or exacerbate pre-existing cardiovascular conditions, with a wide range of manifestations including heat stroke, arrhythmias, acute myocardial infarction, and/or decompensation of heart failure, among others. The mechanism of action primarily involves the exacerbation of the detrimental effects of air pollution on health through various pathways, such as the formation of ground-level ozone, for instance[22].

Recommendations

Numerous studies have demonstrated that air pollution and climate change are among the primary contributors to the global disease burden, particularly in low- and middle-income countries. Interventions can be implemented through preventive measures and/or specialized care actions[1,4,8]. For these actions to be effective, they should be incorporated into a government management process that addresses all levels of decision-making and intervention[1,4,8]. Within this framework, scientific associations, and universities, ideally under government leadership, should develop educational, preventive, and action programs at both individual and collective levels[23].

For government strategies, it is recommended to prioritize actions that can transform productive processes from using polluting energies to low-polluting renewable ones. This includes promoting the use of low-emission vehicles, encouraging active transportation (such as walking or cycling), avoiding the design of mixed residential/industrial urban areas, promoting research on mitigating climate change and the health risks of pollution and climate change, systematically measuring and monitoring pollution through air quality sensors in cities, and implementing advertising campaigns about the dangers of these phenomena[1,4]. Once the risk has been established and according to the air quality (if the pollution level exceeds 35µg/m^3 over 24 hours) and the exposure is acute, it is suggested that governments promote the use of N95 masks outside the home, encourage the closing of doors and windows, and facilitate the use of HEPA filters inside homes as much as possible[4]. In areas with chronic exposure levels (PM 2.5 greater than 12 µg/m^3 annual average), it should be recommended that susceptible individuals avoid outdoor activities, governments should ensure access to filters in air conditioners and cars and implement measures to avoid traffic congestion[4].

At the healthcare level, an environmental medical history or at least a brief history of exposure to pollution, both at work and in daily life, should start to be included, evaluating susceptibility, and providing guidance. The World Health Organization (WHO) believes that the environmental impact on health must be addressed from early life and urges the implementation of strategies that allow addressing, disseminating, and solving environmental health problems in health services[4]. In all cases, it is suggested to recommend avoiding the use of private vehicles and encouraging the use of bicycles as a mode of transportation.

There is also a need to lessen the impact of the health sector on both climate change and pollution[23].

Specifically, regarding cardiovascular disease, the recommendations are targeted as follows[22]:

• Identify individuals who are most susceptible to the effects of climate change and provide them with appropriate care and/or preventive measures to reduce or prevent health impacts. These individuals may include those with a history of heart disease, high blood pressure, comorbidities, or the elderly, among others.

• Be aware that certain medications, such as diuretics or antihypertensives, can have their side effects intensified during heatwaves, leading to hydroelectrolyte disorders and hypotension.

• Pay particular attention to heat stroke by promoting increased hydration, monitoring temperature, encouraging the use of light clothing, and modifying diets, etc.

• In medical emergency systems, stay alert to early warnings of climatic and meteorological phenomena, as

episodes of exacerbated cardiovascular diseases may occur more frequently than typically expected.

• Prepare emergency and hospital services to handle cases impacted by climate change and pollution.

From what has been discussed so far, it is clear that health issues related to pollution and climate change are becoming central to population health. In this context, both phenomena underscore the multifaceted role of healthcare teams. They should not limit themselves to individual patient care but must also assume their social role in highlighting the health consequences of production methods that increase pollution levels[7].

Active involvement of Internal Medicine societies and internists across Latin America is necessary for them to play a significant role in addressing climate change and environmental degradation. This sentiment was recently echoed by the European Federation of Internal Medicine[23], which issues recommendations at national, hospital, corporate, and individual levels.

At the national level, measures that reduce greenhouse gas emissions and environmental degradation are recommended. These include the use of renewable energy sources, low-emission vehicles, healthy buildings, behavioral changes in the population, halting deforestation, financing adaptation plans, supporting research to understand and mitigate the health effects of climate change, imposing environmental ethics in organizations, generating policies for health systems to respond to population health problems related to climate change and environmental degradation, and reducing their ecological impact.

At the hospital level and in clinical practice, actions should be defined to reduce the health sector's ecological footprint and implement a sustainable environment. This includes evaluating the use of heating, ventilation, and air conditioning, adapting its use to its intended purposes, adjusting usage hours, improving energy efficiency in the built environment, reducing emissions from hospital fleets, reducing waste, eliminating metered dose inhalers (MDIs) that use hydrofluorocarbons as propellants, adopting low-carbon alternatives to anesthetic gases, replacing single-use equipment and devices with reusable ones, introducing a plant-based diet in hospitals and scientific meetings, avoiding the use of brochures and paper documents, reducing the impact of travel, promoting virtual meetings, avoiding air travel for short distances, encouraging hospitals to adopt "Green Hospitals" certification, promoting hybrid circuits for patients –digital and human touchpoints–, promoting healthy lifestyles in clinical practice, and reducing over-exploration, over-diagnosis, and over-treatment.

At the level of Internal Medicine Societies, they should promote educational activities and develop a set of tools to help internists reduce energy use and greenhouse gas emissions in their practices, prepare internists to act in diagnoses related to climate crisis disasters, improve knowledge to care for citizens who suffer the consequences of climate change and environmental degradation, promote and implement effective actions to reduce the ecological footprint of the health industry, introduce this theme in their conferences, strive to introduce the theme in undergraduate and postgraduate courses.

At a personal level, individuals should be active agents in promoting practices to improve the environment, increasing community awareness about the health risks of climate change and environmental degradation, and serve as role models in the adoption of environmentally friendly behaviors.

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SUPPLEMENT

CARDIOVASCULAR DISEASE IN WOMEN

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Current state of knowledge

Cardiovascular diseases (CVD) are the leading causes of death globally for both men and women. Despite this stark reality, the risk of CVD in women is often underestimated and undervalued, leading to a common misconception. Many women are unaware that ischemic heart disease is their primary health concern[1].

