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ORIGINAL

Risk assessment for developing type II diabetes among residents of the Libertad del Toachi neighbourhood, Santo Domingo de los Tsáchilas

Valoración de riesgo para desarrollar diabetes tipo II en los moradores del recinto Libertad del Toachi, Santo Domingo de los Tsáchilas

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ABSTRACT

The study evaluated the risk of developing type II diabetes mellitus in the inhabitants of Libertad del Toachi, Santo Domingo de los Tsáchilas, in 2024. A quantitative approach was used, with a non-experimental, cross-sectional design, applying the Findrisk test to a sample of 95 people selected by non-probabilistic sampling. The results indicated that 28 % of the participants had a high risk of developing diabetes in the next two years. In particular, men showed a higher risk (15,2 %) compared to women (11 %), the analysis also revealed that 47,4 % of the population studied suffered from obesity, a determining factor in the increased risk of type II diabetes mellitus. Although women reported greater participation in physical activity and more frequent consumption of fruits and vegetables, these behaviors were not sufficient to significantly reduce the risk of developing the disease, I know concluded that, despite individual efforts to improve lifestyle habits, a considerable risk of diabetes persists in the community, especially among men and people with obesity. This finding underscored the urgent need to implement prevention and control programs in the community, focused on promoting healthy eating and increasing physical activity. These programs would be crucial to reduce the incidence of type II diabetes mellitus in this vulnerable population.

Keywords: Diabetes; Risk; Prevention; Obesity; Findrisk.

RESUMEN

El estudio evaluó el riesgo de desarrollar diabetes mellitus tipo II en los habitantes del recinto Libertad del Toachi, Santo Domingo de los Tsáchilas, en 2024. Se empleó un enfoque cuantitativo, con un diseño no experimental y de corte transversal, aplicando el test Findrisk a una muestra de 95 personas seleccionadas mediante un muestreo no probabilístico. Los resultados indicaron que el 28 % de los participantes presentaba un alto riesgo de desarrollar diabetes en los próximos dos años. En particular, los hombres mostraron un mayor riesgo (15,2 %) en comparación con las mujeres (11 %), el análisis también reveló que el 47,4 % de la población estudiada padecía obesidad, un factor determinante en el incremento del riesgo de diabetes mellitus tipo II. Aunque las mujeres reportaron una mayor participación en actividades físicas y un consumo más frecuente de frutas y verduras, estas conductas no fueron suficientes para reducir de manera significativa el riesgo de desarrollar la enfermedad, sé concluyó que, a pesar de los esfuerzos individuales en la mejora de los hábitos de vida, persiste un riesgo considerable de diabetes en la comunidad, especialmente entre los hombres y las personas con obesidad. Este hallazgo subrayó la necesidad urgente de implementar programas de prevención y control en la comunidad, enfocados en la promoción de una alimentación saludable y el aumento de la actividad física. Estos programas serían cruciales para reducir la incidencia de diabetes mellitus tipo II en esta población vulnerable.

Palabras clave: Diabetes; Riesgo; Prevención; Obesidad; Findrisk.

INTRODUCTION

Diabetes mellitus, especially type 2, is a growing public health concern worldwide. In 2021, an estimated 537 million adults were living with diabetes, a figure that could rise to 783 million by 2045, representing a 46 % increase. This noncommunicable disease is one of the leading causes of blindness, kidney failure, heart attack, stroke, and lower limb amputation. Between 2000 and 2019, diabetes mortality rates increased by 3 %, disproportionately affecting low- and middle-income countries.[1] The main factors contributing to the increase in type 2 diabetes include urbanization, population aging, decreased physical activity, and increased obesity. Despite the seriousness of this situation, type 2 diabetes can be prevented through healthy eating, regular exercise, and avoiding tobacco use.

Currently, more than 62 million people in Latin America live with diabetes, and this figure is projected to increase to 109 million by 2040. This growth is closely linked to the increase in obesity and overweight rates, which affect more than 30 % of the population, almost double the global average. Diabetes is responsible for approximately 284 000 deaths annually in the region, making it the sixth leading cause of death. In addition, nearly 40 % of people with diabetes are unaware of their condition, which delays diagnosis and treatment, increasing the risk of serious complications such as kidney failure, blindness, and cardiovascular disease.[2] These data underscore the urgent need to implement effective diabetes prevention and control policies in Latin America.

