

Epidemiological Diagnosis of Diseases and Social Determinants in a Rehabilitation Center in Ecuador, 2023

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ABSTRACT

It is proposed to carry out an epidemiological diagnosis of NCDs: Diabetes Mellitus, Arterial Hypertension, Overweight, and their relationship with several social determinants of health in the Sierra Centro Norte Cotopaxi Regional Social Rehabilitation Center, belonging to the Zonal Coordination 3 of Ecuador, during the year 2024. The relevance of this research lies in several fundamental aspects, among these, Diabetes Mellitus, Arterial Hypertension and Overweight, are chronic health conditions that represent a significant challenge for public health systems worldwide. These chronic diseases not only affect the quality of life of individuals, but also impose a considerable economic burden on health systems and society at large. In Ecuador, specifically in the area of intervention for the study, the prevalence of these conditions has not been widely documented, underscoring the need for a clear and accurate diagnosis. As the main contribution to knowledge in public health, epidemiology and social sciences. By integrating the analysis of chronic health conditions with the study of social determinants, this paper proposes a holistic and multidisciplinary approach to understanding and addressing the various problems of public health. This perspective is pertinent in the realm of health in rehabilitation centers where health and social factors often interact in complex ways. Finally, the results of the study will have important practical implications by identifying trends and correlations between chronic diseases and social determinants of health in the specific context of Zonal Coordination 3, and more targeted and effective interventions can be developed. Not only will this benefit affected individuals and their families, but it can also contribute to the efficiency and effectiveness of public health programs in Ecuador..

1. Introduction

The term "*health*" was first defined in 1946 during the International Sanitary Conference in New York in the United States organized by the World Health Organization (WHO). At the conference, the so-called "WHO Constitution" was signed, a key document that defines health as:

-... "*a state of complete physical, mental and social well-being, and not merely the absence of infirmity or disease*" .(1)

Since then, health has been considered one of the essential rights that every human being, regardless of race, creed, political ideology or economic and social condition, must access.(2)

Several concepts have been developed since the first definition postulated by the WHO, some would even complement the content of the first definition, for example: health is defined as... "*Balance with the environment and adaptation to it*", "*Behavioral Health as a Lifestyle*", "*A holistic and integral aspect that includes the personal and social sphere*", these definitions have contributed to the restructuring of the most current concept. Currently, the health-disease dyad is postulated within the same concept of health. There are many factors that interact in the broader definition of health, such as environmental, genetic, social and cultural characteristics of an individual and a population, all of which play an important role and participate in a broader conceptualization. Finally, the definition of health is not limited to a purely biological aspect (health – disease), it also includes the environment, in relation to the balance between people and their environment (physical, mental and social dimension), so that when there is an imbalance between the two, the different diseases are present. (3)(4)

The International Conference on Health Promotion in Ottawa, Canada 1986, also organized by the WHO, the Canadian Public Health Association and the Ministry of Health of Canada, brought together more than 200 delegates from 38 countries, who agreed to approve the well-known Ottawa Charter, which allows prioritizing Health Promotion (HCP) as a health axis and essential to achieve one of the most ambitious and important objectives. It is in the interest of all the nations of the world to achieve: "Health for all by the year 2000". At the conference, PS is highlighted as a health strategy that establishes key strategic lines to improve health conditions in different regions of the world. (5) According to the definitions set out above, there are several strategies that, if implemented, would facilitate achieving the highest level of health, at least as a theoretical concept. The basic strategies identified in the Ottawa Charter and considered are: 1) advocacy, which seeks to ensure that the channels of communication between the hierarchical levels that play an important role in decision-making allow the implementation of activities and programs that promote health; 2) empowerment, which seeks to achieve the highest level of health, that all people have equitable access to health programs, and 3) mediation, which seeks intersectoral participation and teamwork among all sectors and actors related to advocacy. (6)

Based on the global commitment of nations to health promotion in the Declaration of Alma-Ata (1978), the Ottawa Charter (1986), and several global conferences on health promotion that have been organized by the WHO, historically, the use, implementation and approach of the so-called Social Determinants of Health (SDH) have been called for through a PS-based approach. whereas promotion is one of the essential functions of public health and goes beyond the treatment and prevention of disease.(1)

PS is summarized in the multidisciplinary and intersectoral participation of the actors involved in specific activities that seek to promote individual, group and community measures that promote healthy lifestyles, especially in places where social determinants such as: the physical environment, physical and psychological condition, and individual and collective lifestyles interact negatively affecting the health of individuals.(7)

Although PS plays an important role in primary health care, disease prevention is no less important, so much so that in the The 2011 United Nations (UN) High-Level Meeting on the Prevention and Control of Chronic Noncommunicable Diseases (NCDs) recognized that prevention is the cornerstone of the response to NCDs and that people's living conditions and lifestyles influence quality of life.

Also recognize the importance of reducing exposure to behavioural risk factors such as alcohol abuse, tobacco use, unhealthy diets, sedentary lifestyles, physical inactivity, etc., and therefore urge individuals, the community at large and their leaders to seek and implement alternatives that improve their lifestyle and quality of life, in the end, recognize that the incidence, prevalence and effects of NCDs can be prevented or at least greatly reduced as long as multisectoral health activities aimed at preventing or neutralizing risk factors and avoiding the emergence of new diseases are organized, planned, implemented and evaluated after implementation, If possible, eradicate or minimize the impact of these diseases on the health of their individuals.(8)

For the most part, health systems continue to prioritize the cure and rehabilitation of diseases, neglecting the social, institutional, and economic benefits that could be accessed by focusing on education, HCP, and disease prevention. The financial resources allocated to PS and disease prevention are scarce, so much so that they do not allow for the implementation of programs designed according to the environments of each region and each country.(9)

On the other hand, considering that ethical values such as freedom, justice, peace, dignity in equal rights of both men and women, should promote social progress and raise the standard of living within the broader concept of freedom. The United Nations proclaims the Universal Declaration of Human Rights, so that individuals, institutions and the community in general may be inspired by it and promote respect for the rights and freedoms of every human being.

"All human beings are born free and equal in dignity and rights and, endowed as they are with reason and conscience, they should behave fraternally towards one another" (9).

Likewise, in its article 2, it states that:

"Everyone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status." (9).

It is understandable, then, that all persons or groups of persons who, due to their different characteristics and qualities, belong to the so-called vulnerable groups, are covered under this declaration.

Social vulnerability in prisons acquires a different focus in relation to other social contexts, physical and psychological health are aspects that become more fragile in the prison context. The PPL are a group of people who should benefit from all rights, the only prohibition for having received a conviction is access to free movement, which constitutes a limitation for them to access decent health care. The attention of this vulnerable group will always be of greater expectation in relation to the rest of the population in general, this, due to their innate psychosocial and economic characteristics that sometimes result in low levels of health and nutrition, sedentary lifestyle, obesity, behavioral alterations, and the use and abuse of alcohol, tobacco and drugs (10)

The United Nations Standard Minimum Rules for the Treatment of Persons Deprived of Liberty (Mandela Rules), which are widely recognized worldwide, state in their rule number 24 concerning medical services, that PPLs shall have access to free, free health care without discrimination on the basis of their legal and juridical status, and shall equally enjoy the same quality standards offered by a general health system. In addition, rule number 25 mentions that every social rehabilitation center must have a health care service that is responsible for protecting and improving the physical and psychological health of its inmates with specific actions of HCP, disease prevention and, if necessary, providing treatment and recovery of illnesses that are capable of being treated at this first level of care.(11)

In our country, article 35, chapter three, of the Constitution of the Republic of Ecuador on the rights of persons and groups of priority attention, states that PPLs:

... "will receive priority and specialized attention in the public and private spheres" To this end, the State "shall provide special protection to conditions in conditions of dual vulnerability" (11).

The implementation of a health post or the provision of health services in detention centres on an itinerant basis (professional health services come to the detention centre on duly planned dates and

times) has certain special characteristics, so its implementation must be in accordance with population density. the epidemiological profile, infrastructure and according to the needs of the detained population; The health problems that PPL will suffer not only affect the internal environment of the rehabilitation center, but in many cases the health problems are transferred to their families and the population in general. (12)

On the other hand, the health care model for social rehabilitation centers in Ecuador should follow the guidelines described in the Comprehensive Health Care Model (MAIS), which is based on the planning of activities: intramural and extramural based on disease promotion programs through health education and disease prevention campaigns with care activities. Diagnosis and treatment of morbidities (12) However, this precept is not complied with, so it is necessary and in accordance with the provisions of the Madrid Recommendation of 2009 in relation to the protection of health in prisons as an essential part of public health:

... *"Develop a comprehensive health protection program in all prisons."*

This in particular, and after having discussed and evidenced that in several countries of the world the implementation of health promotion and harm prevention measures are effective in social rehabilitation centers (13).

