ISSN 1517-6932
ISSN ON LINE 2447-181X

ENDOCRINOLOGIA & DIABETES CLÍNICA E EXPERIMENTAL

FACULDADE EVANGÉLICA MACKENZIE DO PARANÁ (FEMPAR)
HOSPITAL UNIVERSITÁRIO EVANGÉLICO MACKENZIE DE CURITIBA

VOL. 19 - NUMBER 2

MAY/JUNE/JULY/AUGUST 2022

Science and Health

EDITORIAL

"Avaliar, antever e aliviar o sofrimento".

Robert Shannon – Mayo Clinic

Palliative care is a medical specialty focused on active pharmacological, psychological, and mainly spiritual health care that is provided to the person with a serious, progressive illness that threatens the continuity of their existence. It is a support system to help the patient to live with dignity and quality until the end of his life. It is not definition for help "to a good death" or "how to die"; rather, it relates to "living well", to an incurable disease. It seeks to be with the patient for the reaffirmation of life, considering life and death as natural processes. This treatment does not hasten death or delay it; the important thing is to treat the patient's symptoms by offering multidisciplinary and spiritual care. The palliative method will only be successful if the person starts to live well despite the disease, even if he dies at any time. In addition, treatment needs to be consistent with the patient's and family's values, beliefs, and interests. Palliation as it was so well portrayed by Picasso is the union of science with emotion, affection, and spirituality.

Science and Charity

Pablo Picasso painted *Science and Charity*, in 1897. This painting belongs to the Picasso Museum in Barcelona. Pablo Diego José Francisco de Paula Juan Nepomuceno Maria de Los Remedios Cipriano de la Santissima Trinidad Ruiz y Picasso was born in Malaga - Spain (1881) and died in Mougins - Alpes Maritimes - France (1973), where he lived most of his life. Picasso was one of the most important artists of the 20th century. He is considered the founder of Cubism and when Picasso was 16 years old he painted *Science and Charity*.

This picture shows some important features. In the center, is an extremely pale and dying bedridden woman. A doctor is sitting, representing science, with an ethical and affectionate attitude, taking her pulse and looking at a pocket watch. On the opposite side, representing charity, a nun with a child in her arms, tries to alleviate the suffering of the patient, who looks at her daughter with a look of anguish, predicting the child's orphanage. Picasso's father and sister Lola served as role models for the doctor and patient. *Science and Charity* is part of the collection of the Picasso Museum in Barcelona, being the most important work of that museum. The title of the screen *Science and Charity* leads us to reflect on the importance of offering emotional and spiritual support to the patient, in addition to scientific or health care.

Doctors, Residents, and Nurses of Diabetes Unit of Hospital Universitário Evangélico Mackenzie de Curitiba- Brazil

References

What is palliative care?

Mayo Clinic Network

Robert Shanon MD, Palliative Medicine

Picasso

Jornal do Médico, julho 2020

Endocrinol. diabetes clín. exp. - VOL.XIX - NUM. 2

Endocrinology & Diabetes - Clinical and Experimental is a journal of open access that publishes case reports, original article, reviews with new insights in pathogenesis, physiology and metabolism of hormone secretion, cellular mechanisms and tissue action. This journal belongs to the Discipline of Endocrinology and Metabolism of Faculdade Evangélica Mackenzie do Paraná and Service of Endocrinology and Diabetes - Diabetes Unit - Hospital Universitário Evangélico Mackenzie, Curitiba - Brazil

Endocrinologia & Diabetes Clínica e Experimental
Disciplina de Endocrinologia e Metabologia da Faculdade Evangélica Mackenzie, Serviço de Endocrinologia e Diabetes do Hospital Universitário Evangélico Mackenzie. – v.19, nº 2 – Curitiba:
FEMPAR/HUEM, 2000
p.2297- 2321: il.; 29cm

Quadrimestral
ISSN 1517-6932
ISSN on line 2447-181X

1.Endocrinologia – Periódicos. 2. Saúde – Periódicos. I. Faculdade Evangélica Mackenzie do Paraná. II. Faculdade Evangélica Mackenzie.

CDD 616.4
CDU 612.34

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CARCINOMA MEDULAR DE TIREOIDE PARAGANGLIOMA-LIKE NO CONTEXTO DE NEOPLASIA ENDÓCRINA MÚLTIPLA

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Key words: Multiple Endocrine Neoplasia Type 2, Thyroid Cancer, Paraganglioma, Proto-Oncogene Proteins c-ret, Neuroendocrine Carcinoma.
Descritores: Neoplasia Endócrina Múltipla Tipo 2b, Câncer de Tireoide, Paraganglioma, Proteínas Proto-Oncogênicas ret, Carcinoma Medular.

Abstract

Objective: Paraganglioma-like medullary thyroid carcinoma (PLMTC) is a variant of medullary thyroid carcinoma (MTC) that, in the present case, is inserted in the context of Multiple Endocrine Neoplasia Type 2B (MEN 2B). It is a rare variant with less than 10 cases described in the literature. The pathogenic germline variant of the RET proto oncogene, codon 918, is classified as the highest risk MTC, although this clinical variant is described as indolent, accompanied by a marked decline in post-operative serum calcitonin values. A thorough evaluation of the pathological findings is essential, together with clinical presentation and laboratory findings, in order to distinguish PLMTC from paragangliomas of the cervical region of thyroid location. Follow-up with serum levels of calcitonin and carcinoembryonic antigen (CEA) is recommended, as well as clinical investigation of pheochromocytoma, besides evaluation and family genetic counseling. **Endocrinol diabetes clin exp 2022 / 2301- 2304.**

Resumo

O carcinoma medular de tireoide *paraganglioma-like* (CMTPL) é uma variante rara do carcinoma medular de tireoide (CMT) e que, no caso em questão, está inserido em um contexto de neoplasia endócrina múltipla 2B (NEM 2B). Menos de 10 casos estão descritos na literatura. A variante germinativa patogênica do proto-oncogene RET, códon 918, é classificada como CMT de mais alto risco, apesar desta variante clínica ser descrita como indolente, acompanhada de queda acentuada nos valores séricos de calcitonina no pós-operatório. É essencial a avaliação minuciosa dos achados de anatomia patológica, os quais em conjunto com a apresentação clínica e os achados laboratoriais, distinguem o CMTPL de paragangliomas da região cervical de localização tireoidiana. É recomendado o seguimento com níveis séricos de calcitonina e do antígeno carcinoembrionário (CEA), bem como a investigação clínica de feocromocitoma e a avaliação e o aconselhamento genético familiares. **Endocrinol diabetes clin exp 2022 / 2301-2304.**

INTRODUCTION

Medullary thyroid carcinoma (MTC) corresponds to 3-5% of malignant thyroid neoplasms and may be sporadic or hereditary. This tumor originates from parafollicular cells (C cells), which are part of the neuroendocrine system. The majority of MTC can be diagnosed through cytological, histopathological, and immunohistochemical findings. However, some rare variants of MTC may have unusual features that make diagnosis difficult. Additionally, other thyroid tumors can be confounded with MTC (1).

There is a variant of MTC, the paraganglioma-like MTC (PLMTC) which is an extremely rare variant, but widely recognized in the literature, with less than 10 cases reported (1). The present case report aims to describe an additional case and review in the literature, the clinical and pathological presentation of this pathology.

CASE REPORT

D.C.C., male, 10 years old, with a history of thyroid nodule, with three months of evolution, without associated symptoms, was admitted to Barretos Cancer Hospital, Brazil, in February 2021. A cervical ultrasound showed a nodule in the right lobe (LD) of the thyroid, isoechoic with hyperechoic foci, with defined margins and regular borders, with Doppler flow, measuring 1.7x1.5x2.5cm, which was previously submitted to fine-needle aspiration biopsy (FNAB). In the physical examination, a palpable nodule in the right thyroid lobe was evidenced, measuring approximately 3.0 cm. The patient had long extremities with a marfanoid appearance (**Figures 1a and 1b**) and mucosal neuromas on the tongue typical of Multiple Endocrine Neoplasia Type 2B (MEN 2B) (**Figures 2a and 2b**). The cytology review showed a malignant neoplasm with epithelioid and fusiform areas, suggesting the possibility of MTC.Computerized tomography of the neck showed a solid, heterogeneous nodule with post-contrast enhancement in the right thyroid lobe, measuring 2.0X1.8cm, suspicious. It was evidenced infracentimetric cervical lymph nodes, predominating on the right lateral neck (level II), measuring up to 1.1X0.8cm. Chest and abdomen tomographies were uneventful.

