Research Article

Recent Overview of Diabetes in Mexico and its Impact on Public Health

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Abstract

Diabetes is a chronic disease that originates once the pancreas can no longer produce insulin or when the body cannot use this hormone efficiently, characterized by being an irreversible metabolic disorder that greatly undermines the health and hope of life of the people. It is classified into 3 types: type 1 diabetes, type 2 diabetes and gestational diabetes.

The present research proposes, within a general overview, an update to the reader about diabetes in Mexico; developing themes with recent literature on the subject and thus provide new perspectives on this important public health problem.

Keywords: Public Health; Diabetes; México; Quality of Life; Deterioration of Health

Introduction

In the world, it is estimated that there are 540 million people living with diabetes, according to the diabetes atlas carried out in 2021 by the International Diabetes Federation (IDF), which represents 10.5% of the population. adult between the age values ranging from 20-79 years and almost half are not aware that they live with this condition. Likewise, the IDF reported that more than 90% of these people have type 2 diabetes and by the year 2045 approximately 783 million will be living with this disease, which is expected to be an increase of 46% [1].

According to the World Health Organization, diabetes is classified as a non-communicable disease (NCD). These continue to cause the greatest burden of disease worldwide and their impact has worsened. From 2000 to 2019, the number of deaths increased from 31 million to 41 million. The top four NCDs are cardiovascular diseases (17.9 millions deaths), cancer (9.3 millions deaths), chronic respiratory diseases (4.1 millions deaths) and diabetes (2.0 millions deaths) [2].

Mexico is not exempt from this serious public health problem. On the contrary, it is one of the nations with the highest incidence of diabetes worldwide. The IDF reported for that country that 18% (14.6 million people) of its adult population has diabetes and it is expected that by 2030 it will occupy the 7th place in the world in terms of the highest number of cases [3].

On the other hand, the IDF diabetes atlas in 2021 estimated that the deaths attributable to this disease in Mexico represent a figure of 184,384 deaths, also a prevalence of 16.9%, a health expenditure of 19,946.8 million dollars and a adult population of 83,741.6 suffering from this morbidity [4].

Currently in Mexico, diabetes is the third cause of death among its inhabitants; It is estimated that just over 100,000 people die each year, with adults over 65 years of age being the population group most affected in terms of deaths. As for the main cause of diabetes, bad eating habits are attributed, which include refined sugars, saturated fats and sodium. As if that were not enough, we add to this list sedentary lifestyle, obesity and the genetic factor that further complicates this major public health problem [5].

Materials and Methods

A descriptive, non-experimental review investigation was carried out that provides the reader with an update with information on useful concepts about this constantly and persistently evolving global public health problem such as Diabetes. Databases such as: National Library of Medicine, Pubmed, Google Scholar, Scielo, Ciencia Latina Revista Multidisciplinar, International Diabetes Federation, IMMS, WHO, Pan American Health Organization placing in the search the descriptors: diabetes complications, International Diabetes Federation, diabetes in Mexico 2023, novel treatments for diabetes. Obtaining a total of 22 documents made up of 08 scien-

tific articles, 2 thesis, websites of international organizations, of which 16 were selected for this research, published between 2021 and 2024. As selection criteria, sources of relevant, truthful and accurate information were collected; Considering research not older than 4 years from its publication, updated and with special emphasis on the subject. Finally, those bibliographic reviews that were carried out before 2021 were not considered, nor were the publications whose database was of unknown origin, which did not allow free access and also those that could not be referenced for their corresponding bibliographic citation.

Results and Discussion
Some health organizations in Mexico

The Mexican Social Security Institute (IMSS) is the Institution with the greatest presence in health care and social protection for Mexicans since its foundation in 1943. One of its functions is to organize programs and protocols for the benefit of Mexicans patients. In 2023, to achieve and maintain control of diabetes mellitus, avoid its consequences and achieve a good quality of life, the IMSS provided care to more than 3.5 million beneficiaries through the Comprehensive Care Protocol (PAI) that is based in: prevention, diagnosis and treatment. This protocol consists of guidelines that provide timely diagnosis, pharmacological and non-pharmacological treatment. One of the novelties offered by the PAI protocol is the incorporation of new medications that have made it easier for the family doctor and the specialist to better guide the treatment and thus avoid or delay the appearance of chronic diseases. Without a doubt these initiatives are of great help, but when comparing the number of patients covered by the IMMS (3.5 millions) compared to the 14.6 million that exist in Mexico, the analysis indicates that there are around 11.1 million people within the Mexican population that does not have access to this type of programs [6].