In most countries, there are legal and technical regulations to provide adequate and efficient primary health care focused on health care programs and disease prevention, however, the execution of this type of activities in rehabilitation centers does not exist and in other cases is not adequate or is partially carried out, as demonstrated at the local level by the report of the visit made to the hospital. Sierra Centro Norte Cotopaxi Social Rehabilitation Center (CRS Cotopaxi) by the Ombudsman's Office in 2019, in which, within their observations, they state that the PPLs do not receive a comprehensive health check-up upon their entry into the CRS, several of the PPLs state: that it is difficult to access health services, the one who decides who goes or does not go to the dispensary is a representative, usually a prisoner assigned to each ward who is not a health professional, who does not receive talks on sexual health issues, not all PPLs have a medical history; The report also points out that there is a shortage of essential medicines for the control of chronic diseases such as: antihypertensives (medicines to lower blood pressure), hypoglycemic drugs (medicines to lower blood sugar), antithyroid hormones (medicines to control the disorder generated by thyroid hormones) and there is no epidemiological record of the prevalent diseases. however, it is assumed that there are several cases of PPL with chronic diseases.(14)

Thus, the proposed research is justified by the need to obtain updated epidemiological data specific to the population of CRS Cotopaxi. The availability of accurate and contextualized data is essential for the formulation of effective public health policies and for the proper allocation of resources. In this sense, the study will contribute to knowing and interpreting the epidemiological diagnostic profile of NCDs, which will provide specific information that can be used to improve the quality of life of individuals in this rehabilitation center.

In addition, this study will address the knowledge gap regarding the influence of social determinants on health in rehabilitation contexts. Despite the fact that the literature recognizes the importance of these determinants in general health, there is a lack of specific understanding as to how these factors operate within rehabilitation centers. Therefore, this study will provide a comprehensive view of how aspects such as environment, socioeconomic background, control substance habits, physical inactivity, and social support networks influence the prevalence and management of chronic diseases in this particular setting.(15)

Another important reason for conducting this study is to have clear and real data on the quality of care, in order to know, interpret and improve clinical practice within the rehabilitation center. The results of the research could lead to a better understanding of the health needs of inmates and, therefore, to a more effective and personalized management of chronic conditions. Not only does this have implications for the quality of care within the center, but it can also be a model to be implemented in other rehabilitation centers with similar populations.

This study is also crucial from the perspective of social commitment and ethical responsibility. By focusing on a population that is often marginalized or ignored in public health studies, the project prioritizes the importance of including all sectors of society in health research. This not only reflects an equitable public health approach, but also reinforces the notion that health is a universal right.(16) Finally, from a general point of view, this study has the potential to contribute significantly to the field of public health in Ecuador and internationally. By addressing health issues in a vulnerable population group in a specific and unique context, its results will be applicable to other groups of vulnerable populations.

Taken together, conducting this study is critical to improving the understanding and management of chronic diseases in a specific population context, and to implementing public health practices that are inclusive, equitable, and effective. Its importance transcends the local level, contributing to health knowledge and practices at a more general and broad level.(17)

2. Objectives

2.1 General objective

To determine the epidemiological diagnosis of NCDs (Diabetes Mellitus, Arterial Hypertension and Overweight and Obesity) and their relationship with DSS in the PPL of the Regional Social Rehabilitation Center Sierra Centro Norte Cotopaxi Zonal Coordination 3, Ecuador, 2023

2.2 Specific objectives

- To describe the prevalence of Diabetes Mellitus, Arterial Hypertension and Overweight and Obesity in the PPL in the Regional Social Rehabilitation Center Sierra Centro Norte Cotopaxi Zonal Coordination 3, Ecuador
- Describe the social determinants of health such as: living and working conditions, socioeconomic inequalities, discrimination and stigmatization, social exclusion, access to health services, access to rehabilitation programs, and criminal justice policies and practices
- To determine the association between NCDs and the presence of DSS.
- Develop a proposal for a health management model for social rehabilitation centers to improve the level of health of the PPL.

3. Results

3.1 Diabetes

Diabetes is a condition in which glucose (sugar) levels in the blood rise above normal values, which is called hyperglycemia. It is diagnosed when the blood glucose level reaches or exceeds 200 mg/dL (milligrams per deciliter). Food plays an important role in this type of disease, in hyperglycemia, the body tries to break down as much of the food ingested as possible into sugar, also known as glucose, and releases it into the bloodstream.

The pancreas, a glandular organ located in the abdomen, produces a hormone called insulin, which acts as a key that allows the sugar that is circulating in the bloodstream to enter the body's cells so that they can use it as energy, in diabetes, the human body in some cases does not produce enough insulin or cannot properly use the insulin it produces.

When there is not enough insulin or the cells stop responding adequately to insulin, blood sugar levels increase, generating the disease, which generates complications that affect noble organs such as the heart, in the eyes due to the loss of vision as a result of the appearance of diabetic retinopathy and damage to the kidneys (kidney failure).

So far, no definitive cure has been established for this type of metabolic alteration, however, health promotion measures such as the implementation of new healthy lifestyles such as: eating healthy

foods, exercising, and prevention measures among which stand out: permanent medical controls for early diagnosis and short-term follow-up, In the medium and long term, they help prevent and control hyperglycemia (67).

3.1.1 Types of Diabetes

There are three types of diabetes: type 1 diabetes, type 2 diabetes, and gestational diabetes

Type 1 diabetes

Type 1 diabetes, also known as insulin-dependent, juvenile or childhood-onset, is characterized by the fact that the pancreas, the organ that regulates blood sugar, does not produce enough insulin, so those who suffer from it require the daily administration of insulin in the form of medication.

In 2017, there were more than 9 million people with this type of diabetes, most of them living in high-income countries. Its real cause is not known, nor are the means to prevent it.

The characteristic symptoms of this type of hyperglycemia are the triad of the three P's: Polydipsia (intense thirst), Polyphagia (uncontrollable desire to eat at all times) and Polyuria (excessive excretion of urine), in addition, they can present weight loss, decreased vision and fatigue.

Type 1 diabetes, which is characterized by autoimmune destruction of beta (B) cells and usually results in absolute insulin deficiency (latent autoimmune diabetes) and can also present with variable onset of presentation in adults. In adults, the disease does not manifest itself with the classic symptoms seen in children and they may experience a temporary remission of the need for insulin. The most useful features in distinguishing type 1 diabetes include younger age at diagnosis (<35 years), lower body mass index (<25 kg/m²), unintentional weight loss, ketoacidosis, and blood glucose levels greater than 360 mg/dL (20 mmol/L) at diagnosis.

Type 1 Diabetes is a chronic disease characterized by an absolute deficiency of insulin due to autoimmune destruction of beta cells in the pancreas. This condition is mainly distinguished in Type 2 Diabetes, which is usually associated with insulin resistance and may be related to lifestyle factors. Type 1 diabetes is less common than type 2 diabetes and is usually diagnosed in children, teens, and young adults, but in small percentages it can occur at any age.

The exact cause of Type 1 Diabetes is unknown, but it is thought to involve a combination of genetic predisposition and environmental factors that trigger the autoimmune response. This inappropriate immune response leads to the destruction of the beta cells of the pancreas that are responsible for the production of insulin. Insulin is an essential hormone for transporting glucose from the bloodstream to the body's cells, where it is used to produce energy. The destruction of beta cells results in insulin deficiency, which leads to elevated blood glucose levels (hyperglycemia).

The classic symptoms of Type 1 Diabetes include: excessive thirst (polydipsia), excessive urine production (polyuria), unusual hunger (polyphagia), weight loss, fatigue and blurred vision. These symptoms can develop quickly, often in a matter of weeks. Diagnosis is made through blood tests that measure glucose levels, glycosylated hemoglobin (A1c) tests, which reflect blood glucose control during the last three months, and sometimes, the presence of autoantibodies that are indicative of an autoimmune process.