In view of the hypothesis of MEN 2B, it was proceeded with specific laboratory exams. The patient had the following biochemical tests:

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Biochemical tests	Reference values
Calcitonin: 9615	less than 18.2pg/ml
Carcinoembryonic antigen (CEA): 102	up to 9 ng/mL
Ionic calcium: 1.17	1.12-1.32mmol/L
Serum calcium: 9.60	8.4-10.2 mg/dl
Parathyroid hormone (PTH): 21.0	12-88 pg/ml
Thyroid – Stimulating Hormone (TSH): 2.33	0.46-4.68 mIU/L
Free thyroxine (T4l): 1.27	0.78-2.19 ng/dl
Plasma metanephrines: 103/148	Less than 65pg/ml and less than 196pg/ml

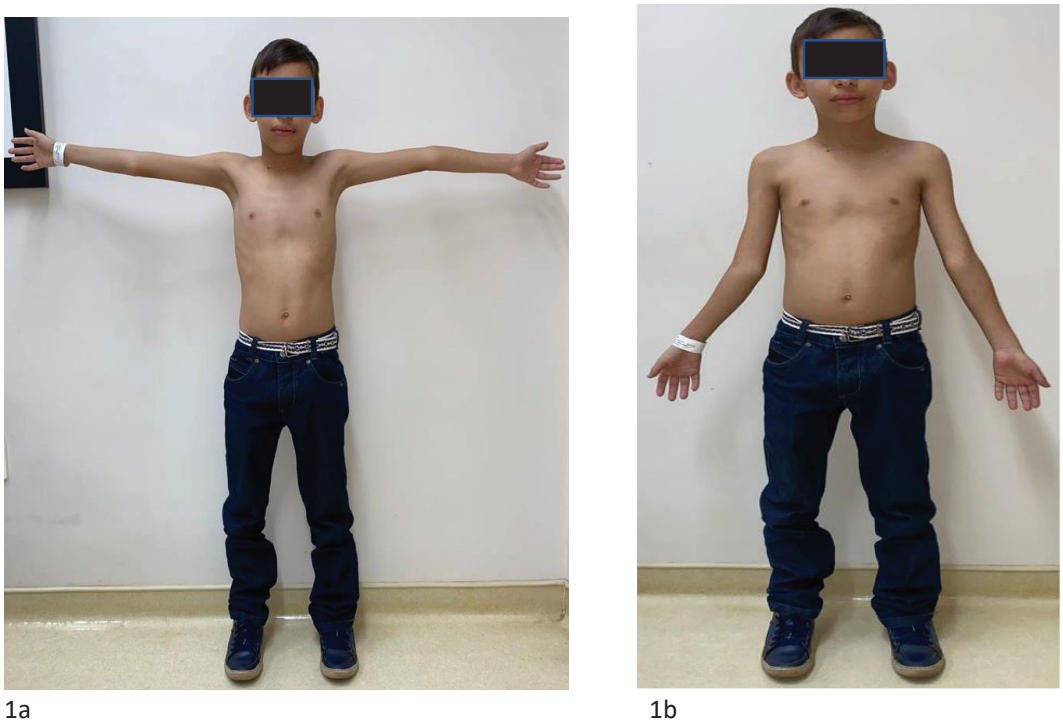
In July 2021, the patient underwent surgical treatment, which consisted of total thyroidectomy, bilateral central cervical lymphadenectomy (level VI), and superior mediastinal lymphadenectomy (level VII), with preservation of the recurrent laryngeal nerves and parathyroid glands. The patient had an uneventful post-operative evolution, without complications, being discharged from the hospital on the second post-operative day, with 75mcg of levothyroxine.

The final pathology of the surgical specimen showed a multifocal tumor, located in the right and left thyroid lobes, measuring 3.5 and 0.5 cm in their greatest diameter, respectively. Routine staining (hematoxylin and eosin) showed an epithelial neoplasm with a circumscribed appearance in the thyroid parenchyma, with cells distributed in nests interspersed with fibrovascular bands, "Zellbalen" pattern **(Figure A)**. Occasionally, areas of irregular eosinophilic substance deposits were noted between the nests, suggestive of amyloid deposits **(Figure B)**. The neoplastic nuclei presented variations in shape between ovoid and fusocellular, with chromatin distribution in a salt and pepper pattern **(Figure C)**. Immunohistochemical examination identified positivity for CK7, chromogranin, synaptophysin and calcitonin, while it was negative for thyroglobulin **(Figures D, E)**. Sustentacular cells were positive for S100 protein by immunohistochemical method, highlighting the "Zellbalen" pattern **(Figure F)**. Special Congo red staining confirmed amyloid deposit in the neoplasm. A diagnosis of medullary thyroid carcinoma (MTC) was established, with a multifocal paraganglioma-like pattern, in the right lobe with 3.5X2.2X1.7cm and in the left lobe with 0.5X0.3X0.3cm, absence of extrathyroidal extension, absence of angiolymphatic invasion, absence of perineural invasion and with free margins. Bilateral and mediastinal recurrent chain lymphadenectomy showed no lymph node involvement among the 27 dissected lymph nodes (pT2N0).

The material was submitted to In Situ Hybridization (ISH) by immunofluorescence in order to check for rearrangement involving the RET proto oncogene (10q11.21, *Zytolight SPEC RET Dual Color Break Apart Probe*). The molecular report did not characterize translocation in the analysis of 60 neoplastic nuclei.

Patient genomic DNA extracted from peripheral blood was submitted to a custom panel of rare hereditary cancer (*Sophia Genetics*), followed by next-generation sequencing on the MiSeq platform (*Illumina*). A pathogenic germline variant (class 5) involving the RET proto oncogene, c.2753T>C, p. (**Met918Thr**) was detected. The **918** mutation is described as related to MEN 2B, with high penetrance for pheochromocytoma and for MTC with the highest risk of aggressiveness by the American Thyroid Association – ATA (2). In view of the confirmation of a hereditary disease, the patient's first-degree relatives were referred for peripheral blood collection to investigate the RET proto oncogene mutation. It is worth mentioning the absence of a family history of thyroid neoplasm or MEN.

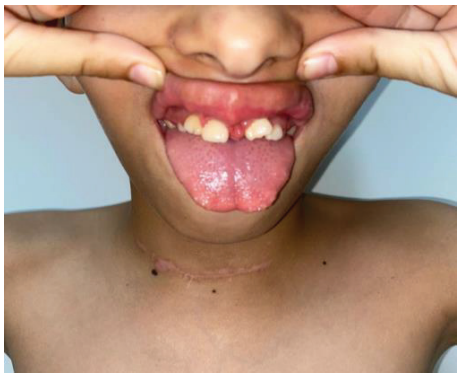
Figures 1a and 1b Patient photos showing long extremities with a marfanoid appearance



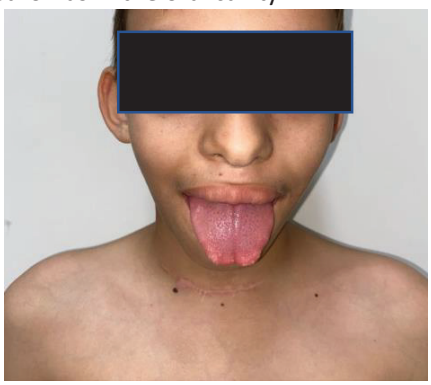
1a 1b

Photos, as well as description of the clinical case, were both authorized by the patient's legal guardian.

Figures 2a and 2b – Photos showing mucosal neuromas in the oral cavity

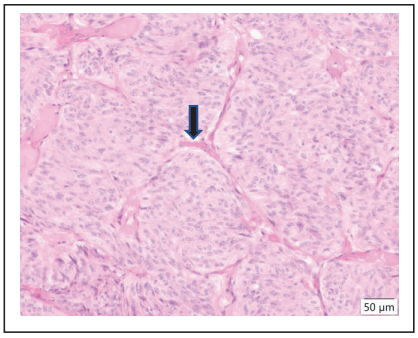


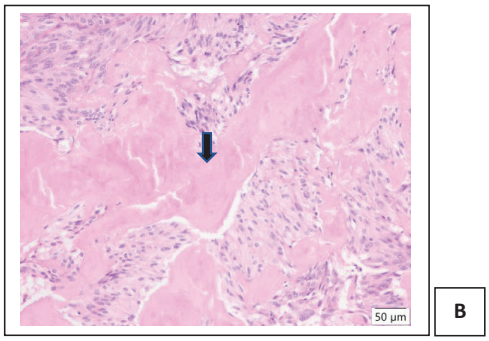
2a



2b

Photos, as well as description of the clinical case, were both authorized by the patient's legal guardian.





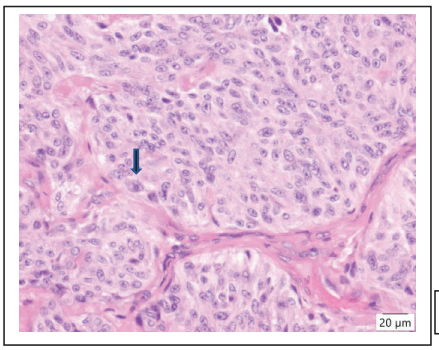
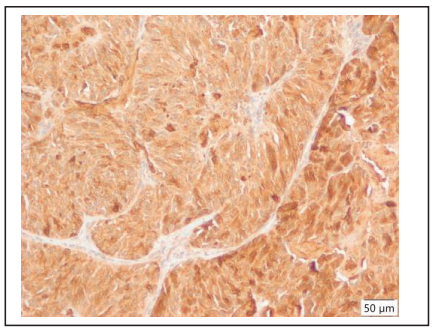
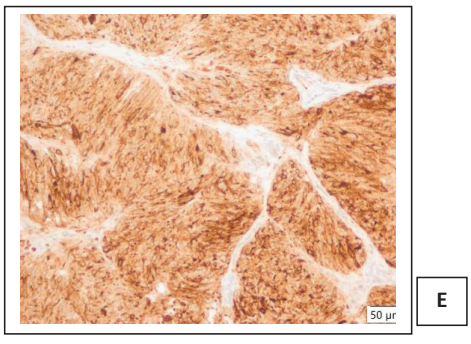


Figure A. "Zellbalen" pattern, distribution in nests interspersed with fibrovascular bands - arrow (HE, 200x resolution).

Figure B. Areas with irregular eosinophilic substance deposition, amyloid – arrow (HE, 200x resolution).

Figure C. Nuclear aspect characterized by nuclei that are either ovoid (arrow) or fusiform, with chromatin that resembles salt and pepper (HE, 400x resolution).





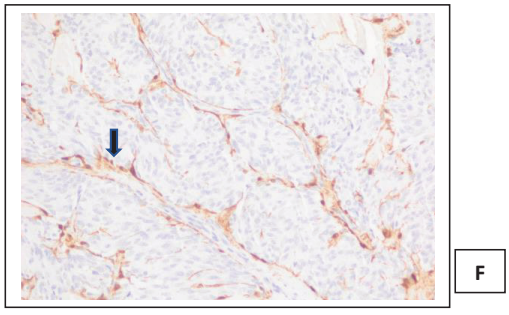


Figure D: Immunohistochemical positivity for calcitonin – brownish pattern (200x resolution).