The prevalence of diabetes in Mexico is high and represents a complex care challenge for the health system and a decrease in the quality of life expectancy of the population. In this sense, ENSANUT (National Health and Nutrition Survey) in 2022 reported that from 2006 to 2022, the prevalence of diabetes has increased considerably from 14.4 to 18.3%. The importance of developing and strengthening actions that contribute to a healthy environment and decisions by the population is évident [7].

The American continent is the region with the highest number of overweight/obesity and physical inactivity in the world, according to the Pan American Health Organization. 63 out of every 100 adults suffer from obesity and 39 out of every 100 people tend to be sedentary. Mexico is a country located in the region of the Americas and is also part of this discouraging statistic [8].

Impact of diabetes

Diabetes is a leading cause of blindness, kidney failure, heart attacks, strokes and lower limb amputation. Diabetic patients should undergo periodic screening tests for complications in order to achieve timely detection; which includes screening for kidney disease, regular eye exams, and foot evaluations [8].

The high prevalence of diabetes also triggers cardiovascular diseases. A study by Russo., *et al.* In 2023, he reported in his research that "the majority of patients were female (52.6%), with an average age of 70 years, and the chronic non-communicable cardiovascular diseases that were the most frequent comorbidities were: 88% dyslipidemia, 75% hypertension arterial, 55% obesity, 35% smoking and 7% sedentary lifestyle. Which indicates that the elderly adult population continues to present a high cardiovascular risk, with poor compliance with therapeutic objectives [9].
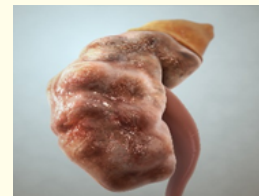

Figure 1: Diabetic foot.

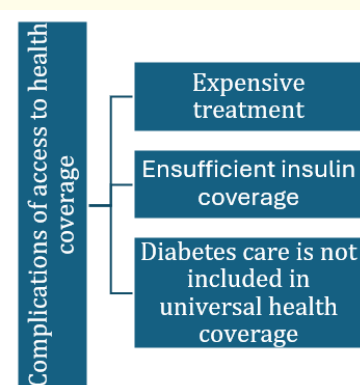**Figure 2:** Kidney affected by kidney failure.

Figure 3: Barriers to accesing health care [8].

Another impact of diabetes in Mexico that is little talked about is that of the patients' relatives who adopt a role as caregivers, because the health service does not include care coverage for each patient. Health professionals from the Mexican Social Security Institute (IMSS) developed an investigation that consisted of the SF-36 health questionnaire and the Zarit scale where they determined that the level of health-related quality of life in caregivers with patients with complications due to type 2 diabetes mellitus had a mean value of 74.8. It was observed that 5.05% of caregivers have light overload and 5.05% have intense overload [10].

Advances in treatments

Currently, sodium and glucose cotransporter-2 inhibitors (iSGLT2) and glucagon-peptide-1 receptor analogues (arGLP1) offer the possibility of advancing double or triple therapy without increasing the risk of hypoglycemia, prevention cardiovascular and no weight gain, on the contrary, weight reduction that patients perceive very positively, also facilitating therapeutic adherence [11].

It is of utmost importance to highlight that GLP-1 RAs reduce the risk of microvascular complications and mortality in patients with T2DM. To date, almost all GLP-1 RAs are available only as injectable medications. Semaglutide is a novel GLP-1 RA that can be administered weekly by subcutaneous injection. Recently, the US Food and Drug Administration (FDA) approved an oral formulation of semaglutide, which expanded the treatment options available for patients with T2DM while being lower cost and more effective compared to other treatments such as sitagliptin and empagliflozin [12].

On the other hand, we know that insulin is an essential treatment, but concomitantly there may be certain limitations to the onset time and duration of the effect. This has led to the development of new insulin analogues, although some have been approved and others are in the pipeline of experimentation, the reality is that progress is being made in the production of new alternatives such as those shown in the following table [13].