The management of Type 1 Diabetes focuses on keeping blood glucose levels as normal as possible and preventing future complications. This is mainly achieved through regular insulin administration, either through multiple injections per day or through an insulin pump. Treatment also involves careful monitoring of blood glucose levels, a balanced and planned diet, and regular exercise. Patient education and ongoing support are critical components to effective disease management.

If Type 1 Diabetes is not properly controlled, it can lead to acute complications such as diabetic ketoacidosis, a life-threatening condition that arises when the body begins to break down fats at an accelerated rate due to a lack of insulin. In the long term, chronic hyperglycemia can cause serious complications affecting the heart, kidneys, eyes, nerves, and blood vessels.

The management of Type 1 Diabetes requires significant commitment and adaptation on the part of the patient and their family. This can have a considerable psychosocial impact, especially on children

and adolescents. Disease education, psychological support, and the integration of diabetes management into daily life are essential to achieve good disease control and maintain high quality of life.

In conclusion, Type 1 Diabetes is a complex and demanding disease that requires a careful and personalized approach to its management. Despite the challenges it presents, with proper treatment and a holistic approach that includes psychosocial and educational support, individuals with Type 1 Diabetes can lead healthy, active lives.

Type 2 diabetes

Type 2 Diabetes is a chronic disease that affects the way the body processes glucose, the main type of sugar in the blood. Unlike Type 1 Diabetes, which involves autoimmune destruction of insulin-producing cells, Type 2 Diabetes is primarily characterized by insulin resistance and, in advanced stages, decreased insulin production. This condition is more common in adults, although its incidence in children and adolescents is increasing due to the increasing rates of obesity, considered one of its most representative ethological causes today.

In Type 2 Diabetes, the body's cells do not respond effectively to insulin, a hormone that regulates the uptake of glucose into cells. This insulin resistance causes blood glucose levels to rise. Initially, the pancreas compensates for this disruption by producing more insulin, but over time, this overload can cause a decrease in beta cell function, reducing insulin production.

The main risk factors for developing Type 2 Diabetes include obesity, physical inactivity, older age, genetic predisposition, and certain ethnicities or population groups. Unlike Type 1 Diabetes, many of the risk factors for Type 2 Diabetes are lifestyle-related, meaning that the disease can be prevented or delayed through dietary changes and increased physical activity.

The symptoms of Type 2 Diabetes may be less noticeable than those of Type 1 Diabetes and may develop gradually. They include excessive thirst, increased urinary frequency, fatigue, blurred vision, and slow wound healing. Diagnosis is made by blood glucose testing and hemoglobin A1c measurement.

Treatment of Type 2 Diabetes focuses on controlling blood glucose levels to prevent complications. This can be achieved through lifestyle changes such as diet and exercise, and, in many cases, oral medication (hypoglycemic medications) and insulin. Effective management also includes controlling other risk factors such as high blood pressure and high cholesterol levels.

If left unchecked, Type 2 Diabetes can lead to a number of serious complications, including cardiovascular disease, neuropathy, kidney disease, retinopathy and an increased risk of infections. These complications result from long-term damage caused by elevated blood glucose levels.

Patient education is a key component in the management of Type 2 Diabetes. Patients should be trained on how to manage their condition including self-monitoring blood glucose, proper nutrition, and the importance of regular exercise. Ongoing support and counseling can help patients make sustainable lifestyle changes and better manage their condition.

In summary, Type 2 Diabetes is a complex disease influenced by several risk factors, many of which are related to lifestyle. Its management requires a holistic approach that includes lifestyle changes, education and, in some cases, medication. With proper treatment and management, individuals with Type 2 Diabetes can maintain good control of their disease and reduce the risk of complications.

Gestational diabetes

This type of diabetes is characterized by its appearance during the gestation stage, the increase in blood sugar despite being higher than normal, sometimes they are too low to diagnose diabetes. Pregnant women are at higher risk of complications during pregnancy and childbirth, and they and their children are at risk of developing type 2 diabetes in the future (68).

Globally, between 2000 and 2016, there was a sustainable 5% increase in premature mortality from diabetes. In 2014, in the Region of the Americas, 8.3% of adults over the age of 18 had diabetes (8.5% globally).

In the Americas in 2019, diabetes ranked sixth as the leading cause of death with an estimated 284,049 deaths directly caused and 44% of all deaths from hyperglycemia occurred before the age of 70 (1.5

million deaths) and 48% before the age of 70 worldwide. In addition, it is the second leading cause of disability-adjusted life years (DALYs), demonstrating that this disease produces limiting complications in people throughout their lives.

An estimated 62 million people in the Region of the Americas are living with type 2 diabetes mellitus (DM), this number has tripled in the Americas since 1980 and is estimated to reach 109 million people by 2040.

Obesity, overweight and physical inactivity have been shown to be the main risk factors for developing hyperglycemia, especially type 2, the prevalence of overweight in young people and adults in the Region of the Americas is almost double that observed worldwide. Of these, about 80.7% of adolescents in the Region of the Americas are physically inactive (69).

This condition develops when a pregnant woman's body is unable to produce enough insulin to cope with the effects of a hormone produced during pregnancy that increases insulin resistance. As a result, blood glucose levels rise. Gestational diabetes is usually diagnosed by glucose tolerance tests between 24 and 28 weeks of gestation, although it can be performed before this time period in women at high risk.

Some factors that increase the risk of developing gestational diabetes include being overweight or obese, older age during pregnancy (usually over 25 years old), a family history of diabetes, a personal history of prediabetes or gestational diabetes in previous pregnancies, and certain ethnicities with a higher predisposition.

Uncontrolled gestational diabetes can have several complications. For the mother, these include an increased risk of pregnancy-induced high blood pressure, preeclampsia, and an increased risk of developing Type 2 Diabetes later in life. For the baby, risks include macrosomia (larger-than-normal body size), complications during delivery, low blood glucose levels after birth, and an elevated risk of obesity and diabetes in later life.

The management of gestational diabetes focuses on keeping blood glucose levels within a normal range. This is often achieved through dietary changes and increased physical activity. In some cases, treatment with insulin or oral diabetes medications may be necessary. In addition, regular follow-up is important to monitor the health of the mother and fetus, including blood glucose testing and evaluations of fetal growth and well-being.

Although gestational diabetes usually resolves after childbirth, women who have had it have a higher risk of developing Type 2 diabetes later in life. Therefore, long-term follow-up including regular blood glucose testing and adopting a healthy lifestyle is recommended to reduce this risk.

Although not all forms of gestational diabetes can be prevented, adopting a healthy lifestyle before and during pregnancy can reduce this risk, including maintaining a healthy weight, eating a balanced diet, and engaging in regular physical activity. Education on the management of Gestational Diabetes is crucial for pregnant women and to ensure the health of both the mother and the health of her baby. In summary, gestational diabetes, an important condition and closely related to pregnancy, requires careful management to protect the health of both mother and baby. Education, implementation of healthy lifestyles, regular monitoring of the gestational process, timely diagnosis and treatment, followed by adequate postpartum follow-up and control, are essential to minimize the risks and long-term complications that are associated with this condition.

Diabetes can be diagnosed using plasma glucose values, either the fasting plasma glucose (FPG) value or the plasma glucose value at 2 hours (2-h PG) during a 75 g oral glucose tolerance test (OGTT) or by titration of glycosylated hemoglobin (Hb A1C) values (21).

In general, both the assessment of the FPG value and the 2-h PG value during the 75 g OGTT and the Hb A1C are equally appropriate for diagnostic detection. It is important to note that detection rates vary across different tests across both populations and individuals. In addition, the efficacy of interventions for the primary prevention of type 2 diabetes has been demonstrated primarily in individuals with impaired glucose tolerance (AGT), with or without elevated fasting glucose, but not

in individuals with impaired isolated fasting glucose (IFG) or in those with Hb A1C criteria defined prediabetes.

The same tests can be used for the detection and diagnosis of diabetes, as well as to identify people with prediabetes. Diabetes can be identified either in apparently low-risk individuals who undergo glucose testing, in people who are evaluated and assessed as at risk of developing diabetes, or in symptomatic patients (70).