Figure E. Immunohistochemical positivity for chromogranin- brownish pattern (200x resolution).

Figure F. Immunohistochemical positivity for S100 protein in sustentacular cells - arrow (200x resolution).

In November 2021, the patient had calcitonin of 2.8pg/mL and CEA of 1.6ng/mL. In April 2022, calcitonin was 4.0pg/mL and CEA was 0.7ng/mL. At last medical consultation performed in August 2022, laboratory tests showed calcitonin of 10pg/mL and CEA of 1.19ng/mL, without clinical evidence of neoplasia.

DISCUSSION

Medullary thyroid carcinoma (MTC) is a rare tumor. Approximately, 75% of MTC are sporadic and the remaining 25% are part of hereditary syndromes such as familial medullary thyroid carcinoma and Multiple Endocrine Neoplasia (MEN 2A and 2B). This tumor originates from parafollicular cells (C cells), which are part of the neuroendocrine system and secrete calcitonin, carcinoembryonic antigen (CEA), and chromogranin A. The majority of them can be diagnosed through histopathological and immunohistochemical findings. However, some rare variants of MTC, including papillary, oncocytic, follicular, clear cell, small cell, and giant cell variants, may present cytological and histological characteristics similar to other thyroid tumors, which can make diagnosis difficult (1). It is important to remember that these variants can generate preoperative cytological findings that are not characteristic of MTC and, commonly, generate Bethesda III and IV classifications, which do not distinguish them from other follicular lesions. In addition, other thyroid tumors, such as trabecular hyalinizing tumor, follicular carcinoma, follicular variant papillary carcinoma, and paraganglioma, can be confused with MTC in both cytology and histology (1, 3).

Paraganglioma-like MTC (PLMTC) is a rare variant. In the literature, only nine well-documented cases have been reported; the majority being sporadic MTC (1). The majority of all primary neuroendocrine thyroid carcinomas belong to the MTC group. Primary thyroid neuroendocrine tumors other than MTC are extremely rare. Paragangliomas have been recognized as neuroendocrine tumors that can occur in the thyroid gland without being true primary thyroid tumors. Medullary cancer usually presents variable histological structure and cellular morphology, and when the PLMTC variant is present, it is difficult to distinguish it from classic paraganglioma due to the similarity of growth pattern (4). From a clinical point of view, they are indolent, without nodal involvement, and without distant metastases in most of the cases described, and are usually accompanied by a marked decline in post-operative calcitonin levels.

The histological aspect of PLMTC resembles the classic growth pattern described in pheochromocytoma and paraganglioma, with neoplastic cells arranged in an organoid pattern (nests) surrounded by sustentacular cells (Zellballen pattern), and possible positivity for protein S100 in these cells (**figure F**); this positivity is marked in paragangliomas (1, 5). The greatest difference between PLMTC and paragangliomas is the strong positivity to calcitonin, synaptophysin, and chromogranin A in immunohistochemistry in a PLMTC context. Positivity for TTF-1 and CEA are also frequent in PLMTC (3, 4). It is important to remember that paragangliomas can also be positive for these markers, and despite having a weak reactivity for them, they make the diagnosis of PLMTC difficult and confusing, especially when located in the thyroid topography. The sum of clinical, laboratory, molecular and pathological characteristics is crucial for the definitive diagnosis of PLMTC.

CONCLUSION

The authors conclude that, in this case, despite the histological similarities between paraganglioma located at thyroid anatomical topography and PLMTC, the extremely high preoperative calcitonin level, the MEN2B phenotype, and the presence of the germline mutation of the RET proto oncogene at codon 918, allowed the conclusive diagnosis of paraganglioma-like medullary thyroid carcinoma (PLMTC).

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Received: 28-06-2022
Accepted: 02-07-2022

Conflict of interests: none

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CASE REPORT
PERIPHERAL FACIAL PARALYSIS AS THE FIRST MANIFESTATION OF PITUITARY GLIOMA: A CASE REPORT

PARALISIA FACIAL PERIFÉRICA COMO PRIMEIRA MANIFESTAÇÃO DE UM GLIOMA PITUITÁRIO: RELATO DE CASO

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Keywords: Glioma, Pituitary Neoplasms, Facial Paralysis, Rare Diseases
Descritores: Glioma, Neoplasias Hipofisárias, Paralisia Facial, Doenças Raras.

Abstract

Low-grade pituitary gliomas are extremely rare neoplasms, originating from the pituicytes of the posterior pituitary or infundibulum. The incidence of these tumors increases with age and peaks in the seventh decade of life. Gliomas are primary brain tumors of the supporting glial cells of the central nervous system, which derive from neuroglial stem cells or progenitor cells. They are responsible for nearly 30% of all primary brain tumors and 80% of all malignant tumors, as well as the majority of deaths from primary brain tumors. The clinical manifestation is mainly through visual impairment, due to optic nerve compression, headache, and pituitary deficits. The present study aims to report a rare case of manifestation of pituitary glioma in a 16-year-old female patient, who was referred to the endocrinology service, due to peripheral facial paralysis and vision change associated with a pituitary tumor found in magnetic resonance (MR). **Endocrinol diabetes clin exp 2022 / 2305 - 2308.**

Resumo

Gliomas pituitários de baixo grau são neoplasias extremamente raras, originárias dos pituicítos da pituitária posterior ou infundibulum. A incidência desses tumores aumenta com a idade e os picos acontecem geralmente na sétima década de vida. Gliomas são tumores cerebrais primários das células gliais, suportes do sistema nervoso central, que derivam de células-tronco neurogliais ou células progenitoras. Estes tumores são responsáveis por quase 30% de todos os tumores cerebrais primários e 80% de todos os tumores malignos, bem como a maioria das mortes por tumores cerebrais primários. A manifestação clínica é principalmente por deficiência visual, devido à compressão do nervo óptico, dor de cabeça e déficits hormonais. O presente estudo tem como objetivo relatar um raro caso de manifestação de glioma pituitário em uma paciente do sexo feminino de 16 anos, que foi encaminhada ao serviço de endocrinologia, devido à paralisia facial periférica e à alteração visual associada a um tumor pituitário encontrado em ressonância magnética (RM). **Endocrinol diabetes clin exp 2022 / 2305 - 2308.**

INTRODUCTION

Although pituitary tumors are the most commonly found intracranial neoplasms (1), their incidence increases with age, reaching its peak in the seventh decade of life (2). Gliomas are primary brain tumors of glial support cells of the central nervous system, which derive from neuroglial stem cells or progenitor cells (3,4). They are responsible for almost 30% of all primary brain tumors and 80% of all malignant tumors, and also for most deaths from primary brain tumors (3).

The present report presents the case of a 16-year-old female patient with a rare pituitary tumor, with a unique clinical manifestation. The patient in question sought medical attention because of an episode of peripheral facial palsy on the right associated with severe headache and nasal congestion and with a previous history of peripheral facial palsy on the left, which had resolved spontaneously. It is an uncommon condition for the diagnosis of pituitary glioma (5). According to epidemiological data, the most likely diagnostic hypotheses would be pituitary adenoma or craniopharyngioma, considering that a low-grade pituitary glioma is an extremely rare tumor (2,3,4,5,6)

CASE REPORT

Female patient, 16 years old, Jehovah's Witness. In 2016, she presented left peripheral facial paralysis without neurological imaging, which spontaneously improved. In 2018, the patient reported frequent headaches but did not seek medical help, relating the symptoms to the beginning of the use of oral hormonal contraceptives. The patient evolved with visual alterations, which improved with the prescription of glasses by an ophthalmologist. The patient denies a family history related to the condition, smoking, drinking, or drug use.

In October 2019, she presented with peripheral facial paralysis on the right, with worsening headache and nasal congestion, which made her seek an otolaryngologist. A computed tomography scan of her head was performed, which revealed an intracranial mass of undefined origin (suprasellar cistern/pituitary/optic chiasm) associated with dilatation of the supratentorial ventricular system. One month later, in December 2019, a magnetic resonance (MR) of the skull was performed, which indicated the presence of a voluminous sellar heterogeneous expansive lesion, with suprasellar extension and heterogeneous contrast enhancement, with dimensions of 3.1 x 3.2 x 2.8 cm. In addition, there was also a displacement of the optic chiasm superolateral to the right, in addition to enlargement and compression on the intracranial segment of the left optic nerve, establishing craniopharyngioma as the first diagnostic hypothesis.

In an attempt to reduce hydrocephalus, the patient was sub-

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mitted to a ventriculoperitoneal shunt in January 2020, which was successful.

In April 2020, she repeated the MR to follow the evolution of the pituitary mass, which showed expansion, with new dimensions of 4.9 x 2.6 x 2.5 cm (FIGURE 1). It was also noticed the involution of hydrocephalus and an important diffuse meningeal impregnation, suggest dissemination of the pathology or inflammatory process.

The patient was submitted to transsphenoidal surgery for complete excision of the tumor mass in June 2020. Immediate postoperative MR is shown in Figure 2. The surgery was successfully performed and the anatomopathological analysis diagnosed the pituitary mass as a neoplasm of round cells with a fibrillar background and low grade of hyalinized blood vessels, suggestive of glial neoplasia. In the postoperative period, the patient complained of nocturnal hyperphagia and insomnia. In thirty days she had ten pounds of weight gain, so she was diagnosed with hypothalamic obesity and started therapy with melatonin 3 mg, naltrexone 100mg/day and oxytocin 4 units (1 puff) /day

At the end of June 2020, the patient returned to the outpatient clinic for a postoperative consultation with symptoms of diabetes insipidus (polyuria and polydipsia, plasma hyperosmolality, and diuresis of 5 liters per day), desmopressin (DDAVP) nasal Spray one application in one nostril every 12 hours was prescribed.

