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Oral health status of patients with Type 1 Diabetes Mellitus

Estado de salud bucal de pacientes con Diabetes Mellitus Tipo 1

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ABSTRACT

Introduction: one of the diseases that most affects the population from the oral point of view is Diabetes Mellitus, which has a tendency to increase its prevalence worldwide.
Objective: to characterize the oral health status of patients diagnosed with Diabetes Mellitus Type 1.
Methods: descriptive observational research, cross-sectional in the period from July 2020 to February 2021. Universe: 60 patients attended at the Endocrinology Office of the Provincial Center for Diabetic Care, Pinar del Río. Non-probabilistic purposive sampling of 26 patients according to inclusion criteria. Sociodemographic variables, oral diseases, family history and time of evolution of Diabetes Mellitus Type 1 were studied. Empirical methods were used: observation and interview; statistics: absolute and relative frequencies; Pearson's Chi-square statistic for a significance level of p<0.05 and Cramer's V coefficient.
Results: female sex, age group 12-18 years (53,84 %) and white skin color (76,92 %), gingivopathies (69,23 %) and patients with a family history of Diabetes   Mellitus Type 1 (65,38 %) predominated. By establishing the chi-square statistical calculation, a link was determined between oral diseases and the time of evolution of Type 1 Diabetes Mellitus (p<0,05).
Conclusions: in the population studied, a statistically significant relationship was confirmed between oral diseases and the time of evolution of Type 1 Diabetes Mellitus, so it is necessary to prioritize stomatological attention to these patients.

Keywords: Diabetes Mellitus; Oral Health.

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RESUMEN

Introducción: uno de los padecimientos que más afecta a la población desde el punto de vista bucal es la Diabetes Mellitus, teniendo esta una tendencia a aumentar su cifra de prevalencia a nivel mundial.

Objetivo: caracterizar el estado de salud bucal de los pacientes diagnosticados con Diabetes Mellitus Tipo 1.

Métodos: investigación observacional descriptiva, de corte transversal en el período de julio de 2020 a febrero de 2021. Universo: 60 pacientes atendidos en la consulta de Endocrinología del Centro Provincial de Atención al Diabético, Pinar del Río. Muestreo intencional no probabilístico de 26 pacientes según criterios de inclusión. Se estudiaron variables sociodemográficas, enfermedades bucodentales, antecedentes familiares y tiempo de evolución de la Diabetes Mellitus Tipo 1. Se emplearon métodos empíricos: observación y entrevista; estadísticos: frecuencias absolutas y relativas; estadístico Chi Cuadrado de Pearson para un nivel de significación de $p<0,05$ y coeficiente V de Cramer.

Resultados: predominó el sexo femenino, grupo etario 12-18 años (53,84 %) y del color de la piel blanca (76,92 %), las gingivopatías (69,23 %) y los pacientes con antecedentes familiares de Diabetes Mellitus Tipo 1 (65,38 %). Al establecer el cálculo estadístico chi cuadrado, se determinó un vínculo entre las enfermedades bucodentales y el tiempo de evolución de la Diabetes Mellitus Tipo 1 ($p<0,05$).

Conclusiones: en la población estudiada, se confirmó relación estadísticamente significativa entre las enfermedades bucodentales y el tiempo de evolución de la Diabetes Mellitus Tipo 1, por lo que es necesario priorizar la atención estomatológica a estos pacientes.

Palabras clave: Diabetes Mellitus; Salud Bucal.

INTRODUCTION

One of the conditions that most affects the population from the oral point of view is Diabetes Mellitus (DM), which is defined as a metabolic syndrome of multiple etiology characterized by chronic hyperglycemia and disorders in the metabolism of carbohydrates, fats and proteins, as a consequence of a defect in the secretion or action of insulin.[1]

This disease is considered a worldwide health problem. It is reported that globally there are 340 to 536 million people with the disease, according to statistics from the International Diabetes Federation and that by the year 2040, these numbers are expected to increase from 521 to 821 million affected.[2]

According to the World Health Organization (WHO) and the Pan American Health Organization (PAHO), in Latin America it is estimated that between 30 and 40 percent of the population affected by Type 2 Diabetes Mellitus does not know they have the disease, which affects more than 62 million people in the region. PAHO also points out that, unlike Type 1 Diabetes, it only represents between 5 and 10 percent of patients with this disease in the region, with Cuba being the country with the best glycemic control of its patients, according to its reports.[3]

Data from the 2019 Cuban Health Statistical Yearbook place diabetes as the eighth leading cause of death in the country. The province of Pinar del Río presented a prevalence of 64.9 affected per 1000 inhabitants, with the eighth place at the national level, while by 2021 it constituted the seventh cause of death at the national level with a prevalence rate in of 65.0 per 1000 inhabitants, which evidenced a discreet increase in diagnosed cases in only 1 year, with a total of 3449 patients with Diabetes Mellitus Type 1 in the province and 734 in the municipality.[4]

Due to the high prevalence of this disease in the Cuban population, it has been considered important to deepen the knowledge on the subject and increase the coverage and quality of the stomatological service.