Type 1 Diabetes

The diagnosis of Type 1 Diabetes is often made in response to the symptoms of diabetes which can include: extreme thirst, frequent urination, unusual hunger, and unexplained weight loss. Typical tests include fasting plasma glucose (FPG) measurements and oral glucose tolerance tests (OGTT). An FPG level of 126 mg/dL (7.0 mmol/L) or higher, or a glucose level of 200 mg/dL (11.1 mmol/L) or higher in an OGTT indicate diabetes. In addition, autoantibody tests are often performed to confirm Type 1 diabetes, as it is an autoimmune disease.

• Type 2 Diabetes

In Type 2 Diabetes, screening is often done in individuals without symptoms, but with risk factors such as obesity, advanced age, or family history. The diagnostic criteria are similar to those for Type 1 Diabetes, with a focus on measuring FPG, OGTT, and hemoglobin A1C levels. An A1C level of 6.5% or higher is considered diagnostic for this condition. Type 2 diabetes is often diagnosed in later stages due to the slow progression of the disease and the absence of symptoms in the early stages.

• Gestational diabetes

Gestational diabetes is diagnosed during pregnancy and is usually performed between 24 and 28 weeks of gestation. The most common test is the 75g OGTT. Glucose values are measured on an empty stomach and then at intervals after consuming a glucose solution. Diagnostic criteria vary slightly from the other types of diabetes, with lower thresholds given the specific risks to the pregnancy and fetus.

•Prediabetes

Prediabetes, a condition that precedes type 2 diabetes, is characterized by blood glucose levels that are higher than normal, but not high enough to be classified as diabetes. Criteria for the diagnosis of prediabetes include an Hb A1C level between 5.7% and 6.4%, an FPG of 100 to 125 mg/dL (5.6 to 6.9 mmol/L), or a glucose level of 140 to 199 mg/dL (7.8 to 11.0 mmol/L) on the OGTT.

Importantly, in all types of diabetes, confirmation of the diagnosis should be made by repeat testing (except in cases of clear symptoms of hyperglycemia and a random plasma glucose result ≥ 200 mg/dL). In addition, the diagnosis of diabetes is not only based on the measurement of blood glucose, but must also consider the clinical context and symptoms of the patient. Ongoing evaluation and monitoring are crucial for the effective management of any type of diabetes.

In the following figure, the American Diabetes Association (ADA) allows us to visualize the diagnostic criteria for Diabetes Mellitus, in which, with the exception of the values for Hb A1c, all represent cut-off points for the assessment in plasma or venous serum.

	Normal	"Prediabetes"		Diabetes Mellitus
		Glucemia de ayuno alterada (GAA)	Intolerancia a la glucosa (IGA)	
Glucemia de ayuno	<100 mg/dL	100 - 125 mg/dL	No aplica	≥ 126 mg/dL
Glucemia ≥ horas poscarga	<140 mg/dL	No aplica	140 -199 mg/dL	≥ 200 mg/dL
Hemoglobina glucosilada A1c	<5.7 %	5.7 - 6.4%		≥ 6.5%

Table 1. Criteria for the diagnosis of DM or disorders of glucose regulation.

Source: American Diabetes Association (ADA) 2019 (71).

4.2 Arterial hypertension (HTN)

Definition and Classification

High blood pressure is commonly defined by blood pressure measurements where values equal to or greater than 140 mm Hg for systolic pressure (the top number) or 90 mm Hg for diastolic pressure (the bottom number) are elevated. Hypertension is classified into different categories such as: mild, moderate and severe arterial hypertension, classification based on the severity of blood pressure readings.

Blood pressure is the force exerted by blood against the walls of blood vessels (arteries) as it is pumped by the heart, the higher the tension, the more effort the heart must exert. Blood pressure is measured in millimeters of mercury (mm Hg). Blood pressure is expressed in two numbers (normal 120/80), the first number is known as systolic pressure, this is the pressure when the heart beats, and the second number is diastolic pressure, which is the pressure when the heart rests between its beats.

CATEGORÍA DE LA PRESIÓN ARTERIAL	SISTÓLICA mm Hg (número de arriba)		DIASTÓLICA mm Hg (número de abajo)
NORMAL	MENOS DE 120	y	MENOS DE 80
ELEVADA	120-129	y	MENOS DE 80
PRESIÓN ARTERIAL ALTA (HIPERTENSIÓN) NIVEL 1	130-139	o	80-89
PRESIÓN ARTERIAL ALTA (HIPERTENSIÓN) NIVEL 2	140 O MÁS ALTA	o	90 O MÁS ALTA
CRISIS DE HIPERTENSIÓN (consulte a su médico de inmediato)	MÁS ALTA DE 180	y/o	MÁS ALTA DE 120

Table 2. Blood Pressure Levels According to the American Heart Association, Inc., 2021

Source: American Heart Association, 2021(71).

HTN has become a public health problem due to the seriousness it implies if it is not treated in time, in many cases HTN does not cause symptoms and the only way to detect it in time is to take blood pressure periodically; It has been considered that in order to establish the diagnosis of arterial

hypertension, at least two different days should be taken and in both doses, the systolic blood pressure should be greater than or equal to 140 mmHg and the diastolic pressure should be greater than or equal to 90 mmHg.

The risk of hypertension may be increased in patients who share certain unhealthy behaviors such as: excessive salt consumption, diets high in saturated fats, insufficient diets in fruits and vegetables, physical inactivity, tobacco and alcohol consumption, overweight and obesity (modifiable risk factors), in addition to: family history of hypertension, older age over 65 years, underlying diseases such as diabetes and kidney disease (non-modifiable risk factors).

The vast majority of patients with high blood pressure have no symptoms, although very high blood pressure may present with excruciating headache, blurred vision, chest pain, dizziness, shortness of breath, nausea, vomiting, ringing in the ears, nosebleeds and eyes, confusion, anguish, and despair (72).

According to WHO data as of March 16, 2023, it is estimated that there are 1,280 million adults between 30 and 79 years of age with hypertension in the world and most of them (about two-thirds) reside in low- and middle-income countries, 46% of adults with hypertension, They are unaware that they suffer from this disease, only 42% are diagnosed and treated, one in five hypertensive adults (21%) have the problem under control, given that hypertension is one of the main causes of death of NCDs in the world, one of the global goals is to reduce its prevalence by 25% by 2030.

Annually, it is estimated that about 1.6 million deaths from cardiovascular diseases occur in the region of the Americas and one of them is hypertension, of which about half a million people are under 70 years of age, these deaths are premature but preventable. Hypertension affects between 20 and 40% of the adult population of the Americas, reflecting the fact that around 250 million people suffer from it (72).

Causes and Risk Factors

The exact cause of hypertension is often not known, which is called primary or essential arterial hypertension. However, certain factors can increase the risk of developing it and include genetics, older age, being overweight or obese, lack of physical activity, excessive salt consumption, alcohol consumption, stress, and certain medical conditions such as sleep apnea. Secondary hypertension is caused by underlying medical conditions such as kidney disease, certain blood vessel defects, or the use of certain medications.

1. **Genetics:** There is a significant hereditary predisposition in hypertension. If close relatives have a history of hypertension, the risk of developing this pathology increases.
2. **Age:** With aging, blood vessels tend to lose their elasticity, which can contribute to increased blood pressure.
3. **Overweight or Obesity:** Excess body weight puts a greater workload on the heart to pump blood through the body, which can raise blood pressure.
4. **Physical Inactivity:** Lack of regular physical activity can contribute to increased body weight and decreased cardiovascular health, both of which are risk factors for hypertension.
5. **High Sodium Diet:** Excessive salt consumption can cause fluid retention in the body, which can increase high blood pressure.
6. **Excessive Alcohol Consumption:** Excessive and regular alcohol consumption can damage the heart and blood vessels leading to an increase in blood pressure.
7. **Chronic Stress:** Prolonged stress can contribute to high blood pressure, possibly through mechanisms related to inappropriate lifestyles such as an unhealthy diet and lack of exercise.
8. **Additional Dietary Factors:** In addition to excessive salt intake, a diet low in potassium, magnesium and calcium, and a high intake of saturated fat and cholesterol can also increase the risk of developing hypertension.