Figure 1. Magnetic Resonance- April 2020

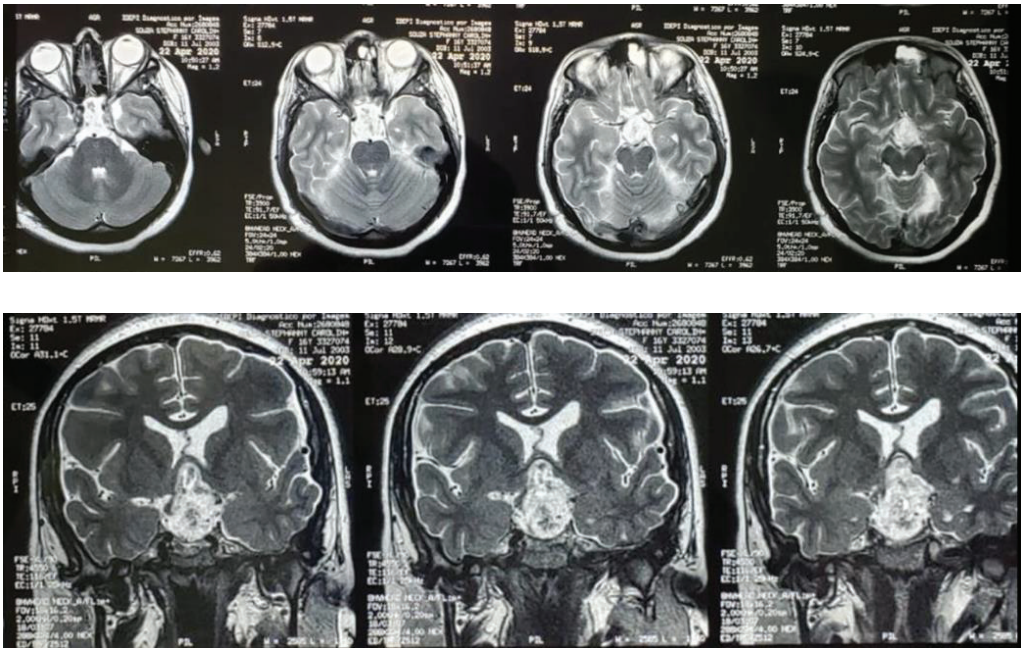
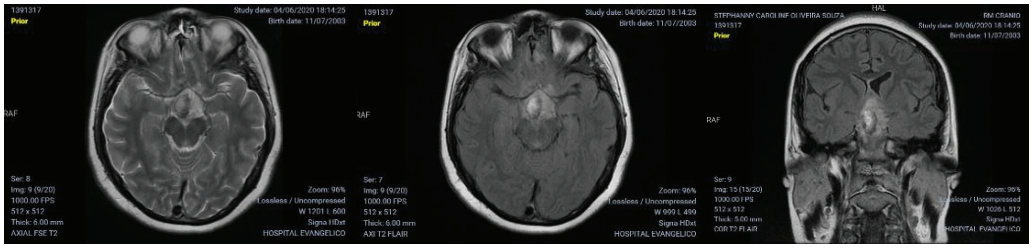


Figure 2. Immediate postoperative Magnetic Resonance - June 2020



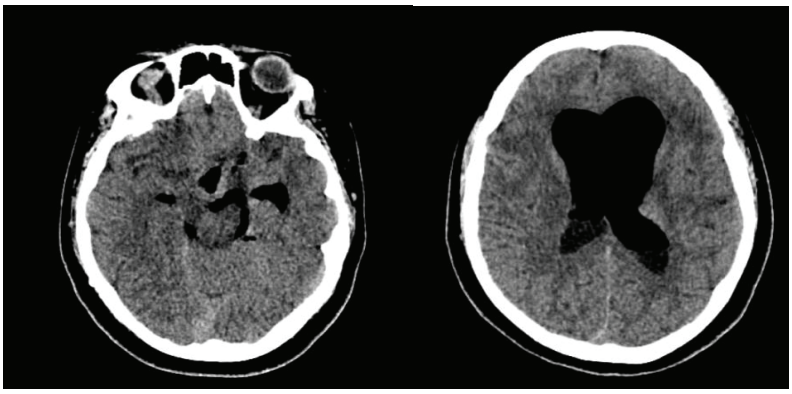
In July 2020, the patient returns to the hospital with a lower level of consciousness, headache, and hyperphagia, maintaining the visual alteration. The RM presented a cerebrospinal fluid fistula, requiring a surgical approach for correction (FIGURE 3). The procedure took place without other intercurrences and led to the resolution of the condition, reducing the intensity of the existing headache and improving the hyperphagia condition. However, it did not change the patient's visual deficit. The etiological investigation was complemented with immunohistochemistry, which defined the diagnosis of pituycitos astrocytoma (World Health Organization – WHO - grade I glioma).

The patient returned two months after the reoperation, reporting improvement in sleep, improvement of hyperphagia, and reduction in polydipsia, but still with frequent nocturia. Laboratory tests indicate the presence of panhypopituitarism, consisting of hypogonadotropic hypogonadism, central adrenal insufficiency, and central hypothyroidism. Hormone replacement therapy was started with estradiol valerate 2 mg + levonorgestrel 0.25 mg (Ciclоprimogyna), hydrocortisone 17.5 mg/day (dose divided into 3 daily doses), and levothyroxine 125 mcg/day.

The patient returned in November 2020, using the correct medications, with new improvement in hyperphagia and denying polyuria and polydipsia. In this interval, she presented 10 kg more of weight gain. The patient was not using the suggested medication for hypothalamic obesity due to the high price of the medication. Metformin 2g per day and orlistat 120mg at night (medicines not so expensive) were started maintaining hormone replacements and desmopressin.

One month, the patient returned to the consultation in good general condition, with normal blood pressure and asymptomatic.

Figure 3. Cutaneous-ventricular fistula and pneumoventricle - July 2020



DISCUSSION

Although pituitary tumors are the most commonly found intracranial neoplasms (1), the low-grade pituitary glioma presented by the patient is an extremely rare pathology, which originates from the pituicytes of the posterior pituitary or the infundibulum (6). Usually, the incidence of these tumors increases with the patient's age, reaching its peak in the seventh decade of life (2,3,4,5,6,7) which contrasts with the patient's age.

Based on their histological appearance, they are traditionally classified as astrocytic, oligodendroglial, or ependymal, and given away the histopathological characteristics of the neoplasm, such as cytological atypia, anaplasia, mitotic activity, microvascular proliferation, and presence of necrosis, they were classified in WHO grades I to IV, which indicate different degrees of malignancy. Low-grade gliomas, such as the one presented by the patient, are a diverse group of brain tumors that tend to appear more in young patients and that generally follow an indolent course with a greater expectation of survival compared to high-grade gliomas (3,4).

The case described calls attention not only because of its rarity but also to the uniqueness of its clinical manifestations. The cases of pituitary glioma reported in the literature manifest mainly through visual deficits, due to the low anatomic resistance to tumor growth into the suprasellar space, compressing the optic apparatus, followed by headache and pituitary deficits, which contrasts with the manifestation of facial nerve paralysis and nasal congestion presented by the patient (5,8,9).

Corroborating the literature, the tumor, in this case, was sporadic, giving away that she had no family history or predisposition to develop it. It is believed that the pituitary tumor arises from a single cellular mutation followed by a clonal expansion, in short, the pituitary neoplasm is a process composed of several steps that involve dysregulation of cell growth or proliferation, differentiation, and finally production of hormones. This process can be initiated as a result of the activation of an oncogene or after the inactivation of a tumor suppressor gene, or both (1,10).

Regarding the diagnosis, the method of choice to detect a brain tumor is magnetic resonance imaging (with and without contrast). However, despite the characteristic radiographic findings, tumor grade cannot be determined by imaging alone. For this reason, the histopathological study of the tissue is necessary and it is the gold standard for the diagnosis and classification of low-grade gliomas (3,4).

As a therapeutic option, the literature describes surgical resection, radiotherapy, and chemotherapy. However, studies indicate that radical resection should be attempted in these tumors, considering that if performed properly, it can improve the patient's quality of life and follow-up, but the regional invasion and the lack of a capsule that clearly defines the extension of the tumor, can make complete resection difficult and may have the consequences of the deterioration of pituitary functions and diabetes insipidus, both presented by the patient (6,11).

Hypothalamic obesity is another example of a postoperative complication, also presented by the patient. It is more common in cases of craniopharyngioma. However, it can also occur in other types of suprasellar tumors, even if its manifestation is more infrequent. Usually, this manifestation occurs after injury to the medial hypothalamic region, encompassing the arcuate nucleus, paraventricular nucleus, ventromedial nucleus, dorsomedial nucleus, and the dorsal hypothalamic area (critical regions in the regulation of satiety and energy balance through neural and humoral communications). Although there is no well-defined therapy for this situation, the literature indicates intervention with the use of metformin, naltrexone, and oxytocin which was prescribed for the patient (10).

4. CONCLUSION

The low-grade pituitary glioma presented by the patient is an extremely rare pathology. However, as it has the potential to manifest in several forms, which go far beyond those described in the literature, it should always be considered in the differential diagnosis of pituitary neoplasms, given its potential for complications and the need for early radical treatment aimed at healing the patient.

This case report was presented as an oral communication at The 24th European Congress of Endocrinology (ECE) on May 2022 – in Milan -Italy

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Received: 28-05-2022
Accepted: 07-06-2022

Conflict of interests: none
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ORIGINAL ARTICLE
HAND DYSFUNCTION IN DIABETES MELLITUS

DISFUNÇÃO DA MÃO EM DIABETES MELLITUS

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Keywords: Diabetes Mellitus, Carpal Tunnel Syndrome, Tendinitis
Descritores: Diabetes Mellitus, Síndrome do Túnel do Carpo, Tendinites.