The endothelium plays a critical role in maintaining vascular tone and blood flow. When endothelial dysfunction occurs, it triggers an inflammatory cascade, leading to the production of prothrombotic factors and vasoconstriction, thereby increasing the risk of developing CVD[2]. The endothelium is responsive to the vasodilatory properties of estrogens. However, when estrogen levels decrease post-menopause, arterial stiffness and atherosclerotic disease gradually develop, escalating cardiovascular risk (CVR) in women[3,4]. Notably, endothelial function begins to decline during perimenopause, even before signs of subclinical atherosclerosis appear[5].

Atypical chest pain and dyspnea are the most common cardiac symptoms in women, often mistaken for menopausal symptoms. Women with atypical chest pain syndrome face a two-fold increased risk of experiencing an ischemic cardiac event within the next 5-7 years[6]. While the prevalence of CVD is lower in women than in men, women have a higher mortality rate due to cardiovascular issues across all age groups, and their prognosis is generally poorer[7].

Obstructive coronary artery disease manifests 7-10 years later in women than in men, with women presenting less focal coronary stenosis at any age[8]. Women have a lower plaque burden, fewer vascular calcifications, and a more diffuse pattern of atherosclerosis compared to men[9]. Coronary vasomotor disorders are the primary cause of ischemic disease in middle-aged women[10]. Women experience more angina but have less severe and extensive ischemic disease than men[11].

Hormonal changes in menopausal women are often linked to changes in body fat, which tends to increase predominantly in the central and visceral region, accompanied by a decrease in lean mass. Chronic inflammation and the ensuing oxidative stress heighten insulin resistance in these patients[12].

It is now recognized that there are distinct cardiovascular risk factors (CVRF) in men and women, both in terms of their prevalence and their impact and treatment. For instance, women with acute coronary syndrome are typically older than men, and more likely to be hypertensive, diabetic, have hypercholesterolemia, and have a history of angina, heart failure, and cerebrovascular disease[13].

Traditional CVRF are well established and common across the population; however, some pose a greater risk of CVD for women, such as diabetes and tobacco use. There are emerging or unconventional CVRF, some of which exhibit different behaviors in women, such as depression, stress, autoimmune diseases, and undergoing cancer treatment. Lastly, there are specific CVRF unique to women, which are detailed below[14].

- Age of menarche
- Premature ovarian insufficiency
- Hormonal contraceptives use.
- Polycystic ovarian syndrome
- Adverse pregnancy outcomes
  - Hypertensive disorders of pregnancy (HDP), childbirth preterm and low birth weight
  - Gestational diabetes
- Menopause

AGE AT MENARCHE

The onset of puberty, particularly early menarche occurring in children under 11 years of age, is gaining increasing recognition as a significant CVRF.

Risks

It has been shown that there is a significant increase in the risk of CVD such as ischemic heart disease, development of CVRF, and non-cardiac diseases in patients with early menarche. In these young women, there is a greater risk of obesity, high blood (BP) pressure and metabolic disorders such as glucose intolerance, increased abdominal adiposity and insulin resistance in adulthood[15,16].

Additionally, there is an increase in the risk of osteoporosis, fractures in lumbar spine and hip, as well as anxiety and depression disorders in adolescents[17].

Recommendations

The recommendation is to investigate the medical history, specifically the age of onset of menarche, with the aim of recognizing and intervening early on associated CVRF[1].

Encourage these young individuals to adopt a healthy lifestyle, including a diet rich in fruits, vegetables, cereals, and fish, while limiting the consumption of alcohol. Additionally, they should engage in physical activity for 150-300 minutes per week at moderate intensity, incorporating muscle strengthening activities twice a week, and avoiding tobacco consumption. All these measures contribute to cardiovascular primary prevention[1].

PREMATURE OVARIAN INSUFFICIENCY (POI)

This condition is characterized by the loss of ovarian function before the age of 40, leading to amenorrhea, hypoestrogenism, and elevated levels of follicle-stimulating hormone (FSH). It affects 1 in 100 women. It can be genetic, infectious, or linked to environmental factors, or induced by radiotherapy, chemotherapy, or surgical procedures.

Risks

Patients with untreated POI have a higher risk of osteoporosis, autoimmune disorders, infertility, psychological disorders, CVD, and all-cause mortality, reducing quality and life expectancy[18].

Patients with POI and early menopause have a 50% higher CVR[19,20]. POI is an independent CVRF, since there is a greater risk of endothelial dysfunction, cardiac autonomic dysfunction, and metabolic alterations as insulin resistance and dyslipidemia. These patients have a higher body mass index (BMI) and altered lipid profile compared to women of the same age[21].

Recommendations

The identification of patients with POI offers an opportunity for the prevention and detection of CVD. For this reason, advice should be offered on CVRF, the need to maintain a healthy diet, engage in regular physical activity, maintain adequate body weight, and avoid tobacco use.

The CVRF must be evaluated annually in the women with POI and early menopause.

Hormone replacement therapy (HRT) is recommended for the alleviation of symptoms associated with hypoestrogenism. Initiating HRT early has demonstrated effectiveness in the primary prevention of CVD, osteoporosis, and cognitive decline. It is advisable to continue this therapy until reaching the typical age of menopause[22].

The beneficial impacts of HRT on CVRF hinge on factors such as dosage, timing of administration, and whether it is administered as monotherapy or in combination with progestogens. In patients undergoing HRT, particular attention should be given to promoting smoking cessation due to the elevated risks of heart attack and thrombosis[1].

The decision to employ HRT should be personalized, considering the patient's preferences, and carefully weighing the cardiovascular benefits against the potential risks of thrombotic events or breast cancer[22].