As a consequence of Diabetes Mellitus a series of symptoms and signs are observed in the oral cavity such as: xerostomia, dysgeusia (loss of taste), increased susceptibility to infectious processes, dental caries, oral candidiasis, paresthesia, itching, burning, increased level of glucose in saliva, gingivitis, periodontitis, changes in pulp tissue and periapical tissues; in addition, lesions of the oral mucosa, such as lichen planus, may occur.[5,6]

In the case of periodontal disease, it maintains a bidirectional relationship with Diabetes Mellitus and they are often present at the same time. Not only does diabetes increase the risk of periodontal disease, but periodontal disease can also impair glycemic control. This is explained by the fact that diabetes causes a heightened inflammatory response to the presence of pathogenic bacteria in the gum, alters the ability to resolve inflammation and subsequent repair, which accelerates the destruction of periodontal support tissues, in turn periodontitis can initiate or increase insulin resistance favoring the activation of the systemic immune response initiated by cytokines.[7]

The increase of diabetic patients in Cuba and in the world in general and the incidence of oral diseases in these patients, motivated to carry out the present research with the objective of characterizing the oral health status in patients diagnosed with Diabetes Mellitus Type 1, attended in the Endocrinology office of the Provincial Center for Diabetic Care in the province of Pinar del Río.

METHODS

A descriptive, cross-sectional, observational research was carried out to characterize the oral health status of patients with Diabetes Mellitus Type 1, seen in the Endocrinology Office of the Provincial Center for Diabetic Care in the province of Pinar del Río, during the period from July 2020 to February 2021.

The universe was constituted by 60 patients attended in that consultation, from which a non-probabilistic intentional sample was selected integrated by 26 patients carriers of Diabetes Mellitus Type 1, who gave their consent to participate in the research, according to inclusion criteria.

Sociodemographic variables, oral diseases, family history and time of evolution of Type 1 Diabetes Mellitus were studied.

Data collection and management
The information used for the research was obtained through questioning and oral examination of the study sample, using a mouth mirror, explorer and artificial light source.

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The results were recorded in a data collection model (Annex 1), which was developed in an Excel spreadsheet and for a better understanding only the variables used are explained. Empirical methods were taken into account, among them: observation and interview, in addition to theoretical methods and procedures, among them, the hypothetical deductive method, the historical tendency method, and the scientific procedures of analysis-synthesis, induction-deduction, as well as the statistical method (descriptive and inferential statistics), all of them based on the dialectical materialist method as the general method of the research.

Techniques and procedures The information was stored in a Microsoft Office Excel database on a Pentium 5 personal computer that supports specialized statistical programs (SPS for Windows) and the digital and educational statistical package for epidemiological research was used for processing. In addition, percentages were used as summary measures and absolute and relative frequency distribution tables. Pearson's chi-square statistic was applied to determine the association between the nominal qualitative variables, with a 95 % confidence interval, in addition to establishing Cramer's V coefficient in case of statistically significant association between variables, to determine the degree of correlation between them, establishing a greater association between variables when the value was between 0,50- 1.Taking into account that the research was developed in patients with Diabetes Mellitus Type 1 up to 18 years of age and that there are no notable differences of the disease in pediatric ages, the variables were analyzed with respect to sex. During the development of the research, the modesty of the patients who were part of the study was respected; the study was developed with prior informed consent of the parents or guardians, with the use of good practices and respecting bioethical principles such as non-maleficence (Annex 2). The results obtained were used for strictly scientific purposes and will only be published in scientific events and journals.

RESULTS

The predominance of the female sex, the group 12 to 18 years with (53,84 %) and patients of white skin color with 76,92 %, is evidenced (Table 1).

Table 1. Sociodemographic characteristics of the sample. Provincial Center for Diabetic Care. Pinar del Río. 2020-2021.