Abstract

Introduction: Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia. Among the multiple complications of this disease, there are musculoskeletal manifestations. These hand manifestations can be expressed as carpal tunnel syndrome (CTS), tendinopathy, and loss of hand dexterity and strength. **Objective:** To evaluate the impairment of hand function and strength in patients with diabetes mellitus and verify the presence of De Quervain's syndrome, carpal tunnel, trigger finger, and diabetic chiroarthropathy in a sample of diabetic patients. **Material and Methods:** Epidemiological and clinical data on diabetics and controls were collected. Physical examination of the hands was performed, observing the presence of CTS using the Tinel maneuver, chiroarthropathy (using the prayer sign), De Quervain syndrome (using the Finkelstein maneuver), and trigger fingers. Participants answered the MHQ (Michigan Hand Outcomes Questionnaire) and Cochin questionnaires for hand function and their dominant hand strength was measured with a JAMAR® dynamometer. **Results:** 56 diabetic patients and 55 control patients were studied. No differences regarding the presence of CTS (p=0.99), De Quervain's tenosynovitis (p=0.06), diabetic chiroarthropathy (p=0.53), trigger finger (p=0.76), strength dominant hand (p=0.43) and Cochin questionnaire (p=0.09) were noted. The MHQ questionnaire showed that patients with DM have worse hand function than controls (P<0.0001). **Conclusion:** Hand functionality is impaired in type II diabetic patients when compared to controls. It was not possible to find differences in the other studied parameters. **Endocrinol diabetes clin exp 2022 / 2309 - 2313.**

Resumo

Introdução: A diabetes mellitus (DM) é uma desordem metabólica caracterizada pela hiperglicemia crônica. Dentre as múltiplas complicações desta doença, existem as manifestações musculoesqueléticas. Estas manifestações, quando nas mãos, podem se expressar com síndrome do túnel do carpo (STC), tendinopatias, perda de destreza e força das mãos. **Objetivo:** Avaliar o comprometimento da função e força das mãos em pacientes com diabetes mellitus e verificar a presença de síndromes, como a de De Quervain, túnel do carpo, dedo em gatilho e a quiroartropatia diabética. **Material e Métodos:** Coleta de dados epidemiológicos e clínicos em pacientes diabéticos e controles. Neles realizou-se exame físico das mãos observando a presença de STC pela manobra de Tinel, de quiroartropatia (pelo sinal da prece), de síndrome de De Quervain (pela manobra de Finkelstein) e dedos em gatilhos. Os participantes responderam aos questionários MHQ (Michigan Hand Outcomes Questionnaire) e Cochin, para função da mão e teve a força da mão dominante medida com um dinamômetro JAMAR®. **Resultados:** Foram estudados 56 pacientes diabéticos e 55 controles. Não foi possível observar diferenças quanto à presença de STC (p=0,99), tenossinovite de De Quervain (p=0,06), quiroartropatia diabética (p=0,53), dedo em gatilho (p=0,76), força da mão dominante (p=0,43) e questionário de Cochin (p=0,09). O questionário MHQ demostrou que pacientes com DM têm função da mão pior do que os controles (P<0.0001). **Conclusão:** Observou-se que existe comprometimento da funcionalidade das mãos em pacientes diabéticos tipo II quando comparados com controles. Não foi possível encontrar diferenças nos demais parâmetros estudados. **Endocrinol diabetes clin exp 2022 / 2309 - 2313.**

INTRODUCTION

Diabetes mellitus (DM) is a common disease that associates with several complications the eye, cardiovascular, renal, and neurological the most feared. (1) The musculoskeletal system may also be involved although this type of involvement is frequently overlooked due to the severity of other manifestations that require frequent clinician monitoring and treatment as they may be life--threatening. Nevertheless, tendons, fascia, and joint structures also suffer from hyperglycemic states as the collagen fibers from these structures may become glycosylated and dysfunctional. (2)

Hand function is fundamental for realizing important activities such as one's care, daily household tasks, job tasks and even expressing feelings and creating works of art. The collagen alterations in hand structure are responsible for the appearance of tenosynovitis causing trigger fingers ad tenosynovitis of the 'De Quervain', chiroartropathy of the hands, and carpal tunnel syndrome that affects the strength of the grip and hands skills. (2-6)

Herein we studied a sample of diabetic patients aiming to know the prevalence of soft tissue involvement and alterations of grip strength as well as the degree of dysfunction of the hands

MATERIAL AND METHODS

This study was approved by the local Committee of Ethics in Research and all participants signed consent. It included patients of both genders, older than 18 years, with diabetes type 2 from a single University Endocrinology Out Patient's Clinic. All participants signed consent. Individuals with other chronic diseases, cancer, women that received surgical treatment for breast cancer in the past, individuals with traumatic, orthopedic, and neurological dysfunction of the limbs, individuals with alcohol abuse, and pregnant females were excluded.

Data collection included:

1-Epidemiological and clinical data: age, gender, diabetes mellitus duration, ethnic background, smoking habits, hand dominance, presence of diabetic complications (such as retinopathy, nephropathy, polyneuropathy, and peripheral ischemia), comorbidities, and used medications.

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2-Physical exam of the Hands: for the presence of carpal tunnel syndrome the Tinnel test;(7) for the presence of tenosynovitis de De Quervain the Finkelstein test, (8) for the presence of chiroarthropathy, the search for the prayer's signs (6) and the presence of trigger fingers (9). The Tinnel's sign looks for the appearance of paresthesia in the median nerve trajectory when the volar aspect of the wrist is tapped. The Finkelstein test looks for pain over the carpal long abductor and carpal short extensor tendons when the wrist is adducted. The prayer's sign looks for difficulty in complete finger extension when the hands are jointed together and nodular tendonitis is diagnosed when the finger's long extensor tendon locks while the finger is extended. See **figure 1**.

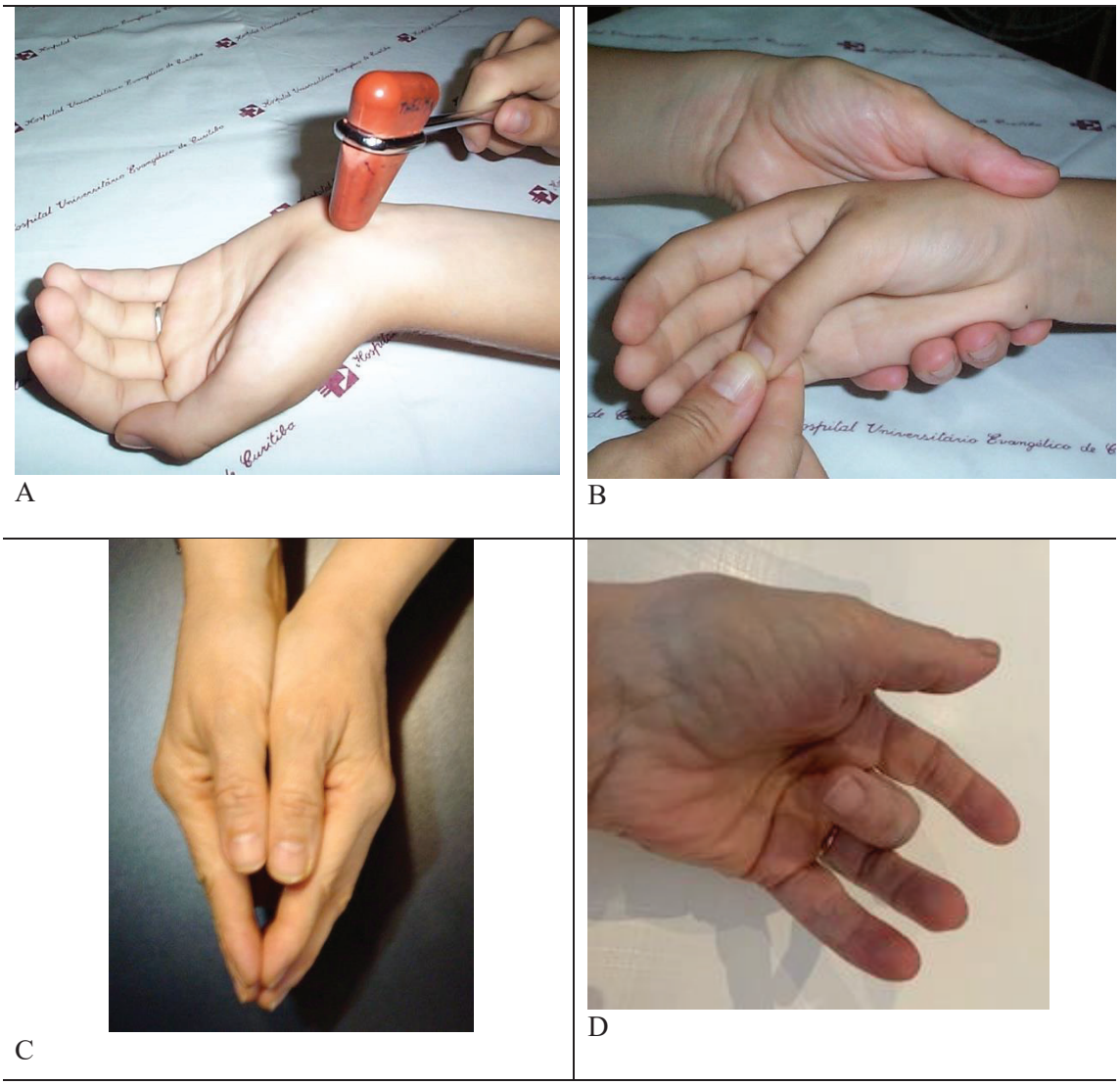

FIGURE 1- Hand examination. A--Tinel sign for carpal tunnel syndrome; B-Fin Kelstein maneuver- for De Quervain tenosynovitis. C- Prayers sing for diabetic chiroarthropathy, D- Trigger finger for nodular tenosynovitis.