USE OF HORMONAL CONTRACEPTIVES

The estrogen plus progestin therapy (ethinylestradiol plus progestin) is an effective and globally accepted contraceptive method. Since its inception in 1960, its association with a heightened risk of cardiovascular events (ECV) has been recognized, attributed to its procoagulant effect, activation of the renin-angiotensin system (RAS), endothelial dysfunction, and oxidative stress. Combined formulations with low doses of ethinylestradiol have mitigated the risk of cardiovascular events. A Danish study demonstrated that the use of combined oral contraceptives (OC) containing 20 µg of ethinyl estradiol increases the relative risk by 1.60 (95% CI 1.37-1.86) for thrombotic ECV and by 1.40 (95% CI 1.07-1.81) for myocardial infarction (MI) compared to non-users of OC[23].

Risks

The use of the combined contraceptive pill may increase the risk of venous thrombosis, acute myocardial infarction, and CVD in users, especially those who are smokers[24].

Likewise, OC consumption is associated with elevated BP due to an increased production of angiotensinogen/angiotensin II; increased glycemia and alteration in lipids (increase in LDL and triglycerides, decrease in HDL)[25]. On the contrary, contraceptives that only contain progestin are not associated with increased vascular or venous risk; therefore, in women with high CVR, they can be prescribed orally, subcutaneously or intrauterine[26].

Recommendations

It is recommended that OC containing ethinyl estradiol should be avoided in women with a history of venous thromboembolism, CVD, or any other peripheral arterial disease. Furthermore, there are also contraindicated in those over 35 years of age, smokers and with severe dyslipidemia or obesity[27].

Women under 35 years of age with controlled pre-existing arterial hypertension can use OC, and regular BP control is advisable[28]. Progestin-only contraceptives may be recommended in women at high CV risk[29].

POLYCYSTIC OVARY SYNDROME (PCOS)

It is a common endocrinological alteration in women of reproductive age that is characterized by irregular or anovulatory menstrual cycles (ovarian dysfunction), poly-cystic ovaries and hyperandrogenism[30].

Risks

Women with PCOS have a higher risk of glucose intolerance (OR:2.48; 1.63-3.77), type 2 diabetes (OR:4.43;4.06-4.82) and metabolic syndrome (OR:2.88; 2.40-3.45), with double risk of ischemic heart disease and CVD when compared to patients without PCOS[31,32]. The prevalence of obesity is 30-60%[33]. The risk of endo-metrial cancer and complications during pregnancy such as preeclampsia, gestational diabetes and preterm birth have been described.

Recommendations

Given the heightened risk of overweight/obesity and type 2 diabetes mellitus (DM), it is advisable to embrace healthy lifestyles, regularly monitor body weight, and undergo peri-odic assessments, including a glucose tolerance test (GTT) every 3-5 years, to screen for prediabetes or type 2 DM[32].

In cases where lifestyle modifications fail to achieve weight loss in patients with PCOS, pharmacological therapy should be considered to address obesity, insulin resistance, and glucose intolerance[33].

It is recommended that all women of reproductive age who are overweight/obese should undergo studies to rule out PCOS[34].

Preconception consultation is essential to control BP, blood glucose and body weight and achieve optimal condi-tions for the start of pregnancy.

ADVERSE PREGNANCY OUTCOMES

a. **Hypertensive disorders of pregnancy (HDPs),** preterm birth and low birth weight: HDPs continue to be the largest cause of maternal and fetal morbidity and mortality related to pregnancy in the world. Its prevalence ranges between 10-15%[35]. The HDPs includes several disorders that cause high BP (HBP) in pregnant women (BP >140/90 mmHg) such as gestational hypertension, preeclampsia (PE)/eclampsia, chronic hypertension and chronic hypertension with superimposed PE.

There is a significant increase in the risk of future CVD in women with a history of HDPs (PE and ges-tational hypertension), regardless of having traditional CVRF[36]. Likewise, the severity of HDP and its recurrence increases the possibility of subsequent CV events at an earlier stage[37].

Risks

Women with a previous history of PE have a 2-3 times greater risk of chronic hypertension and heart failure and a 2-fold greater risk of ischemic heart disease, heart failure, arrhythmias, cerebrovascular disease, and CV death[38]. Furthermore, they have a higher risk of developing type 2 DM, end-stage renal disease, vascular dementia, dyslip-idemia, and venous thromboembolism at a younger age compared to those who do not develop PE[36].

It has been observed that 30% of women with a history of HDPs have signs of calcium in the coronary arteries around 50 years of age, compared to 18% of the group without a history of HD[39]. They also show premature markers of atherosclerosis such as arterial stiffness and increased thickness of the carotid intima media[40].

Conversely, the risk of maternal death from CVD after presenting PE is twofold compared to patients without PE. Specifically, there is a 2.3 times greater risk of dying from ischemic disease and heart failure and 2 to 3 times greater of dying from cerebrovascular disease[41]. Women with a history of PE and preterm delivery (< 37 weeks of gestation) are 7 times more likely to develop ischemic heart disease compared to normotensive women who delivered at term (RR: 7.7; 95% CI: 4.4-13.52). Further-more, maternal cerebrovascular mortality is 5 times higher if the birth was before 37 weeks of gestation (RR: 5.08; 95% CI: 2.09-12.35) vs. after 37 weeks of gestation (RR: 0.98; 95% CI: 0.5-1.92)[41].

Recommendations

Previous history of HDP, preterm birth and low birth weight children are major CVRF. These mothers require postnatal evaluation at 6-8 weeks to inform them about the implications for future pregnancies and long-term CVR, as well as to educate them about primary prevention of future CV events. It is recommended in patients with a history of HDP/PE to perform periodic evaluations for hypertension and DM[42-44,45].

b. **Gestational diabetes (GD):** The prevalence is 16.7% worldwide according to the International Diabetes Federation (IDF) for the year 2021. Hyperglycemia in pregnancy is associated with an increased risk of adverse events for both the mother and the baby[46].

These children have a higher risk of obesity, insulin resistance and type 2 DM throughout their lifetimes[47].