General characteristics		Sex					
		Male		Female		Total	
		No.	%	No.	%	No.	%
Age groups	0-4	1	3,85	0	0	1	3,.85
	5-11	5	19,23	6	23,08	11	42,31
	12-18	5	19,23	9	34,61	14	53,84
Skin color	Blanca	8	30,77	12	46,15	20	76,92
	Negra	3	11,54	3	11,54	6	23,08

Gingivopathies were the predominant oral diseases with 69,23 %, with a higher frequency (42,31 %) in males

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Table 2. Distribution of patients examined with oral diseases according to sex.

Sex	Dental caries		Gingivopathies		Malocclusions	
	No.	%	No.	%	No.	%
Male	2	7,69	11	42,31	2	7,69
Female	5	19,23	7	26,92	4	15,38
Total	7	26,92	18	69,23	6	23,07

65,38 % of the population had at least one member of their family with this disease, with a predominance in the case of female patients with 38,46 %

Table 3. Distribution of the study population with a family history of Type 1 Diabetes Mellitus according to sex.

Sexo	No history		With history		Total	
	No.	%	No.	%	No.	%
Male	4	15,38	7	26,92	11	42,31
Female	5	19,23	10	38,46	15	57,69
Total	9	34,61	17	65,38	26	100

Table 4 shows the link between oral diseases and the time of evolution of Type 1 Diabetes Mellitus.

Statistical association and significant correlation was obtained between the variables oral disease and time of evolution of Diabetes Mellitus Type 1, with values of $x^2 = 11,81$, ($p < 0,05$) and Cramer's V coefficient with a value of 0,44.

Table 4. Oral diseases according to time of evolution of Type 1 Diabetes Mellitus.

Time of evolution of Type 1	Dental caries	Gingivopathies	Malocclusions	Total
Less than 1 year	1	4	0	5
1 to 5 years	5	2	4	11
6 or more years	1	12	2	15
Total	7	18	6	31

$x^2 = 11,81$ ($p < 0,05$) Cramer's V coefficient= 0,44

DISCUSSION

In this research there was no notable difference in the sex of the examinees, this data coincides with the results of Palmezano Díaz, et al.,[8] and Lagos Padilla, et al.,[9] where the predominant sex was female (61,3 % and 55,10 % respectively).

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Regarding age, the researchers state that the results of this variable depend on the behavior of this disease in countries with high or low incidence.

In the research of the Center for Disease Control and Prevention,[10] data similar to those of the present study are shown regarding skin color, they state that patients with white skin are more likely to suffer from the disease and they also refer that, due to the mixed race of the Cuban population, these data may vary. Arnold Domínguez, et al.,[2] are of the opinion that the predominance of a certain race shows the importance of the genetic factor in it.

In diabetic patients, oral diseases are frequent, especially gingivopathies, coinciding with the results of our research, authors such as Alulima Arrobo YD,[11] and Techera Pereira,[12] where there was a predominance of gingival alterations with 68% and 76,7 % respectively.

Both researchers state that the lack of metabolic control of the disease is closely related to the severity and extension of periodontal disease, which in turn maintains this imbalance, hence its bidirectional relationship and add that a diabetic patient who has an adequate glycemic index and control of his disease has a normal tissue response and defenses against infections.[11, 12]

Likewise, they express that gingival and periodontal diseases predominate in diabetic children, hence the importance of prevention and timely treatment of the pathology. They also added that the severity and extent of periodontitis in diabetic patients seems to be related to the control of the disease, since a well-controlled patient has a normal tissue response and defense against infections. Therefore, metabolic dyscontrol, disease duration and increasing age increase periodontopathies. [11, 12]

In the study, some patients had metabolic dyscontrol and received their insulin regulations, although all the elements that can cause this dyscontrol, such as the maintenance of adequate oral health, should be studied in depth.

According to Salvador Arroba et al [13], the relationship between both diseases is based on the fact that maintained hyperglycemia induces the progressive glycation of proteins, increases the final products of this process (AGEs), which act as chemotactic agents, promote exaggerated levels of proinflammatory cytokines, which will exacerbate the inflammatory response and destruction of periodontal tissue.

On the other hand, as periodontal inflammatory processes include chronic bacterial infection, this increases tissue resistance to insulin and leads to poor glycemic control. Hence the importance of avoiding inflammatory and infectious processes in these patients through prioritized care in all areas and levels of care.

Another variable to take into account in this type of diabetes is the genetic factor; in the present investigation, patients with a family history were representative. Arnold Domínguez ,et al.,[2] comment that there are at least 4 DNA segments that determine the risk of developing the disease.