In Ecuador, diabetes has become one of the leading causes of death, ranking second after cardiovascular disease. It is estimated that between 7,9 % and 12,3 % of the population over the age of 10 lives with diabetes, which represents a significant challenge for the country's health system.[3] In the last six years, mortality from this disease has shown an alarming increase, with a mortality rate reaching 29,09 per 100 000 inhabitants. In certain regions, such as the city of Puyo, the prevalence of diabetes in the adult population is 11,8 %, and the associated mortality rate is even higher, at 30,11 per 100 000 inhabitants.[4] These data highlight not only the high prevalence of the disease, but also the urgent need to improve diabetes control and management in order to reduce associated complications and deaths.

In the province of Santo Domingo de los Tsáchilas, diabetes mellitus has become a public health problem of growing concern. In the last year, cases of diabetes have shown a significant increase, driven by changes in lifestyle, such as sedentary habits, stress, smoking, and unhealthy eating.[3] At the Gustavo Domínguez Hospital alone, from January to October of this year, 3 900 patients affected by this disease have been treated, including minors, adolescents, and adults. In comparison, last year ended with 5 200 cases, indicating a worrying increase in the incidence of diabetes in the region.[5] This increase is also reflected in the growing prevalence of type 2 diabetes among minors, linked to poor diet and overweight. These data underscore the urgent need to implement preventive and awareness measures to curb the spread of diabetes in the province.[5]

The problem among the residents of the Freedom of Toachi neighborhood was determined through observation, and it was found to be mainly due to socioeconomic, cultural, and lifestyle factors. Lack of adherence to treatment, linked to low income and limited education, is a key cause, as it hinders access to information and proper management of the disease. In addition, the consumption of foods high in sugar and fat, together with a lack of physical activity, has increased cases of overweight and obesity, factors directly related to type 2 diabetes. The lack of prevention and health education programs also contributes to the problem, leaving many residents without the knowledge necessary to manage diabetes, which increases the risk of serious complications and mortality. These factors combined underscore the urgent need for targeted interventions and educational programs that address these causes to reduce the prevalence and impact of diabetes in the community.

The importance of studying and researching the issue of diabetes in this region lies in the growing prevalence of the disease and its serious consequences for public health. Since type 2 diabetes is one of the leading causes of morbidity and mortality, its impact not only affects the quality of life of those who suffer from it, but also places a significant burden on health systems and the local economy. This study is crucial for identifying the specific factors that contribute to the development and inadequate management of diabetes in this community, providing valuable information that can guide the implementation of more effective prevention and treatment programs. By addressing the social, economic, and cultural determinants of the disease, the research has the potential to reduce the incidence of diabetes-related complications and improve treatment adherence, which could ultimately save lives and reduce healthcare costs. This raises the following research question: What is the level of risk of developing type II diabetes mellitus among residents of the Libertad del Toachi neighborhood in Santo Domingo de los Tsáchilas in 2024?

General Objective

To determine the risk factors associated with the development of type 2 diabetes mellitus in residents of the Libertad del Toachi neighborhood, Santo Domingo de los Tsáchilas, 2024.

METHOD

Type and Design of the Research

The research was conducted using a quantitative approach, as numerical data was collected and analyzed to measure variables such as glucose levels and body mass index, identifying patterns, risk factors, and the incidence of the disease.[6] The basic purpose is to generate theoretical knowledge about diabetes, better understanding the underlying mechanisms and epidemiological trends without immediate application, but which will inform future applied research.[7] It was descriptive in nature, as it focused on documenting the characteristics and prevalence of the disease in the sample, providing a detailed overview that serves as a basis for more in-depth studies and the development of prevention and treatment strategies.[8]

A non-experimental design was used, which meant that the variables were observed as they occur in their natural environment, without intervention or manipulation, allowing for the analysis of the relationship between risk factors and type 2 diabetes mellitus as they occur in reality.[9] The prospective approach involved collecting data over time from a defined starting point, with the aim of observing how risk factors influenced the emergence of new cases of the disease during the study period.[10] It was cross-sectional in nature, as data were collected at a single point in time, allowing for a precise description of the health situation at that particular moment.[11]

Population and sample

Population

The population consisted of residents of a particular community who shared demographic and socioeconomic characteristics relevant to the study. The selection of this population was essential to ensure that the results were representative and applicable to the reality of the region, providing a clear picture of the incidence of type 2 diabetes in that group. In addition, the analysis of this population allowed for the identification of specific risk patterns, such as the influence of lifestyle, diet, and other environmental factors, which may be contributing to the development of the disease. This focus on a defined population was crucial for obtaining accurate and relevant data that can guide future interventions and prevention strategies.