Risks

GD is a strong predictor of maternal risk of type 2 DM later in life. 40-60% of patients with GD will be diabetic in 5-10 years[3].

Moreover, women with GD have a twofold increased risk of major cardiovascular events 10 years after childbirth, as compared to women without GD. Notably, this risk is independent of the subsequent development of type 2 DM[3].

A recent meta-analysis showed that those with a history of GD have a higher risk of presenting CVRF such as chronic hypertension, dyslipidemia, obesity, and type 2 DM within a period of 10 years, but their presence can be as early as one-year postpartum[48].

Recommendations

GD screening should be performed on ALL pregnant women, even without RF, between 24-28 weeks of gestation with 100g of oral glucose by glucose tolerance test (OGTT)[49].

Patients diagnosed with GD should be provided with education regarding the heightened future risks of developing type 2 DM, obesity, metabolic syndrome, and CVD, encouraging them to acquire healthy lifestyles, control body weight, engage in regular physical activity and strictly control pre-existing CVRFs[7].

All women with GD should be screened for DM at 8-12 weeks postpartum, through the OGTT with 75 g of glucose, to evaluate the maternal metabolic status. If it is normal, it should be repeated every 1-3 years[49].

It is indisputable that making the diagnosis of GD or HDP gives us a unique opportunity to identify the future risk of CVD in young women at a very early time in the natural history of the disease, when modifiable RF and primary prevention are still potentially effective[1].

MENOPAUSE

Menopause is an important stage in a woman's life, with an average onset of 51 years (40-60 years).

Risks

Perimenopause and postmenopause lead to states of hypoestrogenemia, which result in an increased risk of CVD and death from this cause. Traditionally, men exhibit a higher cardiovascular risk at an early age than women, but after menopause this risk equals[50]. The changes in estrogen levels following menopause contribute to heightened inflammation, activity of the renin-angiotensin-aldosterone axis, sympathetic response and decreased nitric oxide[51]. Elevated central and visceral adiposity, atherogenic dyslipidemia, increased BP lood pressure, and non-traditional factors such as autoimmune and pregnancy-related diseases have an impact on CVD[4].

Recommendations

A helpful tool for assessing coronary heart disease in middle-aged women is the calcium score, which exhibits a higher predictive value than in men[52]. Women with severe menopausal symptoms and sympathetic hyperactivity have increased heart rate variability, with a predisposition to endothelial damage and the development of subclinical atherosclerosis, which increases CVR. Promoting healthy lifestyle habits and the use of HRT can impact the health of postmenopausal women[53].

Systemic and topical HRT is effective for genitourinary syndrome and prevents bone loss[54].

HRT can help improve symptoms onset and reduce CVD in women < 60 years of age and within 10 years of menopause, with early initiation representing better benefits[55].

However, HRT in individuals over 65 years old may lead to cognitive function deterioration[56].

HRT is not recommended for women with a high risk of cardiovascular disease or those with a previous cardiovascular event[56].

In asymptomatic women, the use of HRT is not pertinent. Women with premature ovarian failure benefit from its use in terms of symptoms, CVD, risk of osteoporosis and cognitive impairment[57].

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PROMOTION OF CARDIOVASCULAR HEALTH AND PREVENTION FROM EARLY STAGES OF LIFE

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Current state of knowledge

Cardiovascular disease is not a major cause of mortality among children and adolescents; however, currently, there is compelling evidence signaling that the onset of the atherosclerotic process begins at early ages, long before coronary or cerebrovascular symptoms manifest[1,2].

Several studies support the association between the quality of the environment during early stages and the risk of future disease in adulthood. Additionally, the adoption of specific behaviors and habits from childhood become cardiovascular risk factors since early ages[1,3-5,8].

Familial background is of utmost importance, since the presence of a family history of cardiovascular disease, especially with an early onset, is considered a non-modifiable but highly relevant risk factor in the detection of children and families with an increased risk of cardiovascular disease[5-8].

During the lockdown period necessary to reduce the spread of COVID-19 pandemic, children and adolescents had to stay at home, leading to an increase in modifiable cardiovascular risk factors in the pediatric age group. This was evident by both weight gain and increased sedentary behaviors, as well as an increase in unhealthy eating habits[9].

Regarding cardiovascular disease prevention in childhood, the focus is primarily on the primordial and primary levels of prevention. Primordial prevention aims to avoid the appearance of risk factors for atherosclerosis, while primary prevention, once these risk factors are present, aims to their reduction and the prevention of their progression towards disease[4, 10-12].

Disease onset in early life stages

Traditionally, chronic non-communicable diseases were considered the result of a specific genetic profile combined with lifestyle choices in adulthood.

There is a close interplay between genes and the environment, with current recognition of the significance of the early pre- and postnatal environment in determining susceptibility to the development of non-communicable diseases throughout life[13].

The concept of DOHaD, which stands for Developmental Origins of Health and Disease, refers to the critical period from conception to the first years of life. This paradigm links adult health status and disease risk to the environmental conditions an individual experienced during the early stages of development[8].

Other fundamental concept is fetal programming or developmental programming, suggesting that certain adverse events occurring at critical moments of development (particularly during the prenatal stage) can lead to permanent and long-term effects. This concept is based on Barker's hypothesis, proposed in 1995, stating that fetal malnutrition, not only affects fetal growth, but also induces postnatal metabolic changes that predispose to chronic disease in adulthood[8,14].

Epigenetic modifications involve changes in deoxyribonucleic acid (DNA) and histones, but not in the nucleotide sequence, that modify gene expression giving rise to different phenotypes. Modifications in the chromatin can favor or inhibit specific gene expression. Although these epigenetic signals can be inherited, the process is dynamic and reversible, and tend to stabilize with age[14].