State that there is a greater susceptibility to Type 1 diabetes in those patients with a family history, but that heredity alone does not determine its presentation, but that the patient must be exposed to a series of genetic and environmental factors for it to develop, whether viral infections, triggering food compounds, environmental toxins or when the body itself begins to destroy the insulin-producing cells in the pancreas. Therefore, they conclude that the disease is not inherited, but rather the probability of presenting it. [14]

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In the present study, when linking the variables: oral diseases and time of evolution of Type 1 Diabetes Mellitus, a significant relationship was found between them, due to the fact that inflammatory and infectious processes maintained for a long time can decontrol the glycemia indexes, which coincides with the data referred by authors such as Urbizo Obiol, et al.,[15] where the greatest importance is associated with periodontal diseases.

The researchers state that when there is hyperglycemia, xerostomia or decrease of salivary flow is promoted, as well as the peripheral vascular response due to the microangiopathy characteristic of this metabolic disease, these signs promote the accumulation of dentobacterial plaque, which is the main risk factor in the development of dental caries and gingivopathies.[15]

In the case of the study by Techera Pereira,[12] he also took into account that another effect is the process of tooth replacement, where he states that this process is characterized by inflammation in addition to the fact that the newly erupted teeth are more susceptible to caries, and that it occurs in a period of time when the children may not have mastered the habit of tooth brushing.

According to Sariego Quintana, et al.,[16] the age of the patient also has an influence because the endocrine glands are related to growth and development, so it should be considered that the metabolism of glucose is inversely proportional to the growth hormone, therefore, the latter reduces the sensitivity to insulin mainly during puberty and depending on the time of evolution of the patient with Diabetes, and the influence of other factors during that period, physiologically increases of insulin are needed between 30 % and 50 %, therefore the daily doses in these patients should be increased.

All these elements support the results achieved by showing how diabetes behaves in relation to the oral health status of patients. This knowledge is vital when caring for diabetic patients, since oral alterations should be prevented early, as well as insisting on preventive activities and metabolic control of the disease.

It is concluded then that the population studied was characterized by a predominance of patients between 12 and 18 years of age, female sex and white skin. Gingivopathies were the most frequent oral diseases and patients with a family history of Type 1 Diabetes Mellitus. A statistically significant relationship was confirmed between oral diseases and the time of evolution of Type 1 Diabetes Mellitus, so it is necessary to prioritize stomatological care for these patients.

Conflict of Interest
The authors declare that there is no conflict of interest.

Contribution of the Authors
MMH: conceptualization, research, supervision, data visualization/presentation, writing, original draft.
ZCTS: conceptualization, research, formal analysis, writing, original draft, critical revision and editing.
ALAS: conceptualization, formal analysis, writing, original draft, critical revision and editing.

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Additional material
Additional material to this article can be consulted in its electronic version available at:
www.revcmpinar.sld.cu/index.php/publicaciones/rt/suppFiles/5872

BIBLIOGRAPHICAL REFERENCES

1. Trujillo Saínz ZC, Eguino Ortega E, Paz Paula CM, Labrador Falero DM. Estado de salud bucal en pacientes diabéticos de más de 20 años de evolución. Rev Ciencias Médicas [Internet]. 2017 Feb [citado 19/12/2022]; 21(1): 47-53. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-31942017000100009&lng=es.

2. Arnold Domínguez Y, Licea Puig ME, Hernández Rodríguez J. Algunos apuntes sobre la Epidemiología de la diabetes mellitus tipo 1. Rev Cubana Salud Pública [Internet]. 2018 Sept [citado 19/12/2022]; 44(3): e1127. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0864-34662018000300013&lng=es.

3. Rodríguez Suárez C, Escariz Borrego L. Factores modificables que inciden en pacientes con diabetes mellitus tipo II atendidos en un Centro de Salud de Babahoyo. FACSALUD [Internet]. 2020 [citado 19/12/2022]; 4(6): 34-6. Disponible en: https://ojs.unemi.edu.ec/index.php/facsalud-unemi/article/view/1081

4. MINSAP. Anuario Estadístico de Cuba 2019. [Internet]. La Habana: Oficina Nacional de Estadística e Información; 2020. [citado 19/12/2022]: [aprox. 32 p.]. Disponible en: http://www.onei.gob.cu/sites/default/files/19_salud_publica_y_asistencia_social_2019.pdf

5. Castellanos Prada DR, Domínguez Santana L. Manifestaciones bucales de la diabetes mellitus tipo 2 en el adulto mayor. Revista Cubana de Endocrinología [Internet]. 2018 [citado 19/12/2022]; 29(3): 1-11. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-29532018000300005&Ing=es&ting=es.