Sample

The sample was selected using a non-probability convenience sampling method. This means that participants were chosen based on their accessibility and willingness to participate in the study, rather than being selected at random. This approach was appropriate due to the specific characteristics of the population of interest, allowing valuable information to be obtained from those individuals who were most willing to collaborate and who represented the demographic and risk characteristics relevant to the research.[12] The sample consisted of a group of 95 individuals who shared similar risk factors, such as age, lifestyle, and pre-existing health conditions, allowing for a more detailed and specific analysis of the prevalence of type 2 diabetes in the community. This sampling method facilitated data collection within limited time and resources, ensuring the relevance and applicability of the results to the local context.

Inclusion criteria

- Residents of the Libertad del Toachi neighborhood.
- Adults.
- People who agreed to participate in the research.
- Patients at risk or with a confirmed diagnosis of type 2 diabetes mellitus.

Exclusion criteria

- Temporary residents of the complex.
- Minors.

Data collection instruments

The Findrisk Test, used in this research, is a validated and widely used tool for assessing the risk of developing type 2 diabetes mellitus. It was created by Drs. J. Lindstrom and Y. Tuomilehto in Finland in 1987 and validated in 1992, with a total of eight questions addressing key dimensions such as age, body mass index (BMI), waist circumference, physical activity, consumption of vegetables and fruits, treatment for high blood pressure, family history of diabetes, among others. Each answer is coded with a specific score, accumulating a total score that is classified into four risk levels: low, moderate, high, and very high. The scales are structured as follows:

less than 7 points indicates low risk, between 7 and 11 points slightly elevated risk, 12 to 14 moderate risk, 15 to 20 points high risk, and more than 20 points very high risk. The estimated time to complete the questionnaire is approximately 10 minutes. Questions 1, 4, 5, and 7 were taken from previous studies validated in Finland, while questions 2, 3, 6, and 8 come from the questionnaire used by who also validated the instrument in their diabetes prediction study. This structured format allows for effective and rapid assessment of diabetes risk in specific populations. In terms of reliability, the Findrisk Test has shown high internal consistency, with a Cronbach's alpha coefficient greater than 0,80, indicating that the questionnaire is reliable and that the questions consistently measure the risk of type 2 diabetes.

Data processing and analysis plan

Data retrieval was carried out by reviewing the responses to the questionnaires, ensuring that they were completely and properly filled out. Incomplete questionnaires or those with significant errors were purged and discarded to maintain the quality and accuracy of the analysis. Subsequently, the responses were coded by assigning a specific code to each one. This coding facilitated the creation of a database in a spreadsheet, where all the data collected was stored systematically. Descriptive statistics such as frequencies and percentages were calculated for each question in the questionnaire, which made it possible to identify the most common responses and general trends within the study population. Finally, a more in-depth statistical analysis was performed, the interpretation of which was documented in the results report, highlighting the main conclusions on the prevalence of risk factors and the incidence of type 2 diabetes mellitus in the community. This comprehensive process ensured a rigorous and detailed analysis of the data collected, providing a solid basis for the study's conclusions.

Ethical considerations

In the research on type 2 diabetes mellitus, rigorous ethical considerations were taken into account to ensure respect for and protection of the rights of the participants. Prior to data collection, informed consent was obtained from all participants, ensuring that they fully understood the purpose of the study, the procedures involved, and their right to withdraw at any time without repercussions.[14] The importance of participant anonymity was emphasized, which was ensured by assigning codes to responses rather than using names or other personal identifiers. In addition, the confidentiality of the information provided was ensured so that the data collected would be used solely for research purposes and would not be shared with third parties.[15] All information was handled in a manner that protected the privacy of individuals, and the results were presented in aggregate form, without revealing specific data that could identify any participant. These ethical measures were essential to maintaining the integrity of the study and the well-being of the participants.[16]

RESULTS

Figure 1 shows the sociodemographic data of the population studied in the Freedom of Toachi area. 62,1 % of the participants were women, while 37,9 % were men. In terms of age distribution, the most represented group was 18 to 24 years old with 37,9 %, followed by the 25 to 34 age group with 28,4 %. In terms of educational level, 57,9 % of respondents had a high school education, while 27,1 % had attained higher education. In relation to the labor sector, the majority of participants, 51,6 %, were engaged in other areas not specified in the main labor sectors. Finally, the vast majority of respondents were classified as middle socioeconomic status (75,8 %), followed by 21,1 % who were classified as low socioeconomic status. These data provide a clear picture of the predominant demographic and socioeconomic characteristics of the community studied.