The first 1000 days of life, spanning from gestation to the first two years of age, constitute the most sensitive period for epigenetic modifications and alterations in developmental programming that will have effects throughout life. An example of this is the well demonstrated association between low birth weight, as a consequence of an adverse prenatal nutritional environment, and cardiovascular disease in adulthood[13,14].

Recommendations

Due to the early occurrence of the initial lesions leading to the development of cardiovascular disease, it is essential to initiate healthy lifestyles since early childhood to improve adult health status[15-18].

To start early prevention strategies in families with high atherogenic risk, it is crucial to know and identify risk factors and family history of cardiovascular disease. Therefore, it is recommended that every medical consultation include targeted anamnesis to gather information about personal and family history of these factors[5-7].

Recommendations on diet, overweight and obesity[4-6]

– Promote breastfeeding for at least the first 12 months of life, if possible, for the first 24 months, with exclusive breastfeeding recommended ideally for the first 6 months.

– Recommend the introduction of complementary feeding gradually from 6 months of age, according to the infant's age and development.

– Encourage family meals in a relaxed environment, favorable to communication, without screens or other distractions.

– Suggest minimizing or eliminating the consumption of sodas, juices, or other sugary beverages.

– Promote the consumption of fruits and vegetables.

– Recommend four main meals per day, highlighting the importance of breakfast.

– Suggest the consumption of skimmed milk and its derivatives, starting at 2 years of age.

– Discourage daily consumption of high-calorie foods and off-schedule meals.

– Encourage a total caloric intake that does not exceed the necessary requirements to guarantee adequate growth.

– Suggest controlling portion sizes.

– Recommend maintaining a healthy body weight with a body mass index below the 85th percentile for age.

– Involve the whole family in lifestyle changes.

Recommendations on high blood pressure, dyslipidemia, and diabetes[4-6]

– Monitor blood pressure at each pediatric routine visit from the age of 3 years or earlier (if the child has risk factors).

– Discourage foods with preservatives and excessive sodium content.

– Suggest removing the saltshaker from the table.

– Recommend the consumption of lean meats and healthy fats.

– Discourage the consumption of high-fat foods.

– Recommend the use of raw oils and discourage cooking methods with excessive fats.

– Determine blood glucose, post-load blood glucose, or glycosylated hemoglobin in children over 10 years old with a body mass index above the 85th percentile for sex and age associated with two risk factors (family history of type 2 diabetes mellitus, signs of insulin resistance, hypertension, dyslipidemia, polycystic ovary syndrome).

– Maintain appropriate blood glucose and glycosylated hemoglobin levels.

– Routine assessment of lipids and lipoproteins is suggested for children and adolescents at 2 moments: between 6-11 years and between 17-21 years.

– Lipids and lipoproteins assessment is recommended for children with family history and with risk factors or comorbidities at any age, other than those mentioned in the previous paragraph.

Recommendations on physical activity and sedentary lifestyle[4-6, 17]

– Encourage parents to be role models for their children by leading physically active lives themselves.

– Recommend family activities that include appropriate physical activity for all family members.

– Promote active play in safe environments tailored to the age group.

– Advocate for limiting sedentary screen time to a maximum of 2 hours or less per day for children over 5 years old and less than 1 hour for children between 2 and 4 years old. For infants aged 0 to 2 years, screen time should be discouraged.

– Encourage participation in recreational and/or sports physical activities appropriate for the child's age and developmental stage.

Recommendations on tobacco and alcohol consumption[4-6]

– Explain the meaning of passive smoking and its harmful health consequences.

– Encourage smoke-free environments at home and other places frequented by children.

– Discourage smoking near children and pregnant individuals.

– Provide parents assistance for smoking cessation.

– Discuss with children and adolescents the harmful consequences of smoking.

– Strongly discourage and demotivate the initiation of smoking and encourage quitting for current smokers.

– Talk to children and adolescents about the harmful consequences of alcohol consumption.

– Strongly discourage alcohol consumption at early ages.

Recommendations related to maternal health and pregnancy control[1, 5, 6, 17]

– Conduct regular periodic prenatal check-ups with the aim of optimizing weight gain and early detection of gestational diabetes and high blood pressure.

– Recommend starting pregnancy with an adequate weight.

– Advise on a healthy diet with micronutrient supplementation according to medical indication.

– Recommend, when there are no contraindications, regular moderate-intensity physical activity, at least 150 minutes per week (including aerobic activity, muscle-strengthening exercises, and gentle stretching).

– Consider factors such as a history of diabetes, hypertension, or maternal obesity during pregnancy as contributors to an increased risk profile for cardiovascular disease in adulthood. Emphasize the importance of a healthy diet and lifestyle from birth for the child and their entire family.

– Implement interventions for smoking cessation as early as possible during pregnancy and maintain the cessation after birth.

– Inform about the risks associated with the consumption of alcohol, drugs, and tobacco; explicitly advise against the consumption of these substances during pregnancy and breastfeeding and highlight the negative effects of passive exposure to tobacco.

– Inform about the benefits of breastfeeding as a protective factor for the mother, contributing to reducing the development of risk factors for cardiovascular disease in later stages of life.

Conclusion

Any effort made to reduce premature mortality and morbidity from cardiovascular disease should focus on primordial prevention, meaning preventing the development of risk factors, and primary prevention, reducing these risk factors when appear.

Considering that family medical history is an unmodifiable factor, its detection and recognition are essential with the goal of educating, raising awareness, and guiding the entire family group toward the prevention of modifiable risk factors. Healthy habits are established from childhood, and it is crucial to identify cardiovascular disease risk factors amenable to intervention in childhood and adolescence. Furthermore, children are more willing to learn and modify their habits, making childhood an ideal stage to address these issues, especially in individuals or families where multiple mentioned risk factors tend to cluster.

Due to the influence of early childhood experiences, including those occurring before conception, on health and their association with the onset of non-communicable diseases, efforts in prevention and health promotion should focus on ensuring the adequate nutritional needs of pregnant women and young children, creating a favorable parenting environment, preventing exposure to environmental toxins, chronic stress, and an adverse environment.