9. **Kidney Diseases:** Disorders that affect the kidneys, such as chronic kidney disease, can lead to the development of hypertension due to fluid retention and alteration of the balance of salts in the body.
10. **Endocrine Disorders:** Pre-existing conditions such as primary hyperaldosteronism, Cushing's syndrome, hypothyroidism or hyperthyroidism can cause hypertension.
11. **Sleep Apnea:** Characterized by interrupted breathing during sleep, it is strongly associated with increased blood pressure.
12. **Congenital Anomalies:** Congenital defects in the blood vessels, such as coarctation of the aorta, may be responsible for hypertension in some individuals.
13. **Medications:** Certain drugs, including oral contraceptives, corticosteroids, nonsteroidal anti-inflammatory drugs (NSAIDs), and some cold medicines, can increase blood pressure.
14. **Illicit Drug Use:** The use of stimulant drugs, such as cocaine and amphetamines, can cause a significant increase in blood pressure.

In both types of hypertension, the identification and management of these risk factors are essential to prevent the development of hypertension and to effectively manage the condition in those who already suffer from it. Early detection through regular check-ups and modification of modifiable risk factors can play a crucial role in reducing the risk of serious complications associated with hypertension.

Symptoms

HTN is known as the "silent killer" as it often has no noticeable symptoms until it causes significant organ damage. In cases of severe hypertension or hypertensive crisis, symptoms may include severe headaches, confusion, blurred vision, chest pain, and shortness of breath.

Hypertension often goes unnoticed in its early stages due to the lack of obvious symptoms, which justifies its nickname "silent killer". However, when symptoms occur, especially in advanced stages or in hypertensive crisis situations, they can be severe and require immediate medical attention.

The most relevant signs and symptoms are described below:

- **Severe Headaches:** They can be very frequent and more intense particularly in the morning hours, they do not yield to common painkillers.
- **Nausea and Vomiting:** These are often accompanied by severe malaise following a headache.
- **Confusion or Cognitive Problems:** Difficulty concentrating, episodes of confusion, or changes in mental status.
- **Blurred Vision or Vision Problems:** Hypertension can cause changes in the blood vessels of the eye, leading to blurred vision, visual impairment and even vision loss.
- **Chest Pain:** High blood pressure can increase the risk of heart problems, manifesting itself in the form of chest pain or pressure.
- **Shortness of breath:** Manifests as a feeling of shortness of breath, which can be a sign of heart or lung complications associated with hypertension.
- **Nosebleeds:** Although less common, episodes of unilateral or bilateral nosebleeds may occur in some cases.
- **Hypertensive Crisis Symptoms:** In a hypertensive crisis, where blood pressure levels are extremely high, the symptoms are more severe and require emergency medical attention.

Due to the asymptomatic nature of hypertension in its early stages, early detection through regular blood pressure checks is crucial, especially in individuals with risk factors. Knowledge and attention to the signs and symptoms, even when they are subtle, can be critical in treating and preventing serious complications in which they can trigger hypertension.

Diagnosis

The diagnosis of hypertension is made by regular blood pressure measurements. Several measurements are required at different times to confirm the diagnosis, due to the natural variability of blood pressure. Blood pressure monitoring is a process that involves the accurate and repeated

measurement of blood pressure to determine if levels are consistently high. This diagnostic process is crucial, given that hypertension is a condition that usually does not present clear symptoms until it has already caused significant damage.

Blood Pressure Measurements:

- **Measurement Procedure:** Blood pressure is measured using a calibrated sphygmomanometer that can be digital or manual. The measurement should be performed in a calm environment, ensuring that the patient is seated comfortably with the arm resting at the level of the heart, and has not consumed caffeine, exercised, or smoked for at least 30 minutes prior to the measurement.
- **Diagnostic Criteria:** According to current medical guidelines, a systolic blood pressure (the top number) of 130 mm Hg or higher, or a diastolic blood pressure (the bottom number) of 80 mm Hg or higher, is indicative of hypertension.
- **Repeated Measurements:** Due to the natural variability of blood pressure, several measurements at different times are required to confirm the diagnosis of hypertension. This may include measurements on different days or over a period of time (week) in order to establish a consistent pattern of how the pressure has varied.
- **Ambulatory Blood Pressure Monitoring (ABPM):** In some cases, ABPM may be recommended, which involves the use of a device that measures blood pressure at regular intervals throughout the 24 hours. ABPM can provide a more accurate graphical representation of blood pressure fluctuations in the patient's daily life.
- **Cardiovascular Risk Assessment:** Once hypertension has been diagnosed, it is important to assess the patient's overall cardiovascular risk. This may include tests to detect other diseases or superadded alterations such as high cholesterol, diabetes, and other cardiovascular risk factors.
- **Electrocardiogram (ECG) and echocardiogram:** These are used to evaluate the function and structure of the heart.
- **Blood and urine tests:** These are used to evaluate kidney function and look for signs of kidney disease.
- **Fundus Examination:** Very useful for detecting changes in the blood vessels of the eyeball and at the same time diagnosing intraocular hemorrhages due to increased intraocular hypertension, synonymous with hypertension.

In cases where hypertension appears to be secondary to another medical condition, additional testing may be necessary to identify underlying causes such as kidney or endocrine problems.

In summary, the diagnosis of hypertension is based on repeated and careful measurements of blood pressure along with a comprehensive assessment of cardiovascular risk and the search for possible damage to very noble organs. This detailed approach is essential for the effective management of hypertension and for the prevention of associated complications.

Complications

If left untreated, hypertension can lead to serious complications including heart disease, stroke, kidney failure, eye damage, and other cardiovascular conditions. Arterial hypertension (HBP), without timely and adequate treatment, can result in a series of serious complications that affect multiple organs and various systems in the body. These complications are the result of chronically elevated blood pressure, which causes progressive damage to blood vessels and other organs.

Among the most serious complications is heart disease, which encompasses a variety of conditions, including coronary artery disease, which can lead to angina and heart attacks. High blood pressure places an additional burden on the heart, which can lead to thickening of the heart walls (left ventricular hypertrophy) and eventually congestive heart failure, where the heart cannot pump blood efficiently.

In addition, hypertension is one of the main causes of stroke. Increased high blood pressure can damage blood vessels in the brain, which can lead to a stroke due to a clot (ischemic stroke) or hemorrhage (hemorrhagic stroke). These events can cause extensive brain damage, resulting in long-term disability or even death.

Renal insufficiency is another significant complication of uncontrolled hypertension. The kidneys, which are highly vascularized organs, are particularly vulnerable to damage caused by hypertension. Over time, hypertension can lead to impaired kidney function, resulting in chronic kidney disease and, in severe cases, the need for dialysis or kidney transplantation.

Damage to the eyes, known as hypertensive retinopathy, is also a potential complication. High blood pressure can damage the delicate blood vessels in the retina, which can lead to changes in vision and, in severe cases, blindness. In addition, hypertension increases the risk of developing other cardiovascular conditions, such as peripheral artery disease, which affects blood flow to the extremities and can cause pain and fatigue in the legs.

Taken together, these complications underscore the importance of effective management of hypertension to prevent long-term damage. Proper blood pressure control not only helps minimize the risk of these serious complications, but also contributes to a better quality of life and increased longevity.

3.3 Overweight and obesity

Overweight and obesity are chronic medical conditions that are characterized by excessive accumulation of fat at the body level. These conditions represent a significant global public health problem and are associated with an increased risk of health problems including cardiovascular disease, type 2 diabetes, metabolic disorders, hypertension, sleep apnea, and certain cancers.

Overweight and obesity are generally defined through the calculation of the Body Mass Index (BMI), a measure that relates a person's weight and height. A BMI between 25 and 29.9 is considered overweight, while a BMI of 30 or higher is classified as obese. BMI provides a general estimate of the degree of body fat, but does not take into account other important factors such as fat distribution or body composition.

Causes of Overweight and Obesity

Overweight and obesity are the result of an imbalance between calorie intake and energy expenditure. Genetic, metabolic, environmental, and behavioral factors can contribute to this disruption. Some risk factors include:

- **Unhealthy diet:** Consuming foods high in calories, refined sugars, and saturated fats can contribute to weight gain.
- **Physical inactivity:** Lack of regular physical activity makes it difficult to burn calories and can lead to weight gain.
- **Genetic factors:** Genetics play an important role and can influence a person's predisposition to overweight and obesity.
- **Psychological factors:** Stress, depression, and other emotional factors can lead to unhealthy eating behaviors.
- **Socioeconomic factors:** Access to healthy food and the availability of exercise options may be limited by socioeconomic factors.