3- Application of hand function questionnaires: (a)--MHQ or Michigan Hand Outcome Questionnaire - The MHQ is a self-reported questionnaire that assesses a person's general hand function; it can help to portray an overall sense of what the patient feels their strengths and weaknesses are as it relates to their examined extremity. It ranges from 62 (best scenario) to 310 (worst scenario). (10)
(b)- Cochin questionnaire - The Cochin questionnaire's score ranges from 0 to 85 points. This questionnaire is directed to problems associated with the patient's daily life, such as difficulties in moving the upper limb in performing tasks such as holding a bowl, brushing teeth, and buttoning a shirt, among others. It ranges from 0 (best scenario) to 85 (worst scenario). (11)
4- Measurement of hand grip strength: Using a dynamometer Jammar®. The patients should be sitting with their elbows flexed at 90 degrees. **Figure 2.** The measurement was done three times and for the statistical purpose, the highest obtained value was used. (12)

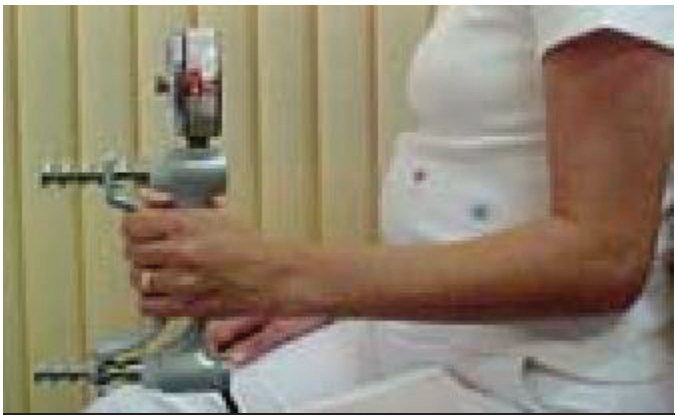

FIGURE 2 - Measurement of grip strength with Jamar dynamometer.

Statistical analysis: Data was collected in frequency and contingency tables. Chi-squared and Fisher tests were used to compare the frequency of nominal data. The Mann-Whitney and unpaired t-test were used to compare numerical data. The adopted significance was 5% ($P<0.05$).

RESULTS

The sample included 111patietns: 56 with diabetes mellitus and 55 controls. Epidemiological data as well as pairing data are in **Table 1**.

TABLE 1 – Epidemiological and pairing data of studied sample

	Diabetes patients N=56	Controls N=55	P
Gender (n)	Males – 26 (46.4%) Females – 30 (53.5%)	Males - 23 (41.8%) Females- 32 (58.1%)	0.62 (*)
Age (years)	34 an 85 Mean of 61.1±11.3	33 a 79 Mean of 57.7 ±10.6	0.10 (**)
Ethnic background (n)	Euro descendants - 45 (80.3%) Afro-descendants -10 (17.8%) Asians 1 (1.7%)	Euro descendants - 48 (87.2%) Afro-descendants 7 (12.7%) Asians-1 (1.8%)	0.73 (*)
Fumo (n)	Yes -5 (8.9%) No -36 (64.2%) Ex- 15 (26.7%)	Yes-4/42 (9.5%) No-25/42 (59.5%) Ex- 13/42 (30.9%)	0.88 (*)

(*)-chi squared test ; (**) unpaired t test n= number.

Table 2 shows the main characteristics of the diabetic sample. It shows that all had right-hand dominance and a low proportion of diabetic complications.

TABLE 2 – Main characteristics of the diabetic studied sample.

Hand dominance (n)	Right - 56/56- 100%
Comorbidities (n)	
Arterial hypertension	37/56 – 66.0%
Dyslipidemia	7/56 – 12.5%
Hypothyroidism	11/56 – 19.6%
Use of insulin (n)	16/56 – 28.5%
Complications (n)	15/56 – 26.7%
Retinopathy	6/56 – 10.7%
Nephropathy	4/56 – 7.1%
Polyneuropathy	5/56 – 8.9%
Peripheral ischemia	1/56 – 1.7%
Disease duration (Years)	0,08 a 26 – Median of 6 (2-14)

n= number

When the performance of the hand of DM patients was compared with controls the results of **Table 3** were found.

TABLE 3- Comparison of clinical findings related to hand function in diabetic patients and controls

	Diabetes patients N=56	Controls N=55	P
Tinel (n)	15/56	15/55	0.99 (*)
Finkelstein (n)	22/56	13/55	0.06 (*)
Prayer's sign (n)	7/56	4/55	0.53 (**)
Trigger finger (n)	5/56	7/55	0.76 (**)
Hand strength – (KgF) median (IQR)	22 (18-30)	22 (18-34.7)	0.43 (§)

(*) test of qui-square; (**) - test of Fisher; (§) test of Mann Whitney.
IQR- interquartile range ; n= number

Patients with DM had a median Cochin result of 0 (0-3) and controls of 0 (0-1), with p=0.09. The comparison of MHQ results in Figure 3, shows worse performance in DM patients than in controls.

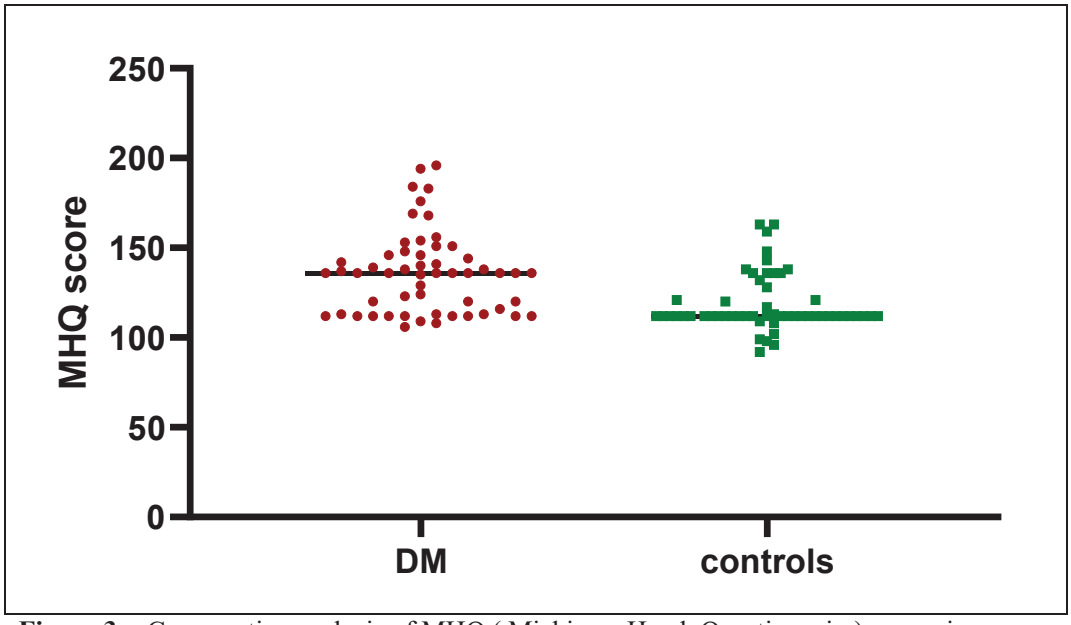

Figure 3 - Comparative analysis of MHQ (Michigan Hand Questionnaire) scores in patients with diabetes mellitus and controls

Diabetes patients– median of 136 (113-146)
Controls – median of 112 (112-121), p<0,0001.

DISCUSSION

DM is associated with a wide variety of musculoskeletal manifestation, many of them subclinical, that correlates with the time of evolution and inadequate control of the disease. (6) In the analysis of the present study, it was seen that patients with type 2 diabetes presented significant impairment in hand functionality when the results of the MHQ test were compared to the control group. On the other hand, when analyzing the Tinel tests, a sign of prayer and trigger finger, it was found that the results did not show significant variance between the two groups. The Cochin test showed only one tendency for diabetics to perform worse than controls. Both the Cochin and MHQ tests are intended to evaluate hand performance when performing daily tasks. However, the MHQ test is more complete, containing not only questions very similar to those of the Cochin test, but also several others that allow the interviewee to give his own interpretation of the role of the member. (10,11) So MHQ is more complete and probably portrays reality better than Cochin's questionnaire.