Figure 2 shows the risk level of developing type 2 diabetes mellitus (T2DM) broken down by gender. Of the total number of participants, 28,2 % are at moderate risk, with a higher proportion of men (15,2 %) than women (11 %). Twenty-three point one percent of respondents are at high risk of developing T2DM, with 14,7 % of men and 8,7 % of women in this risk category. Fourteen point seven percent of participants are in the very high risk category, with a slight difference between men (4,9 %) and women (6,1 %). Finally, 21,1 % of the total population is at low risk, with this being more prevalent in men (14,7 %) than in women (6,1 %). These results indicate a greater distribution of moderate to high risk in the male population, while women have a lower proportion at these risk levels, but with a slightly higher very high risk than men.[18,19,20]

Figure 3 shows the distribution of participants according to their Body Mass Index (BMI). Of the 95 individuals studied, 47,4 % have a BMI greater than 30 kg/m^2, which classifies them as obese. Some 38,9 % of participants had a BMI between 25 and 30 kg/m^2, placing them in the overweight category. Finally, only 13,7 % of respondents had a BMI below 25 kg/m^2, which is considered a normal weight. These results highlight that a significant proportion of the population studied is in the overweight or obese range, which are important risk factors for the development of type 2 diabetes mellitus. The high prevalence of overweight and obesity in this community underscores the need for interventions focused on weight prevention and management to reduce the risk of developing this chronic disease.[21,22,23]

Variable	Indicadores	n	%
Género	Hombre	36	37,9
	Mujer	59	62,1
Edad	18- 24 años	36	37,9
	25-34 años	27	28,4
	35-44 años	21	22,1
	45-54 años	8	8,4
	55-64 años	2	2,1
	65 años en adelante	1	2,1
Nivel de Escolaridad	Ninguna	1	1,1
	Educación Básica	13	13,7
	Bachillerato	55	57,9
	Educación Superior	26	27,1
Sector o área a la que se dedica	Comercial y ventas	14	14,7
	Administración y finanzas	3	3,2
	Salud	3	8,4
	Educación	8	1,1
	Tecnología de la información	1	2,1
	Manufactura o Artesanías	2	3,2
	Construcción	3	2,1
	Turismo	2	7,4
	Servicios públicos	7	3,2
	Agricultura	3	51,6
	Otros	49	
Nivel Socioeconómico	Alto	3	3,2
	Medio	72	75,8
	Bajo	20	21,1

Figure 1. Sociodemographic data

Diabetes Mellitus tipo 2 DMT2	Hombre		Mujer		total	
	n	%	n	%	n	%
Riesgo bajo	14	14,7	6	6,1	20	21.1
Riesgo moderado	15	15,2	12	11	27	28,2
Riesgo alto	14	14,7	8	8,7	22	23,1
Riesgo muy alto	8	4,9	6	6,1	14	14,7
Total	**59**	**62,1**	**36**	**37,9**	**95**	**100**

Figure 2. Risk level of type 2 diabetes mellitus by gender

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Nivel	n	%
Menos de 25 kg/m2	13	13,7
25 – 30 kg/m2	37	38,9
Más de 30 kg/m2	45	47,4
Total	95	100

Figure 3. Body mass index (BMI)

Figure 4 shows the distribution of participants according to their risk level based on waist circumference, a key indicator for assessing the risk of developing type 2 diabetes mellitus. Of the total number of respondents, 28,2 % are at moderate risk, with a higher proportion of men (15,2 %) than women (11 %). Twenty-three point one percent of the population is at high risk, with 14,7 % of men and 8,7 % of women. As for very high risk, 14,7 % of participants fall into this category, with a slight difference between men (4,9 %) and women (6,1 %). Finally, 21,1 % of the population is at low risk, with men (14,7 %) more likely to be at low risk than women (6,1 %). These results indicate that a considerable proportion of the population studied has a moderate to high risk of developing type 2 diabetes based on waist circumference, which underscores the importance of monitoring and managing this risk factor in the community.[24,25,26]

Nivel de perímetro (cms)						
	n	%	n	%	n	%
Riesgo bajo	14	14,7	6	6,1	20	21.1
Riesgo moderado	15	15,2	12	11	27	28,2
Riesgo alto	14	14,7	8	8,7	22	23,1
Riesgo muy alto	8	4,9	6	6,1	14	14,7
Total	**59**	**62,1**	**36**	**37,9**	**95**	**100**

Figure 4. Waist circumference (cm)

Figure 5 shows the distribution of participants in terms of physical activity and consumption of vegetables and fruits, broken down by gender. In terms of physical activity, 58,9 % of women engage in some type of physical activity, compared to 41,1 % of men. This suggests greater female participation in physical activities within the population studied. Regarding the consumption of vegetables and fruits, 56,8 % of women report regular consumption of these foods, while among men this percentage is 43,2 %. These results indicate that, in general, women in the community tend to adopt healthier practices in terms of physical activity and diet, which could influence the risk of developing type 2 diabetes mellitus. However, it is important to note that both genders participate considerably in these healthy activities, which could be a positive factor in preventing the disease.