Health Impact

Overweight and obesity are linked to a number of serious health problems such as cardiovascular disease, high blood pressure, type 2 diabetes, liver disease, certain types of cancer (such as breast cancer and colon cancer), sleep disorders, and musculoskeletal problems. In addition, obesity can have a significant impact on a person's quality of life, causing limitations in their mobility and physical bodily function.

Below is a more detailed description of the adverse effects these conditions can have on a person's health:

1. **Cardiovascular Diseases:** Overweight and obesity are important risk factors for the development of cardiovascular diseases such as coronary heart disease, heart failure and stroke. The accumulation of fat in the arteries can narrow blood vessels and increase blood pressure, increasing the workload of the heart and increasing the risk of serious cardiac events.
2. **High Blood Pressure:** Excess weight can lead to an increase in blood pressure, which increases the risk of high blood pressure. Uncontrolled hypertension can have serious health consequences such as damage to vital organs and cardiovascular disease.
3. **Type 2 Diabetes:** Obesity is one of the main risk factors for type 2 diabetes. Excess body fat can interfere with insulin function, resulting in elevated blood sugar levels. Type 2 diabetes can lead to serious complications such as cardiovascular disease, kidney damage, and vision loss.
4. **Liver disease:** The accumulation of fat in the liver, known as hepatic steatosis, is common in people who are overweight or obese. This can lead to more serious liver diseases such as nonalcoholic steatohepatitis (NASH) and cirrhosis.
5. **Cancer:** Overweight and obesity are associated with an increased risk of certain cancers including breast cancer, colon cancer, uterine cancer and others. Underlying mechanisms may include changes in hormones and chronic inflammation.
6. **Sleep Disorders:** Obesity can contribute to sleep disorders, such as sleep apnea, in which the airway is repeatedly obstructed during sleep, which can lead to interruptions in breathing and poor quality sleep.
7. **Musculoskeletal Problems:** Excess weight can put extra pressure on the joints, especially the knees, increasing the risk of musculoskeletal problems such as osteoarthritis and chronic joint pain.
8. **Quality of Life:** Obesity can have a significant impact on a person's quality of life. Mobility may be limited, making it difficult to participate in physical, social, and work activities. In addition, weight-related discrimination and stigma can have negative psychological and emotional effects.

In summary, overweight and obesity are associated with a number of serious health consequences that can affect a person's quality of life and life expectancy. It is essential to address these health problems early through lifestyle changes, medical interventions, psychological interventions to prevent and treat excess weight and its complications.

Prevention and Treatment

Prevention and treatment of overweight and obesity are essential to reduce the risk of associated diseases and improve quality of life. This may include:

- **Dietary changes:** Adopt a balanced diet rich in fruits, vegetables, whole grains, and lean proteins.
- **Increased physical activity:** Incorporate regular physical activity into your daily routine.
- **Behavior modification:** Addressing unhealthy eating habits and emotional factors that may contribute to weight gain.
- **Medical support:** In cases of severe obesity, support from healthcare professionals who can recommend medical treatments or surgery may be necessary.

Public Health and Awareness

Overweight and obesity are major public health concerns worldwide. Public health strategies seek to promote healthy eating habits, encourage physical activity, and increase awareness of the risks

associated with excess weight. Education and prevention are essential to address the already considered global obesity epidemic and reduce its impacts on the health of populations.

- **Promotion of Healthy Eating Habits:** One of the main strategies is the promotion of a balanced and healthy diet. This includes educational campaigns that highlight the importance of consuming fruits, vegetables, whole grains, and lean proteins, while limiting intake of foods high in calories, refined sugars, and saturated fats. It also promotes the importance of controlling portion sizes and reducing the consumption of ultra-processed foods.
- **Promotion of Physical Activity:** To combat a sedentary lifestyle, regular physical activity is promoted. This can include campaigns that encourage people to incorporate exercise into their daily routine such as walking, cycling, or participating in sports activities. In addition, it seeks to improve access to safe public spaces for physical activity such as parks and trails
- **Awareness and Education:** Community awareness of the risks associated with overweight and obesity is critical. Awareness-raising campaigns that inform about the health consequences and quality of life of these conditions become priority actions, this includes disseminating information on the relationship between excess weight and chronic diseases such as diabetes, cardiovascular diseases and cancer.
- **Health Regulation and Policies:** In many countries, policies and regulations are implemented to address the problem of obesity. These policies may include labeling foods, increasing taxes on sugary drinks, restrictions on advertising unhealthy foods to children, and promoting healthy environments in schools and workplaces.
- **Access to Health Care:** Health care plays a crucial role in the prevention and treatment of overweight and obesity. Access to health care services that provide weight management support, nutritional counseling, and medical treatment options when needed is encouraged.
- **Research and Evaluation:** Continued research into the causes and effective strategies to address overweight and obesity is essential. Studies are conducted to better understand the underlying factors and assess the effectiveness of public health interventions.

Ultimately, the fight against overweight and obesity requires a comprehensive approach involving local governments, health professionals, the food industry and society as a whole. Education and prevention are critical to reversing this global epidemic and improving the health and well-being of populations around the world.

WHO classification of body weight according to BMI

- BMI less than 18.5 Underweight
- BMI between 18.5 and 24.9 Normal or healthy weight (normal weight)
- BMI between 25.0 and 25.9 Overweight
- BMI between 30.0 and 34.9 Grade I obesity
- BMI between 35.0 and 39.9 Grade II obesity
- BMI greater than 40.0 Grade III obesity (75).

One of the causes of overweight and obesity is related to an energy imbalance between calories consumed and calories expended. In general, poor eating habits and lack of physical exercise are the consequence of environmental and social changes associated with development and the lack of supportive policies in sectors such as health, agriculture, transport, urban planning, the environment, education and, finally, processing. The distribution and marketing of unhealthy foods are causes for the appearance of this type of disease.

Excess weight (high BMI) is an important risk factor for the onset of NCDs, these health conditions encompass a diverse group of diseases that share the same characteristic of having a prolonged and generally progressive course. Some of the most prominent NCDs linked to excess weight include:

- **Cardiovascular Diseases:** Being overweight and obese significantly increases the risk of cardiovascular diseases, such as coronary heart disease, high blood pressure, and stroke. Excess body fat can contribute to plaque deposition in the arteries, which narrows blood vessels and hinders blood flow, thus increasing the load on the heart.
- **Type 2 Diabetes:** Weight gain is closely linked to the development of type 2 diabetes. Insulin resistance is a condition in which cells do not respond properly to insulin, it is common in people who are overweight or obese resulting in elevated blood sugar levels.
- **Respiratory Diseases:** Excess body fat can negatively affect lung function and increase the risk of respiratory diseases such as sleep apnea and dyspnea.
- **Certain Cancers:** Overweight and obesity have been shown to be linked to an increased risk of developing certain types of cancer, including breast cancer, colon cancer, and uterine cancer. Underlying mechanisms may include the influence of body fat on hormones and inflammation.
- **Liver disease:** Non-alcoholic fatty liver disease (NASH), a condition in which fat builds up in the liver, is more common in people who are overweight. NASH can progress to more serious liver diseases, such as cirrhosis.
- **Diseases of the Musculoskeletal System:** The additional load of excess weight can increase pressure on the joints and contribute to the development of musculoskeletal problems such as osteoarthritis and joint pain.

In summary, excess weight through a high BMI is a significant risk factor for the development of NCDs. These chronic diseases can have a negative impact on people's quality of life and long-term health. Therefore, prevention and weight management are critical to reducing the risk of these alterations and improving overall public health.

Chronic Non-Communicable Diseases (NCDs) include:

1. **Cardiovascular Diseases:** This group of diseases includes heart disease and stroke. Excess body fat can contribute to the buildup of atheromatous plaques at the level of the arteries, which narrows blood vessels and increases blood pressure, thus increasing the risk of serious cardiac events.
2. **Type 2 Diabetes Mellitus:** Weight gain is strongly associated with the development of type 2 diabetes mellitus. Insulin resistance, which is commonly seen in people who are overweight or obese, results in elevated blood sugar levels and an increased risk of this disease.
3. **Osteoarticular Disorders:** Excess weight can put extra pressure on the joints, increasing the risk of osteoarticular disorders, such as osteoarthritis and osteoarthritis. These conditions can cause pain and limit mobility.
4. **Cancer:** Overweight and obesity are associated with an increased risk of developing several types of cancer including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon cancers. The underlying mechanisms may involve hormonal changes and chronic inflammation.