According to the literature, the prevalence of carpal tunnel syndrome (CTS) in diabetic patients is 20% and is more frequent in female patients with polyneuropathy (4). CTS may be indicative of the diagnosis of DM (4). About 5-8% of CTS patients are diabetic or pre-diabetic and more common in patients with prediabetes than in the normal population. It i finding, therefore, allows the clinician to raise the diagnostic hypothesis of DM. (4) In the present study, the Tinel test was used for diagnosis, with a prevalence of 26% of CTS in the diabetic group- a number similar to that mentioned in the literature. However, there was no difference in the prevalence of the syndrome in the diabetic group in relation to the control. It is possible that this discrepancy is due to the fact that only clinical criteria for the diagnosis of the carpal tunnel were used; the use of ultrasound or electroneuromyography could have provided different results. The Tínel test is based on the finding of paresthesia pain when the median root undergoes compression and is therefore subject to variability caused by individual pain perception. Its specificity is high from 67 to 93%, but its sensitivity is relatively low from 23% to 67%. (8)

The prevalence of trigger finger in patients with DM ranges from 5%-36% in those with type 1 and type 2 DM to 2% in the

general population, and its onset is associated with the longer term disease. (13) In the diabetic group studied here, there was a prevalence of 8% of trigger fingers, which corroborates the literature. However, unlike studies in the area, there was no significant difference in the prevalence of this pathology between the control and diabetic group of the sample collected. As for the pathophysiology of trigger finger syndrome, it is known that hyperglycemia leads to increased collagen cross-links that accumulate around the tendon sheath of the flexor muscles of the fingers, thus causing tendon clamping. (14)

Another factor that can influence hand function is diabetic neuropathy which brings changes in strength and sensitivity by altering coordination. As already described, the consequences of peripheral diabetic neuropathy (NDP) are most commonly observed in the lower limbs, although the hands are also affected by the loss of sensory information. (15)

Tendinopathies are also more common in diabetics due to post synthetic changes in the collagen of periarticular structures. It is believed that these changes are due to chronic hyperglycemia and are similar to those that occur in the aging process. In both situations, there is an increase in intermolecular collagen bonds, resistance to enzymatic digestion, and loss of elasticity. (3)

Diabetic quiroarthropathy, responsible for the appearance of the sign of prayer, is also associated with poor glycemic control. The pathogenesis is not clear, but it is believed that increased periarticular collagen and skin glycation, decreased collagen degradation, microangiopathy, and neuropathy are involved in the process. (16) The prayer's signal was little evidenced in the diabetic group of the sample, given that most of the patients interviewed and submitted to the test were at the controlled glycemic level, justifying the paucity of findings on the physical examination. As can be observed, findings of quiroarthropathy and tendinopathy are associated with disease control. The population currently studied is accompanied by an Endocrinology Service of a tertiary hospital – which excels in the good control of its patients and this may have affected the findings present. These results strongly suggest that when Diabetes is treated, the loss of hand functions is minimized.

This study is limited by its cross-sectional design and the lack of more accurate tests for the diagnosis of CTS and tendinopathies (such as ultrasound). In addition, there was no glycemic control in the control individuals, and it was not possible to rule out that some of them had undiagnosed diabetes. On the other hand, it reflects the real-life findings of an endocrinology clinic in our country, emphasizing the existence of functional impairment of the hands in patients with DM.

Musculoskeletal findings in diabetic individuals are not always adequately valued to the detriment of other complications of diabetes, which are more easily identified and known. However, they do cause pain and loss of function and thus contribute to the loss of quality of life in this population already so affected by many other problems.

Hands are delicate and precise instruments; with our hands, we feed, dress, and perform day-to-day tasks. With them, we communicate. With them, we express our feelings. In this sense, all efforts must be made to preserve its function in the diabetic population.

CONCLUSION

Through the analysis and comparison of the responses to the COCHIN and MHQ questionnaires, it was observed that there is an impairment of the functionality of the hands in type II diabetic patients when compared with controls.

It was not possible to find differences in the prevalence of carpal tunnel (by Tinel test), De Quervain tenosynovitis (by Finkelstein test), or diabetic quiroarthropathy (by the sign of prayer).

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Received in: 14-06-2022
Accepted in: 28-06-2022

Conflict of interests: none
Funding: none

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ORIGINAL ARTICLE
ASSESSMENT OF KNOWLEDGE ABOUT THE SYMPTOMS OF TYPE 1 DIABETES MELLITUS AMONG ELEMENTARY SCHOOL AND HIGH SCHOOL TEACHERS IN CASCAVEL - PR

AVALIAÇÃO DO CONHECIMENTO SOBRE OS SINTOMAS DO DIABETES MELLITUS TIPO 1 ENTRE PROFESSORES DO ENSINO FUNDAMENTAL E ENSINO MÉDIO DE CASCAVEL – PR

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Key words: Type 1 Diabetes Mellitus, Childhood Diabetes, Health education.
Descritores: Diabetes Mellitus Tipo 1, Diabetes infantil, Educação em saúde.

Abstract

Type 1 Diabetes Mellitus (DM1) is the most common chronic disease in childhood. After the diagnosis of the disease, the child faces serious changes in the daily routine, such as multiple application doses of insulin, self-monitoring of blood glucose, and care with the food and physical activity. The school routine must be adapted to provide conditions for blood glucose monitoring and education professionals trained to intervene in cases of hypoglycemia and hyperglycemia, making the school environment safe for the child. The objective of this study was to evaluate the knowledge about this pathology among elementary and high school teachers. This research was carried out through a quiz with objective questions about DM1, 35 educators accepted to participate in the study and were included in the research, both from public and private schools. According to the research results, DM1 is a topic that still generates many doubts in education professionals and because it is a frequent disease in children and adolescents population, the lack of knowledge about it is highly relevant for the safety of diabetic students in the school environment, being It is of fundamental importance to train educators on this pathology. **Endocrinol diabetes clin exp 2022 / 2314 - 2318.**

Resumo

Introdução: O Diabetes Mellitus Tipo 1 (DM1) é a patologia crônica mais comum na infância. Após o diagnóstico da doença a criança enfrenta sérias modificações na rotina diária, como múltiplas aplicações de insulina, automonitorização da glicemia e cuidados com a alimentação e atividade física. A rotina escolar deve ser adaptada, a fim de fornecer condições para a monitoramento da glicemia e profissionais da educação capacitados para intervir em casos de hipoglicemia e hiperglicemia, tornando o ambiente escolar seguro para a criança. O objetivo desse estudo foi avaliar o conhecimento sobre essa patologia entre os professores dos ensinos fundamental e médio. Esta pesquisa foi realizada através de formulário, com questões objetivas sobre DM1, 35 educadores aceitaram participar do estudo e foram incluídos na pesquisa, tanto de escolas públicas como privadas. Segundo os resultados da pesquisa o DM1 é um tema que ainda gera muitas dúvidas nos profissionais da educação e por ser uma doença frequente na população infanto-juvenil, a falta de conhecimento sobre ela é de alta relevância para a segurança do aluno diabético no ambiente escolar, sendo de fundamental importância a capacitação de educadores sobre essa patologia. **Endocrinol diabetes clin exp 2022 / 2314 - 2318.**

INTRODUCTION

Type 1 Diabetes Mellitus (DM1) is a common metabolic syndrome characterized by a constant increase in blood glucose and is the most frequent endocrine metabolic disease in childhood and adolescence (1). This pathology affects more than 15 million individuals worldwide, data from centers specializing in the disease estimate that 30,000 new cases occur each year in the United States (1).

The incidence of DM1 is increasing worldwide, manifesting itself, particularly in children under 5 years of age, especially post-COVID (2). After the diagnosis of the disease, the child envisages serious lifestyle changes such as multiple daily insulin shots, blood glucose monitoring, attention to a special diet, and physical exercises (2).

This pathology affects the whole family's life, hypoglycemia fear and guilt feeling are often manifested in parents. The complex transformation of the child's behavior, the psychological burden of the disease, and problems of acceptance of the condition contribute to poor metabolic control, which implies the early appearance of complications resulting from inadequate management of the disease (1).

The special needs of the patient should be also attended to in the school environment. The diabetic child is able to normally attend educational institutions, with no physical limitations for participating in student activities and socializing with other students. However, it is patient safety needs to receive individualized and specialized care by a trained professional from the educational institution who knows the routines of control and monitoring of blood glucose.

The objective of this study was to evaluate the qualification and quantification of educators' knowledge about diabetes and their experiences with students with DM1.

MATERIAL AND METHODS

As it is research carried out with human beings, the pre-project was submitted for approval by the Ethics Committee in Research on Human Beings of the tro Universitary Center FAG, being approved under the number CAAE 42662421.4.0000.5219. The Free and Informed Consent Term was sent, via e-mail, and attached to the form for all participants. Those who, upon accepting the terms, explained in detail, proceeded to fill out the form.

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This was a quantitative/qualitative, cross-sectional descriptive study. The sample used consisted of teachers, from elementary to high school in the city of Cascavel-PR. This survey was conducted online, by the "Google Forms" platform, from March, 3rd, 2021 to March, 7th, 2021. Forms were sent to all educators from municipal and private schools, totaling 35 teachers who agreed to participate in the research by answering the attached questionnaire. Descriptive statistics such as absolute frequency, relative frequency (percentage), and graphic representations were used for the collected responses. All statistics were developed in R software (3).

The form was prepared by the authors, containing 14 objective questions, the first two questions identified which school system (public or private) and grade in which the teacher taught. Followed by four questions regarding general concepts about diabetes and nutrition, each question presented four alternatives with only one correct answer. In sequence, four other questions related to emergency situations, hypoglycemia and hyperglycemia, also presented four alternatives with only one correct. The four final questions consisted of alternatives to indicate yes or no, about the teacher's perspectives in relation to diabetic students and their experiences with them.

RESULTS

In this research, 57.14% of the teachers taught at the Elementary level (55% were from public school), 20% at the Middle level (50% were from public school), and 22.86% at both (87.71% were from public school. This result can be seen in **Figure 1** and **Table 1**.

In general, among those surveyed, most had contact with diabetic students (65.71%) and believed that these students require special care (91.43%). However, not everyone feels prepared to handle complications with a student with DM1 (57.14%) and the vast majority of participants (97.14%) believed it was necessary to increase their knowledge about diabetes (**Table 1**). The teachers didn't receive training. The proportion of returns for these statements was similar between professionals from the public and private schools, indicating that they all need more knowledge on the subject.

Table 1. Characterization of the sample according to the school system.