6. Trujillo Saínz ZC, Paz Paula CM, Hernández Acosta Y, Henríquez Trujillo D. Salud bucal y diabetes gestacional en el Centro Provincial de Atención al Diabético. Rev Ciencias Médicas [Internet]. 2019 Ago [citado 19/12/2022]; 23(4): 513-22. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-31942019000400513&lng=es.

7. Rodríguez Rodríguez V, Rodríguez Cutiño JD, Rodríguez Matamoros FA, Moreno Diéguez O. Relación Diabetes Mellitus y Salud Periodontal Consultorio 39. Rosa La Bayamesa. Bayamo. Multimed [Internet]. 2019 Feb [citado 2022 Dic 22]; 23(1): 58-72. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1028-48182019000100058&lng=es.

8. Palmezano Díaz JM, Figueroa Pineda CL, Rodríguez R, Plazas Rey L, Corredor Guzmán K, Pradilla Suárez LP. Características clínicas y sociodemográficas de pacientes con diabetes tipo 1 en un Hospital Universitario de Colombia. Med. interna Méx [Internet]. 2018 Feb [citado 19/12/2022]; 34(1): 46-56. Disponible en: https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0186-48662018000100007

9. Lagos Padilla KA, Barrientos Guevara SA. CARACTERÍSTICAS EPIDEMIOLÓGICAS DE PACIENTES PEDIÁTRICOS CON DIABETES MELLITUS TIPO 1, TEGUCIGALPA-HONDURAS. Rev Cient Cienc Méd [Internet]. 2019 [citado 2023 Abr 06]; 22(1): 29-35. Disponible en: http://www.scielo.org.bo/scielo.php?script=sci_arttext&pid=S1817-74332019000100005&lng=es.

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10. Hechavarría Naranjo S, Achiong Estupiñán F, Méndez Gómez H, Vega Rico O, Díaz Piñera A, Rodríguez Salvá A, et al. Caracterización clínica epidemiológica de la diabetes mellitus en dos áreas de salud. Municipio Cárdenas. 2017. Rev. Med. Electrón [Internet]. 2019 Ago [citado 19/12/2022]; 41(4): 899-913. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1684-18242019000400899&lng=es

11. Alulima Arrobo YD. Salud bucal y malnutrición infantil. [Tesis]. Ecuador: Universidad de Guayaquil. Facultad Piloto de Odontología; 2021 [citado 19/12/2022]: 103p. Disponible en: http://repositorio.ug.edu.ec/bitstream/redug/51688/1/3559ALULIMAyessenia.pdf

12. Techera Pereira A. Diabetes Mellitus Tipo 1 y salud bucal: una comparación entre niños diabéticos y no diabéticos uruguayos [Tesis]. Uruguay: Facultad de Odontología; 2018 [citado 19/12/2022]: 88p. Disponible en: https://www.colibri.udelar.edu.uy/jspui/bitstream/20.500.12008/22456/1/Tesis%20-%20Dra.%20Adriana%20Techera.pdf

13. Salvador Arroba JA, Loyola Carrasco DJ. Actualización sobre la enfermedad periodontal y la relación con la diabetes mellitus. Universidad y Sociedad [Internet]. 2022 [citado 19/12/2022]; 13(S1): 75-1. Disponible en: https://rus.ucf.edu.cu/index.php/rus/article/view/2007

14. V, Monlun M, Foussard N, Blanco L, Mohammedi K. Diagnóstico de diabetes. EMC-Tratado de Medicina [Internet]. 2021 [citado 19/12/2022]; 25(2): 1-7. Disponible en: https://www.sciencedirect.com/science/article/abs/pii/S163654102145110X

15. Urbizo Obiol D, Pérez Samper EH, Espinosa Reyes T, Jiménez Echemendía TJ. Alteraciones bucales asociadas a Diabetes mellitus tipo 1 en niños y adolescentes. Instituto de Endocrinología. Cuba. Rev Haban Cienc Méd [Internet]. 2017 Ago [citado 19/12/2022]; 16(4): 540-551. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1729-519X2017000400006&lng=es.

16. Sariego Quintana IM, Suárez Labrada M, García Rodríguez A, Aglae Nuevo M, Cordoví Lastre O. Guía para el estudio del sistema endocrino con un enfoque integrador [Internet]. Segundo Congreso Virtual de Ciencias Básicas Biomédicas; 2021 [citado 19/12/2022]: 19p. Disponible en: https://cibamanz2021.sld.cu/index.php/cibamanz/cibamanz2021/paper/viewFile/661/429

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