Childhood overweight and obesity require urgent attention in view of the fact that they have now become a major public health problem to consider, a high BMI in children is associated with a possibility of developing premature death and permanent disability in adulthood. In addition, children with obesity are the ones who are prone to have breathing difficulties, risks of fractures, hypertension, insulin resistance and psychological alterations (76).

Facts & Figures

According to data from the Pan American Health Organization (PAHO), there has been an alarming increase in overweight and obesity rates globally in recent decades:

- **Global Obesity Growth:** In the period between 1975 and 2016, there has been a shocking increase in the prevalence of obesity globally. During this time span, obesity has tripled worldwide, reflecting a worrying trend.
- **In 2016, more than 1.9 billion adults over the age of 18 worldwide were overweight, and within this group, 13% were considered obese.** These figures illustrate the magnitude of the problem in the adult population globally.
- **Impact on Childhood:** The problem of overweight and obesity also significantly affects children. In 2016, an estimated 41 million children under the age of five were already overweight or obese. In addition, more than 340 million children and adolescents in the 5-19 age range were in the same situation, underscoring the importance of addressing these diseases from an early age.
- **Prevalence in Children and Adolescents:** The prevalence of overweight and obesity in children and adolescents (aged 5 to 19 years) has increased considerably over time. In 1975, only 4% of this age group was overweight, while in 2016 this figure had exceeded 18%. This increase has been consistent across both sexes, with 18% of girls and 19% of boys overweight in 2016.
- **Increase in Obesity in Children:** One of the most disturbing data is the increase in the prevalence of obesity in children and adolescents aged 5 to 19 years. In 1975, less than 1% of this population was considered obese, while by 2016, the figure had risen to 124 million, representing 6% in girls and 8% in boys. This increase is of deep concern and underscores the need for effective interventions in the prevention and treatment of childhood obesity.

These shocking statistics highlight the magnitude of the global epidemic of overweight and obesity, underscoring the growing concern around the world about this public health problem.

Data presented by the Pan American Health Organization (PAHO) show alarming data on the severity of the problem:

- **Alarming Trend:** Between 1975 and 2016, obesity has experienced a dizzying increase, tripling globally. This alarming trend reflects the urgent need to address this challenge effectively.
- **Impact on the Adult Population:** In 2016, more than 1.9 billion adults over the age of 18 worldwide were affected by being overweight, and within this group, approximately 13% were in the obese category. These figures are a testament to the scope of the epidemic and its implications for public health.
- **Affecting Childhood:** The concern is not limited to adults, since in 2016 it was estimated that 41 million children under the age of five were already overweight or obese. In addition, more than 340 million children and adolescents between the ages of 5 and 19 were in the same situation, thus highlighting the importance of addressing this problem from an early age.
- **Prevalence in Children and Adolescents:** The prevalence of overweight and obesity in children and adolescents aged 5 to 19 years has increased dramatically. It went from a modest 4% in 1975 to more than 18% in 2016. This significant increase was observed in both girls (18%) and boys (19%) in 2016.
- **Rise of Childhood Obesity:** A worrying fact is the significant increase in obesity in children and adolescents between the ages of 5 and 19. In 1975 less than 1% of this population was in the obesity category, while by 2016, this figure had risen alarmingly to 124 million, with 6% attributable to girls and 8% attributable to boys.

In Ecuador, NCDs have become a public health problem that is difficult to solve, this type of metabolic diseases have become one of the main serious disorders for the public health system of our country, so much so, that the problems of overweight and obesity are conditions that, like Diabetes and Arterial Hypertension, They are noted for the poor quality of life suffered by their carriers, as well as the low educational knowledge that people have (53), which shows that social and gender

inequalities are present in a modern society. This urgently encourages the adoption of healthy lifestyles in accordance with a modern society (78).

On the other hand, and within the same context, hypertension is one of the most prevalent diseases, its prevalence is high and is increasing with the development of new population groups, establishing itself mainly as a biomedical problem, so as it is not of a transmissible nature, emphasis is placed on lifestyles, social participation, the management of stress and negative emotions, access to socio-cultural resources and, above all, economic access (25).

Obesity, hypertension and diabetes in their different stages are classified among the main NCDs in our country due to the frequency with which they have occurred in recent decades, NCDs have become a burden of disease that represents about 43% and that are increasing; They are also responsible for 59% of deaths. It is estimated that by 2020, the increase would be 73% for deaths and 60% for morbidity, which reflects the direct influence of economic, social, congenital and other factors (79).

These characteristics and their palliative care become more difficult for PPLs, as access to medicine and specialized professionals is more difficult and limited; Therefore, this group of vulnerable people are more likely to worsen their disease due to the conditions in which they develop their daily lives. However, and paradoxically, the health of this vulnerable group is evidenced as a right that is guaranteed and promulgated under the constitution of the state, the Constitution of the Republic of Ecuador.

Generally, this group of diseases in PPL stands out for having become a serious problem for public health throughout the world and in our country in view of having evidenced that NCDs are responsible for 60% of mortality cases and integrate about 75% of public expenditure for treatment and care of people suffering from this type of disease. In addition, it has been determined that one out of every two inmates has some type of chronic disease based on a prison population of 1,077 PPL with an average age of 37.4 years, Of these, 17.8% suffer from hypertension and 5.3% have diabetes mellitus, while the rest of the population has a variety of pathologies that include dyslipidemias, asthma, chronic obstructive disease (COPD) and others. It is important to note that many of these pathologies are the cause of alternative risk factors such as obesity in the first instance, followed by smoking, alcohol consumption and controlled substances such as cocaine (52).

In the case of rehabilitation centers for PPL in Ecuador, the prevalence of this type of disease is high, especially for cases of high blood pressure. In about half of PPLs, this disease has been found to be present. Among those affected, 47.7% have diastolic hypertension, 52.3% have systolic hypertension, and 7.7% of them have additional comorbidities. In the case of diabetes mellitus, a higher frequency has been observed in people aged 30 to 64 years, reaching 64.6%. As for overweight, this pathology affects 56.9% of the population, followed by obesity with 23.1%. Within this, the lack of adequate attention in the diagnosis, treatment and management of these pathologies stands out, which leads to these diseases being the main causes of mortality (80).

There are several reasons why these types of diseases are not diagnosed or controlled early, one of them is that the vast majority of social rehabilitation centers do not have optimal health facilities, nor do they have adequate health personnel for the early diagnosis and control of these pathologies. and according to the current data provided by the Inter-American Commission on Human Rights (IACHR), it establishes that one of the main problems that prisons have in Ecuador is physical space, as a general statistic of overcrowding, it is known that the state houses around 36,599 PPL when the real housing capacity of the prisons, It is a maximum of 30,169 persons deprived of liberty.

Data on prison overcrowding in Ecuador have been cross-referenced with statistical data from the Office of the United Nations High Commissioner for Human Rights (OHCHR), showing that the data provided by the National Service for the Comprehensive Care of Adults Deprived of Liberty and Adolescent Offenders (SNAI) does not match reality. this was corroborated after a visit to a women's prison, which apparently had 70 PPLs available, and in fact, could only accommodate approximately 21 people. According to the IACHR, the nominal capacity declared by the Ecuadorian state is based exclusively on a number of beds and does not concern the actual accommodation capacity (81),

experiences of neighbouring countries with rehabilitation centres with the same characteristics as ours, reflect that overcrowding, limited privacy and enclosed space represent a risk for the spread of infectious diseases and that chronic non-communicable diseases are increasing in prevalence (60). For more details regarding current figures for 2021, tables 3 and 4 are presented. These data confirm the persistence of significant levels of prison overcrowding in Ecuador.

Mes de reporte	Población Penitenciaria Promedio	Capacidad Instalada Efectiva	% Hacinamiento
Enero	38.362	29.897	28,31%
Febrero	38.633	29.897	29,22%
Marzo	38.570	30.043	28,38%
Abril	38.903	30.099	29,25%
Mayo	38.985	30.165	29,24%
Junio	39.073	30.165	29,53%
Julio	38.985	30.165	29,24%
Agosto	38.800	30.169	28,61%
Septiembre	38.386	30.169	27,24%
Octubre	37.612	30.169	24,67%
Noviembre	37.007	30.169	22,66%
Diciembre	35.834	30.169	18,78%
Promedio Anual 2021	38.240	30.169	26,75%

Table 3. Average Prison Population, Effective Installed Capacity and % of Monthly Overcrowding
Source: Administrative Records of Detention Centres, Comprehensive Care Service for Adults Deprived of Liberty and Adolescent Offenders (SNAI) (82).