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SUPPLEMENT

SOCIAL DETERMINANTS OF CARDIOVASCULAR DISEASES

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Current State of Knowledge

In the "Universal Declaration of Human Rights," there is a reference to a fundamental principle that every individual has the right to an adequate standard of living that ensures, for themselves and their family, health, and well-being. This includes provisions for nutrition, clothing, housing, medical care, and necessary social services. Additionally, individuals have the right to social security in situations such as unemployment, illness, disability, widowhood, old age, or other circumstances leading to a loss of livelihood beyond their control[1].

In the year 1974, Marc Lalonde, the Minister of Health of Canada, published "New Perspectives on the Health of Canadians," a document commonly known as "The Lalonde Report"[2]. This publication established the social determinants of health and brought about a transformative shift in healthcare systems, transitioning from the traditional model to the bio-psycho-social model. The document introduces a dependency on health in four dimensions: human biology, the environment in which we live (the environment), lifestyles, and the organization of healthcare. Furthermore, it prioritizes health promotion and primary prevention over secondary and tertiary prevention, now encompassing quaternary prevention as well.

The "United Nations Resolution on Universal Health Coverage" of 2013, point 4, invites Member States to adopt a multisectoral approach and address the determinants of health within each sector, incorporating health in all policies, and taking into consideration the social, environmental, and economic determinants of health, with a view to reducing health inequalities[3]. The resolution acknowledges universal health coverage, placing particular emphasis on access for the most vulnerable populations and the capacity to implement comprehensive public health measures, ensure health protection, and consider health determinants through policies across different sectors, notably promoting health education among the population[3]. It also states that universal health coverage entails non-discriminatory access for all to a set of basic medical services for promotion, prevention, cure, and rehabilitation that align with the needs. It also includes essential,

affordable, effective, and quality medications, ensuring that utilizing these services does not impose significant economic difficulties on users, especially vulnerable and marginalized population sectors[3].

The World Health Organization (WHO) defines "universal health coverage" as a situation where all individuals and communities receive the health services they need without experiencing financial hardships to pay for them[4]. It encompasses the entire spectrum of essential quality health services, from health promotion to prevention, treatment, rehabilitation, and palliative care.

The WHO defines social determinants of health as socio-economic, political, cultural, and environmental conditions in which people live and develop, as established in the "World Conference on Social Determinants of Health" in Rio de Janeiro, Brazil, in October 2011[5].

Ultimately, social determinants generate risk factors that influence the onset of chronic diseases, including cardiovascular disease (CVD), and these, in turn, contribute to the burden of illness, disability, and mortality. Therefore, social determinants should be incorporated into medical histories, alongside data on human biology, such as genetic studies, for example, in familial hypercholesterolemia, and the environment and lifestyles of individuals.

Health exclusion is a part of social exclusion and is defined as "the lack of access of certain groups or people to goods, services and opportunities that improve or preserve their state of health and which other individuals or groups enjoy"[6].

There are various indices for measuring population poverty or social exclusion, and in addition to local or regional measures, the most widely used in Europe is the At Risk of Poverty or Social Exclusion rate (AROPE). In the updated 2021 definition, it is characterized as the population experiencing at least one of the following three situations:

Risk of poverty, serious material and social lack, low intensity of employment.

In developing countries, the Multidimensional Poverty Index is used[7,8].

The educational level directly influences life expectancy and health.

Loneliness has significant implications with several mental and physical illnesses that negatively influence CVD.

Socioeconomic status is a largely unrecognized risk factor in the primary prevention of cardiovascular diseases.

Risks

There exists a social gradient in CVD, linking individuals with unfavorable social conditions to a higher risk of developing CVD and, consequently, experiencing a poorer prognosis once the disease has occurred. Studies assessing cardiovascular risk factors across low, middle, and high-income countries have revealed that, at an equal risk score, patients in low and middle-income countries had higher mortality from CVD[9].

Being in an unfavorable social context or experiencing discrimination negatively impacts cardiovascular health, affecting treatment adherence, worsening heart failure, impairing blood pressure control, and increasing the likelihood of heart attacks[10].

Recent evidence shows that low socioeconomic status, adverse childhood experiences, lower social support, reduced health literacy, and limited access to health care are associated with increased CVD risk and poorer health outcomes[11].

Recommendations

– During the clinical interview, inquire the educational level of the person being treated, as it directly influences life expectancy and health; Moreover, educational level holds significance in the context of therapeutic adherence[12,13].

– Assess self-perception of health: One month before your current care, you would say that your perception of health is: Excellent, very good, Good, Fair, Poor, Very poor.

Self-perceived health stands as an independent predictor of poor prognosis. Thus, people with "bad" self-perception of health have a higher risk of mortality compared to those who perceive it as "excellent"[14].

– Ask about Health Coverage:

Do you have health coverage? Public Health System, Assistance Provider Company, etc. Universal health coverage is defined by the WHO as ensuring that all people and communities receive the health services they need without having to suffer financial hardship to pay for them. It covers the entire spectrum of health services[4].

– Ask about access to prescribed medications.

Do you have access to the medications that have been prescribed for you?

Do you have economic possibility for your purchase?

Do you have an economic deduction for the purchase?

The United Nations Resolution recognizes that everyone has access to essential, safe, affordable, effective, and quality medicines, while ensuring that the use of these services does not entail serious economic difficulties for users, in particular poor, vulnerable and marginalized sectors of the population[3].

– Assessing loneliness is crucial, as it has implications for various physical and mental health conditions, including depression, alcoholism, cardiovascular problems, sleep difficulties, immune system disruption, Alzheimer's disease, overall health status, and premature mortality[15, 16].

– Consider socioeconomic factors that identify populations with greater vulnerability in order to implement appropriate social interventions and provide ongoing care for patients with chronic diseases in this context[17, 18].