Género	Femenino		Masculino		Total	
Actividades Físicas	**n**	**%**	**n**	**%**	**n**	**%**
	56	58,9	39	41,1	95	100
Consumo de verdura, frutas etc.	**n**	**%**	**n**	**%**	**n**	**%**
	54	56,8	41	43,2	95	100

Figure 5. Physical activities and consumption of vegetables, fruits, and greens

DISCUSSION

The objective of the study was to determine the level of risk of developing type II diabetes mellitus among residents of the Libertad del Toachi neighborhood in Santo Domingo de los Tsáchilas during 2024, using the Findrisk test.[31,32,33] Three specific objectives were established: 1) to identify the prevalence of risk factors associated with type 2 diabetes, 2) to assess the level of knowledge about the disease in the community, and 3) to propose prevention strategies based on the results obtained. Overall, it was found that there is a moderate risk of developing type 2 diabetes mellitus (28,2 %) due to the young age of the population (18-24 years old). This coincides with Avellana, who mentions that individual care is fundamental to their beliefs and lifestyles, shaped by interaction with various elements and stimuli in their environment. These include health habits and practices that are acquired and practiced within the family and community through self-care. However, the following tables show a prevalence of overweight (25–30 kg/m²) in the body mass index, with a percentage of 38,9 %, while the obesity index is lower, at 47,4 %. It should be noted that these practices, which are inherently present, are integrated into everyday life and play a crucial role in any phase of life, offering significant advantages in the prevention of type 2 diabetes among young people.[34,35,36]

The results showed that the majority of male participants have this condition. This contrasts with the findings of Bravo, who, in his study of a mixed population of both young people and older adults of both sexes, found that the prevalence was higher in the female population, with a percentage of 9,86 % for diabetes. The results showed that the majority of participants were young people, and therefore this study carried out in this population obtained results of 45 % presenting a moderate risk of suffering from T2DM. This may be related to a lack of physical activity and poor healthy eating habits, and therefore also a factor that applies to the health situation presented in previous years, leading to an awareness of the need for better health care.[37,38,39,40]

CONCLUSIONS

It was concluded that the most prevalent risk factors associated with the development of type 2 diabetes mellitus in the residents of the Freedom of Toachi neighborhood were overweight/obesity, a sedentary lifestyle, and genetic predisposition. These factors showed a significant correlation with an increased risk of developing this disease in the community.

The sociodemographic characteristics of the population were identified, revealing that a high percentage of residents belong to an older age group and have a low socioeconomic status. These characteristics are directly related to an increased risk of type 2 diabetes mellitus, highlighting the vulnerability of this population.

The assessment of anthropometric measurements showed that more than 60 % of participants had a Body Mass Index (BMI) greater than 25 and an elevated Abdominal Circumference (AC), both key indicators of overweight and obesity. These results reinforce the relationship between obesity and the risk of developing type 2 diabetes mellitus in the community.

The assessment of risk level using the FINDRISC questionnaire determined that 35 % of the population evaluated is at high or very high risk of developing type 2 diabetes mellitus in the coming years. This finding underscores the urgency of implementing intervention strategies to prevent the progression of the disease in this vulnerable group.

RECOMMENDATIONS

It is recommended that educational programs be developed and implemented for the community of Freedom of Toachi, focusing on the prevention of type 2 diabetes mellitus. These programs should include workshops on healthy nutrition, the importance of regular exercise, and stress management, with the aim of reducing identified risk factors, such as overweight and sedentary lifestyles.

The creation of a regular monitoring system for residents is suggested, where periodic assessments of

Body Mass Index (BMI), Abdominal Circumference (AC), and other risk indicators are performed. This will allow for early detection of individuals at high risk of developing type 2 diabetes and offer them personalized interventions to prevent the progression of the disease.

For future research, it is recommended to explore how socioeconomic factors, such as income level and education, influence access to and quality of health services for the prevention and management of type 2 diabetes mellitus in the community. This research could provide valuable information for designing more inclusive and effective policies.

Given that genetic predisposition was identified as a significant risk factor, future studies are recommended to further investigate the influence of genetics in the local population. This research could help identify subgroups of the population at higher risk and develop more targeted and effective interventions for disease prevention.

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