The figure provided shows a monthly report of the average prison population, its installed capacity and the percentage of overcrowding in the Ecuadorian prison system during the year 2021.

The average prison population fluctuates throughout the year, starting in January with 38,362 inmates and peaking in June with 39,073 inmates. After June, the population begins to decline, reaching its lowest number in December with 35,834 inmates. Effective installed capacity, which refers to the number of places available to house inmates, remains relatively constant throughout the year, with a slight increase in March and then remaining stable at 30,169 places from July to December.

The percentage of overcrowding indicates how far above the installed capacity the prison population is, and it can be observed that the percentage decreases progressively throughout the year. It starts with 28.31% in January and ends with 18.78% in December, which could suggest an improvement in overcrowded conditions. This change could be due to the decrease in the prison population or to the optimization of available resources and spaces.

Looking at the annual average, it can be seen that the average prison population was 38,240 inmates, compared to an effective installed capacity of 30,169 places, resulting in an average overcrowding of 26.75% throughout the year. This indicates that, on average, facilities were operating above their designed capacity during 2021.

The figure reflects a common challenge in prison systems: overcrowding, although the situation seems to improve towards the end of the year, overcrowding is a persistent problem exceeding the effective installed capacity each month. This overcrowding can have significant implications for the health and well-being of inmates, as well as for the security and operations of correctional facilities. It is important, urgent and necessary for the competent authorities to address these issues in order to ensure humane and safe conditions of detention.

Condiciones	Nro. de PPL
Discapacidad	8 (no todas tienen carné)
Enfermedades crónicas	111 (principalmente diabetes e hipertensión)
Embarazadas	8 (permanecen en el centro solo hasta la semana 26 de gestación, posteriormente son enviadas a la Casa de Confianza)
Enfermedades contagiosas (TB)	Ninguna
Enfermedades psiquiátricas	35 (reciben medicación mensual)

Table 4. Existing diseases in the women's ward deprived of liberty of the CRSR of Cotopaxi, 2019.
Source: Obtained from data provided by the Ombudsman's Office in Ecuador (dpe) (18).

The table provides relevant information on the medical and health conditions of persons deprived of liberty (PPL) at the Cotopaxi social rehabilitation center (women's pavilion). The conditions are divided into five categories, with the corresponding number of people affected in each:

- **Disability:** There are 8 people with some type of disability. An additional observation is made that not all of these persons have a card certifying their disability.
- **Chronic Diseases:** A total of 111 people have chronic diseases such as diabetes and hypertension, these 2 NCDs are the most predominant. Chronic diseases are those that are long-lasting and generally slow to progress.
- **Pregnant women:** There are 8 pregnant women in the population. These women remain at the center only until the 26th week of gestation, after which they are transferred to the "Casa de Confianza," a center or program that appears to offer a specialized environment and care for pregnant women.
- **Communicable Diseases (TB):** There are no reported cases of tuberculosis (TB), a potentially serious infectious disease.
- **Psychiatric Illnesses:** There are 35 people who suffer from psychiatric illnesses and are receiving monthly medication. This indicates ongoing care and likely follow-up by specialized medical services within the facility.

This table appears to indicate that the facility is actively monitoring and managing various health conditions of its incarcerated population, with a particular focus and focus on the specific needs of individuals (pregnant women) as opposed to vulnerable conditions (chronic or psychiatric illnesses). The absence of TB appears to suggest effectiveness in preventive or control measures for communicable diseases. Mental health care is highlighted by the number of people who receive psychiatric medication on a regular basis.

4. Conclusions

The proposed epidemiological diagnosis is essential not only to understand the magnitude and characteristics of Diabetes Mellitus, Arterial Hypertension and Overweight at the Sierra Centro Norte Cotopaxi Regional Social Rehabilitation Center, but also to explore how social determinants influence these conditions. This comprehensive approach promises to provide valuable knowledge and tools to address key challenges in the field of public health.

The social justification for carrying out this study is clear and compelling. By exploring how chronic diseases and social determinants interact in a rehabilitation facility, the study not only addresses a

crucial public health need, but also contributes to the building of a more aware, inclusive, and equitable society.

In Ecuador, most of the Social Rehabilitation Centers lack the minimum conditions of medical facilities and equipment suitable for providing safe, reliable and total care with the absence of dangers that PPLs require, above all, to implement rehabilitation and health care programs during their stay in these centers. In 2019, the National Service for the Comprehensive Care of Adults Deprived of Liberty and Adolescent Offenders (SNAI), proceeded with a health evaluation of its facilities and equipment to the country's rehabilitation centers and determined to have found several problems within which, in consideration of the health axis, it highlighted that most rehabilitation centers do not have the minimum necessary number of adequate and trained personnel. In addition, they do not have the materials, supplies, or minimum equipment to proceed with the implementation of health activities contemplated by the comprehensive care model (18).

Therefore, it is essential and urgent to design a comprehensive epidemiological diagnosis of the PPL of one of the social rehabilitation centers such as the one in the regional north-central highlands of Cotopaxi, which is in line with the MAIS and that contemplates in the future the design of one or more programs that encompass an effective PS. as well as programs that contribute to the prevention of diseases, specific programs or activities that must be attached to an efficient and effective Primary Health Care, in order to provide and return to the PPL, a total and complete state of physical and psychological well-being, in order to leave a precedent that in the future can be considered for replication at the level of all rehabilitation centers in the country.

The presence of communicable, non-communicable and chronic infectious diseases in the population deprived of liberty at the Sierra Centro Regional Rehabilitation Centre in Cotopaxi that have not been diagnosed, recorded, analysed and treated, as well as the few records (daily reports) of prevalent morbidity available at the social rehabilitation centre; the lack of knowledge of the main DSS involved in the deterioration of the quality of life of prisoners reflects the fact that the institutions in charge of the rehabilitation of a PPL do not have a baseline diagnosis, with clear and real information that allows the authorities in charge of making strategic decisions that benefit this vulnerable group (31).

The results of a comprehensive and effective epidemiological diagnosis that contain real data on a morbidity and mortality profile in PPL, the incidence of one or more health problems, as well as exposure to social, personal, environmental, and cultural determinants, are key and relevant elements to define the implementation of health strategies that improve the quality of life of this vulnerable population group.

Thus, the central research problem for the study of the epidemiological diagnosis of Diabetes Mellitus, Arterial Hypertension and Overweight at the Sierra Centro Norte Cotopaxi Regional Social Rehabilitation Center, Zonal Coordination 3, Ecuador, in 2023, focuses on the lack of detailed and specific information on the prevalence and management of these chronic diseases in a context of social rehabilitation. This problem is broken down into several fundamental aspects that require attention and detailed analysis (32).

One of the key challenges is the absence of population-specific epidemiological data in rehabilitation centers in Ecuador. Although there are general statistics on Diabetes Mellitus, High Blood Pressure, and Overweight in the general population, there is a notable lack of information about these conditions in specialized settings such as rehabilitation centers. This lack of data prevents a full understanding of the magnitude of these chronic diseases in this specific setting and thus hinders the development of effective intervention strategies.

Another aspect of the problem is the limited understanding of how social determinants impact the health of individuals in rehabilitation settings. Although it is widely recognized that factors such as socioeconomic status, education, and social environment influence health, there is little research addressing how these determinants operate in a social rehabilitation setting. This creates a knowledge gap that is essential to fill in order to improve the care and well-being of this vulnerable population (33).

In addition, there is a gap in understanding how these chronic conditions are managed within the rehab center. Treatment and prevention strategies that are effective in the general population may not be equally applicable in a rehabilitation setting due to differences in resources, infrastructure, and social dynamics. This failure to adapt health strategies to the specific needs of the facility's population can result in inadequate management of these diseases, exacerbating their impact on the health and quality of life of inmates.

Another dimension of the problem is the potential impact of these chronic diseases on the social reintegration of the individuals in the center. Ineffective management of Diabetes Mellitus, High Blood Pressure, and Overweight can have significant consequences not only for physical health, but also for mental health and general well-being, thus affecting the chances of successful social reintegration (34).

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