Addressing the social determinants of health through public policies is a priority and should be integrated into the agendas of different countries. This includes addressing issues related to poverty, the development of universal health coverage, and access to education, including health education, among other aspects.

In conclusion, social determinants of health play a crucial role in influencing risk factors, the development of diseases, and cardiovascular outcomes. Effectively addressing these determinants poses challenges that necessitate a multidisciplinary and multi-level approach, involving public health measures and implementing changes in health systems[11].

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EXHIBIT

COMMUNICATION TOOLS AND HABIT MANAGEMENT FOR THE PREVENTION OF CARDIOVASCULAR DISEASE

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Regarding the implementation of lifestyle changes, physicians have various communication strategies that can have an impact on patients and the community to achieve positive changes in quality of life, health improvement, and disease prevention[1].

The first step to achieve effective communication between doctor and patient involves positioning and identifying the healthcare professional as an advisor in the patient's decision-making process, serving as a guide at each step of their progress. A fundamental concept is recognizing and accepting that changes are often gradual and must be individualized, like pharmacological therapy. This process involves analysis, intervention, and a cycle of improvement until the agreed-upon objectives are achieved with the patient[2].

On the other hand, sustaining long-term treatments (whether lifestyle or pharmacological changes) requires organizational adjustments (such as facilitating follow-up, assembling multidisciplinary teams) and the use of communication strategies that go beyond brief consultations, including the use of social networks and available technological advances[3,4].

Since the scenario for these changes is everyday life, it is essential that individuals acquire self-management skills for health in their daily lives, where different contexts, moments, and social relationships become relevant, as indicated by the strategy proposed by the World Health Organization, known as the Life Course Approach[5,6].

How to reach patient's daily lives?

Various methods are available according to the level of intervention, which are described below:

A. Interventions at the doctor's appointment, addressing various health-related topics related to daily routines.

B. Interventions that extend aspects of the consultation into everyday life using media and content selected for that patient.

C. Community-level dissemination and communication, involving health institutions, scientific societies, ministries, and other relevant entities.

A. Interventions at the doctor's appointment

Despite the constraints of limited time, these meetings hold significant importance not only in terms of therapy and lifestyle modifications but also in establishing a foundational bond, representing the initial step toward effective communication. Face-to-face interactions allow for communication to be tailored based on the patient's verbal and non-verbal cues. In this context, the trust and comprehensive understanding gained through a sustained connection become crucial. This facilitates the primary care physician in building bridges between scientific knowledge and the patient's communication style, using understandable words that promote changes and identify barriers in their implementation.

The challenge lies in ensuring that the patients receive adequate information, comprehend the importance and impact of recommendations, and can integrate them into their daily lives. Throughout the year, the patient will be in the consultation for only 30 or 120 minutes, depending on the case, but the remaining time will be in their daily life.

Before recommending strategies, we must get to know the patients:

• Their biography, what they do for a living, both related to how they manage their life and health.

• The confidence they have in achieving changes.

• What they know and what skills they have related to what they want to achieve.

• What their perspective is on the proposed change.

In which stage are they in relation to their condition:

Have they just found out about the need to change, or have they been dealing with this problem for a while? In the first case, explanations about what is happening to them are appropriate; in the second, an inventory of what they have already done, what they have achieved, and the barriers and opportunities.

These data are part of the educational diagnosis and contribute precision when implementing modifications and achieving a bridge between scientific knowledge and people's conceptual networks and capabilities. They can be considered as "target" points, "leverage" points; For example, if the patient knows how to cook, it is easier for them to create recipes with less salt, fat or calories[7, 8].

Knowing the patient allows for better communication, extending beyond explanatory and descriptive aspects. For instance, using metaphors that enable connection by similarity between the new information and what the person has already acquired, establishing common ground that facilitates the patient's understanding[9-11].

Consider that there may be substantial differences regarding the need for health care in each individual, with no single answer as to why and for what purpose they should take care of their health and adhere to a possible treatment. For example, with the same goal of a patient reducing salt in their meals, there can be different scenarios: a) a 75-year-old patient mentioning reducing salt intake to avoid bothering their children in the future (this is what they imagine will happen if they have a stroke); b) another patient, a 40-year-old male, accepting a low-sodium diet but asking, "Do I always have to eat without salt?" He is concerned about feeling different at dinners or social events. There are numerous scenarios, hence the importance of individualizing recommendations[7].

It is important to simplify the prescription since a significant part of the burden of chronic care is the dissatisfaction caused by disrupting routines, we call habits. The great opportunity of habit changes is that they can influence multiple risk factors simultaneously, achieving a significant impact if implemented from early ages[6]. It is useful to choose a modification, for example, increasing vegetable consumption in the diet, which would be suitable for a set of alterations[12,13].

To assess both **feasibility and barriers and opportunities**, it is necessary to conduct an analysis after the dialogue that allows identifying the reality of the person being consulted. If, for example, the obstacle to eating healthily is the lack of available time, strategies can be developed to enable easy cooking or acquiring healthy ready-made meals for this purpose[7,14,15].

When assessing the possibility of implementing a lifestyle modification, it is also necessary to consider the **self-confidence** the person has in achieving the goal. This concept is at the core of the social learning theory, introduced by Alberto Bandura and extensively applied in health education by Kate Lorig. "Self-efficacy" is one of the parameters most prospectively related to outcomes, in addition to avoiding the frustration of instructing a patient to do something they cannot achieve. If there are numerous changes to propose, some theorists recommend resisting the temptation to begin with the most significant and instead starting with what is more feasible. For instance, in a session with an overweight individual with metabolic syndrome, the instinct may be to focus on weight loss, but it might be more practical to encourage them to engage in physical activity first, even if weight loss is not immediate[17, 18].

In general, it is recommended to formulate a **plan that can be progressively develop** in subsequent visits, treating it as a step-by-step process within a program that will likely span several sessions. Discussing daily routines naturally helps break down asymmetries between doctors and patients. For instance, when discussing food and dietary changes, allowing patients who have gained knowledge and skills in managing their condition to share what they've learned fosters the practical "empowerment" of the patient.