Pharmacological groups under study for the treatment of type 2 diabetes	
Pharmacological treatment	**Performance**
α-glucosidase inhibitors	Effective in reducing postprandial hyperglycemia.
Modulator of β-cell Na+ channels	Increased insulin secretion through ranolazine-type molecules.
Glucokine enzyme activators	functioning of the β cell and hepatocyte and that is directly involved in the regulation of insulin secretion.
Inhibitor of Na+/glucose cotransporter 1 and 2 of the intestinal brush border and renal tubule	reduce the absorption of hexose in the digestive tract and increase its urinary excretion: dapaglifozin.
Reducers of insulin resistance with decreased hepatic cortisol regeneration through inhibition of protein tyrosinephosphatase 1B	inhibit acetylCoA carboxylase 1 and 2.
Insulin sensitizers	Dual agonists or pan-agonists of peroxisome proliferator-activated receptors (PPAR receptors) They activate dopamine D2 receptors: bromoergocryptine.
Other GLP1 agonists in development: albiglutide, taspoglutide, lixisenatide.	-
Others: dipeptidylpeptidase-4 inhibitors (alogliptin, teneligliptin, dutogliptin and gemigliptin).	-
Metabolic surgery (bariatric surgery) in obese people	Bypass gástrico, derivación biliopancreática

Table 1: Pharmacological groups under study for the treatment of type 2 diabetes [11].

New meal insulins	The objective of prandial insulins is that as glucose is absorbed from food and reaches the blood, it is mobilized to the peripheral tissues, maintaining blood glucose within a normal range.
New basal insulins	The development of new basal insulins aims to obtain long-acting insulins, for more than 24 hours, requiring a single daily dose, with a flat pharmacokinetic and pharmacodynamic profile, low inter- and intra-individual variability, and low risk of hypoglycemia.
Glargine U300 (Gla-300)	It is a second generation analogue that has a longer effect, lasting more than 24 hours 10. Gla-300 was approved for use in people with T1D from 6 years of age.
Degludec (IDeg)	IDeg reduces the incidence of nocturnal hypoglycemia, presents fewer episodes of hyperglycemia with ketosis, and requires a lower dose than other basal insulins.
Biosimilar insulins	Biosimilars are biological medicines similar to an already approved one, which contain substances (proteins) from a biological source such as cells or microorganisms (bacteria or yeast). It still needs to be approved with quality stan.'l,dards'
LY2963016 (LY IGlar)	Insulin LY2963016 is the first Biosimilar of insulin glargine approved on the market. The most important benefit of good quality biosimilars is that they could reduce the cost of insulin and create competition in the market.
Smart insulins	They protect the drug from degradation, improving its stability, allowing it to cross biological barriers, such as the lung or intestinal barrier, and increasing its bioavailability. These new delivery systems, including insulins, are being studied, but still only in animal models.

Nanoliposomas	This system would improve the bioavailability of oral insulins. Furthermore, when absorbed through the gastrointestinal tract, they enter the portal circulation, inhibiting hepatic glucose synthesis.
Polymer nanospheres	Hydrogen peroxide destroys the lipid membrane and releases insulin. This system functions as a sensor of tissue blood glucose, delivering insulin as required.
Erythrocyte membrane	These new glycemic-dependent insulin release systems, or smart insulins, simulate the function of the pancreatic beta cell. There are studies in diabetic animals (mice) with positive results, with a good hypoglycemic effect, however, studies in humans are still required.

Table 2: New insulins analogues [13].

Conclusion

In conclusion, there is an urgent need to implement more efficient strategies for medical care and prevention of these complications, in order to improve the quality of life of this vulnerable population [14].

In 2021, the Mexican government, through standard NOM-051-SCFI/SSA1-2010, established a front labeling system for foods and non-alcoholic products. This labeling is made up of 5 octagon-shaped warning seals, which, in a clear, simple and visible way, indicate when a product contains excess nutrients and critical ingredients such as: calories, saturated fats, trans fats, sugar and sodium. This initiative will help the population raise awareness about choosing healthier nutritional options, improve good nutritional culture and thus prevent metabolic alterations that lead to deterioration of health and quality of life. Time and the Mexican population itself will determine in a few years if this new measure was successful [15].

Finally, adherence to treatment is extremely important for the correct management of chronic diseases and diabetes mellitus is no exception. If it is accompanied by factors of physical activity, dietary monitoring and attendance at medical appointments, as indicated by the World Health Organization, better results would be achieved. It is considered pertinent that the Mexican government invest a little more in the health system to provide quality coverage to its patients with the inclusion of physical trainers, nutritionists and doctors who are needed in this work [16].

Conflicts of Interest

The author has not conflict of interest to declare.

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