It should be considered that successive consultations, even periodic check-ups, are opportunities to evaluate the process, observe progress, and provide positive reinforcements. It will also be necessary to evaluate and to some extent, have tolerance for setbacks, where according to J. Prochaska, change is a process that includes the possibility of falling and starting over. Beyond conceptualization, it is crucial to actively undergo and consolidate the process[19].

A well-established set of concepts and evidence suggests that specific approaches may be more successful in promoting the adoption of habit changes. While **there is no singular theory**, the study of behavior and its changes draws from various disciplines, including philosophy, pedagogical and psychological schools, innovations in companies, and even behavioral economics, among others. The PRECEDE-PROCEED model, originating from the Centers for Disease Control and Prevention (CDC), proposes that, upon conducting a situational diagnosis, the best theory for the posed problem should be employed. This model is one of the most widely used in health education and promotion, offering a comprehensive, systemic framework for understanding the various determinants of health. Some of the concepts mentioned earlier stem from practical experience in applying this model[7,20].

In a clinical trial **comparing the effect of two communication models** in patients with high blood pressure, one that assumes people lack knowledge and merely need to be taught (assuming that to know is to do), as commonly proposed, and another that adjusts communication tailored to individual needs, following the mentioned guidelines. This approach prioritizes recognizing what individuals have already accomplished, their existing knowledge

and skills, and their potential for promptly enhancing their self-management. Starting from a baseline of 40%, blood pressure control increased in the second group, reaching 40% and 70%, respectively, without altering medication. Similar results were observed when working with family physicians and implementing organizational changes[16,21].

B. Consultation extended to daily life using media

Consultation naturally extends and gets closer to everyday life, to routines, decisions, and uncertainties. This can be enhanced and made even more effective if some educational content is developed to accompany it and is placed on an appropriate platform (a website, a WhatsApp group, social networks, and even Instagram, which can allow organizing content like in a library).

The content should be precise, consistently motivating, and should target key behaviors for achievement or serve as a helpful reminder. The effect is completed when the patient (teaches) feels they have something new to share with their family, neighbors, etc., and then we delve into how to do it[22,23].

C. Communication with the community

As we transition from a paradigm of treating diseases to promoting health, it is crucial for this information to reach all possible levels. This requires a focus on modifying educational content at the initial, primary, and secondary levels, actively coordinating efforts, and concentrating on recommendations to foster healthy habits. The actions and content should be straightforward, promoting understanding and easy application, thereby instigating positive changes from an early age.

D. Quality criteria for health communication

Since the early initiatives, the concept of quality has become more complex[22,24]. When starting to design content, it's essential to assess its scope. There's a foundational level that is informational, and a communicative level comes into play when audiences are segmented, and the content aligns with their specific needs.

1. The first step. Define the audiences To whom/ who is the message directed?

A) **To the person who consults:** It will accompany a professional act, a consultation as "reinforcement" material that will be delivered by the intervening professional.

B) **To the community:** It will be read at any time by anyone.

Evaluate whether it will be directed towards individuals who are encountering the topic for the first time or those who are already familiar or have taken initial steps in dealing with it. Knows/doesn't know, takes care/doesn't take care, is afraid/isn't, has skills/doesn't. In addition to age, gender, having children or dependents, adults, etc.[7].

If audiences are not clearly defined, only generalities will be communicated that will be of helpless[22].

2. Develop an idea for multiple platforms that integrate into everyday life.

Initially, a core concept is developed, and then communication is tailored based on the usage characteristics of each platform. Here, the usage contexts are considered (the traditional Sender, Message, Receiver model is no longer sufficient).

3. Design statements following quality criteria

In the design of a statement, various considerations came into play:

A) **Communication structuring and the inverted pyramid concept:** The most important information should be presented at the beginning. This is a strategy originating from operational communication in wartime (where communication could be cut off at any moment, so essential information is shared first). This contrasts with a **scientific statement**, which is typically structured differently (introduction, material and methods, results, and conclusions).

B) **Ease of reading and comprehension, or health literacy.** The specific language of each discipline is a traditional barrier to this intention, often being the first obstacle in communication. This coexists with adequate accuracy (unambiguous language, explanation of usage context and limitations), and tone. Using examples, anecdotes or concrete situations allows for greater understanding. Including the voice of the people, in the form of questions, testimonies, the speech becomes **polyphonic**[25].

C) **The title** clearly states the message's objective, defining the topic.

D) **Subheadings** are an essential tool for maintaining attention and establishing new "entry points".

Other quality criteria: Grouping similar concepts, avoiding negations and double negations, specifying who is communicating, providing dates, citing sources correctly, and avoiding plagiarism[22,25,26].

4. Visual language and conceptual integration

Visual language contributes on its own, providing color, vitality, art, and tacitly communicates the value of health and life for the institution or service creating the communication. It adds structure to the text, influences reading modes, enhances meaning, and promotes identification[25,26].

5. Social networks: generating possibilities for new communication channels.

Most concepts of effective communication remain relevant but are now subordinate to the effects they will produce. The **importance of interaction** through questions, surveys, reactions, and other resources is highlighted.

6. How to implement these practices?

There is no single path, and doing something is always better than doing nothing. It is useful to form interdisciplinary teams within institutions to act as mediators between health professionals interested in communication, communicators, and audiovisual designers with teaching experience and a commitment to health promotion.

Additionally, **medical information websites for the community can be utilized, containing quality content with reliable information suitable for patients.** Examples of sites with ongoing updates include Medline Plus Mayo Clinic, CDC, and Learn Health from the Italian Hospital of Buenos Aires[23]. Including young doctors in teams who are familiar with new modes of social communication facilitates a quicker transition to opportunities for health-focused communication and people's well-being.

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