		Teaching network			Total
		Private	Public	Both	
Level of education					
	Fundamental	40,00% (8)	55,00% (11)	5,00% (1)	57,14% (20)
	Both	25,00% (2)	50,00% (4)	25,00% (2)	22,86% (8)
	Medium	14,29% (1)	85,71% (6)	0,00% (0)	20,00% (7)
Had to contact a diabetic student					
	No	27,27% (3)	38,10% (8)	33,33% (1)	34,29% (12)
	Yes	72,73% (8)	61,90% (13)	66,67% (2)	65,71% (23)
Believes that diabetic students require special care					
	No	0,00% (0)	14,29% (3)	0,00% (0)	8,57% (3)
	Yes	100,00% (11)	85,71% (18)	100,00% (0)	91,43% (32)
Consider yourself able to manage complications with a diabetic student					
	No	63,34% (7)	52,38% (11)	66,67% (2)	57,14% (20)
	Yes	36,36% (4)	47,62% (10)	33,33% (1)	42,86% (15)
Beliefs he needs to increase his knowledge about diabetes					
	No	0,00% (0)	0,00% (0)	33,33% (1)	2,86% (1)
	Yes	100,00% (11)	100,00% (21)	66,67% (2)	97,14% (34)
Total		31,43% (11)	60,00% (21)	8,57% (3)	

Source: Prepared by the authors (2021)

When asked for more technical information about DM1, the percentage of correct answers to the questions varied between the education systems (Table 2). Professionals from the public network were the ones who answered the least questions regarding DM1 (correct rate per question between 42.86% and 95.24%). Among the professionals in the private school system, everyone knew that: a diet prepared by a nutritionist is a fundamental part of the treatment; in patients with DM1, there is a lack of insulin production by the pancreas; when glucose is increased in the blood it is called hyperglycemia; and that the symptom that is not related to hypoglycemia is a pain in the feet. However, not everyone knew that childhood diabetes mellitus (type 1) occurs due to a decrease in the production and levels of insulin in the blood, which causes an accumulation of glucose (sugar) in the blood (81.82%). Among professionals in the public network, this knowledge was better disseminated (95.24% knew).

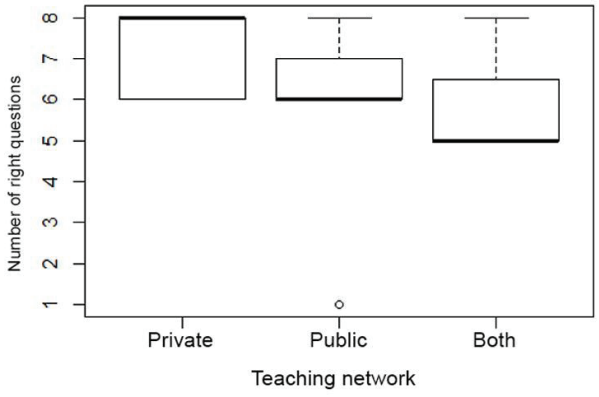
Table 1. The number of professionals correctly indicated the technical issues related to DM1.

	Teaching network			Total
Know that:	Private	Public	Both	
1. Childhood diabetes mellitus (type 1) occurs due to a decrease in the production and levels of insulin in the blood, this causes an accumulation of glucose (sugar) in the blood.	81,82% (9)	95,24% (20)	100,00% (3)	91,43% (32)
2. A diet designed by a nutritionist is a fundamental part of the treatment.	100,00% (11)	95,24% (20)	100,00% (3)	97,10% (3)
3. Type 1 Diabetes Mellitus is triggered by a dysregulated immune response (autoimmune disease).	81,82% (9)	42,86% (9)	33,33% (1)	54,29% (19)
4. In the patient with type 1 Diabetes Mellitus, there is an absence of insulin production by the pancreas.	100,00% (11)	95,24% (20)	66,67% (2)	94,29% (33)
5. Assuming an insulin-dependent diabetic student is found unconscious in the classroom, the correct procedure is to call SAMU immediately.	81,82% (9)	80,95% (17)	66,67% (2)	80,00% (28)
6. When glucose is increased in the blood it is called hyperglycemia.	100,00% (11)	95,24% (20)	66,67% (2)	94,29% (33)
7. The symptom that is not related to hypoglycemia is foot pain	100,00% (11)	61,90% (13)	66,67% (2)	74,29% (26)
8. The symptom that is not related to hyperglycemia is fever	81,82% (9)	76,19% (16)	100,00% (3)	80,00% (28)
Total	31,43% (11)	60,00% (21)	8,57% (3)	

Source: Prepared by the authors (2021)

Also observe, in **Figure 2**, the number of correct questions among professionals in the private network varied between 6 and 8. In the public institution, there was a professional who only got 1 question right; while the others got it right between 6 and 8. When analyzing the professionals who worked in both networks, the number of correct answers ranged from 5 to 8 questions. It is worth mentioning that as the questionnaire was developed online, the correct answers to the questions may not reflect the participant's prior knowledge, given that they could have performed some type of consultation/research on the web.

Figure 2. Boxplot graph refers to the number of correct questions by each teacher according to the type of school system.



Source: Prepared by the authors (2021)

DISCUSSION

The results of this study demonstrate that, regarding the definition of DM1, the teachers had no difficulty in characterizing the disease as an increase in blood glucose and a decrease in insulin production, with question Nº. 1 of the questionnaire being 91.43% correct.

Question Nº. 2 addressed the importance of diet in the treatment of DM1, with 97.1% of correct answers demonstrating a good understanding of the relationship between diet and DM1 control. Corroborating this, the results of a study carried out with employees of 4 public schools in Natal-RN in 2017, also found that: “When asked what care is, 86% (n=43) answered correctly or partially correct, mentioning care with food and regular physical activity” (4).

Regarding the etiology of DM1, 54.29% of the teachers were aware of the participation of the immune system in the pathophysiology of the disease (question Nº. 3). This attests to the lack of clarity regarding the origin of the pathology. However, 91.4% of the teachers correctly answered question Nº. 4, proving their knowledge about the decrease in insulin production in the pancreas, and this information is fundamental for understanding the disease. The knowledge of this information is based on common sense, so teachers have difficulty defining DM1, but they are able to relate it to the term insulin (5).

> “Such information allows us to believe in knowledge based on common sense regarding the definition of diabetes in a broad context, in which people acquire knowledge, sometimes incomplete and/or scientifically unfounded information that can lead to mistaken attitudes about the management of the disease. DM1 student” (5).

Regarding the management of complications with a diabetic student, most teachers did not consider themselves capable of handling such a situation (57.14%). The lack of training generates insecurity for the teacher responsible for the student with diabetes, not feeling able to intervene and provide adequate care (4).

The question addressing the knowledge of the term hyperglycemia resulted in 94.29% of correct answers, certifying a good knowledge of the terminology related to high blood glucose levels. The fundamental concept to understand the main alteration caused by DM1.

The recognition of symptoms of hypoglycemia and hyperglycemia by teachers is essential for the management of acute complications of this pathology, hypoglycemia, if not recognized and treated immediately, can put the diabetic child or adolescent at risk of life. Recognized, according to the description of the Ministry of Health (6) as cited by Camargo (5): “Evidenced by sweating, tremors, headache, weakness and mental confusion, among others, hypoglycemia can be triggered by excess insulin administration, low carbohydrate intake or excessive physical activity".

In the study, the inquiry about symptoms related to hypoglycemia and hyperglycemia showed that only 74.29% of the teachers were aware of the hypoglycemia symptoms and 80% of hyperglycemia.

Thus, it was observed that the topics that obtained lower percentages of correct answers were about the management of acute complications and about the symptoms of DM1. A study carried out in Uberaba - MG in 2010 showed similar results”. Regarding the management of a child with a hypoglycemic crisis, 42.40% of the teachers stated that sugar should not be offered under any circumstances, but that they should inform the mother about what had happened, while 28.26% did not know how to act in this situation, and 14 (7.60%) are not sure ‘’what hypoglycemia is” (7).

CONCLUSION

According to the research results, DM1 is a topic that still raises many doubts among education professionals, and as it is a frequent disease in the child and adolescent population, the lack of knowledge about it is highly relevant for the safety of diabetic students in the school environment.

School plays a crucial role in a child's life, making it a safe and inclusive space for diabetic children is still a challenge to be faced. The training of education professionals on this topic plays a key role in the best strategy to improve teachers' understanding of the disease and thus provide special care for students with DM1.

FORM

Assessment of knowledge about the symptoms of childhood diabetes (type 1 diabetes mellitus) among elementary and high school teachers Dear Sirs, I invite you to participate in the research entitled "Assessment of knowledge about the symptoms of childhood diabetes (type 1 diabetes mellitus) among elementary and high school teachers. My name is Isaac Weiber, I am an eighth-period academic of the FAG Medicine course. The research will be presented as my TCC, I am under the guidance of the endocrinologist Prof. Dr. Marise Pescador.

1- Which educational network are you connected to?
( ) Public network
( ) Private Network
( ) Public Network and Private Network

2- What series do you teach?
( ) Public network
( ) Private Network
( ) Public Network and Private Network

3- Check the correct alternative:
( ) Childhood diabetes mellitus (type 1) occurs due to a decrease in the production and levels of insulin in the blood, this causes accumulation of glucose (sugar) in the blood.
( ) Insulin produced by the pancreas plays an important role in increasing the level of glucose (sugar) in the blood.
( ) Diabetes is a chronic disease that only occurs in children who eat too much sugar.
( ) Children with diabetes should never use insulin as a treatment.

4- Check the correct alternative:
( ) Children who are born with diabetes should only be breastfed until they are three months old.
( ) A diet designed by a nutritionist is a fundamental part of the treatment.
( ) Diabetic children who are thin can drink orange juice freely.
( ) The diet should be based on potatoes, cassava and corn, avoiding fruits.

5- Check the correct alternative:
( ) Type 1 Diabetes Mellitus can be reversed with healthy eating and exercise.
( ) Type 1 diabetic children do not produce glucose in the pancreas.
( ) Type 1 Diabetes Mellitus is triggered by a dysregulated immune response (autoimmune disease).
( ) High insulin production is a consequence of Type 1 Diabetes Mellitus

6-In patients with type 1 diabetes mellitus, the following occurs:
( ) Absence of insulin production by the pancreas.
( ) Excess insulin production.
( ) Increased absorption of glucose (sugar) by the intestine.
( ) Decreased glucose (sugar) in the urine.

7-Assuming an insulin-dependent diabetic student is found unconscious in the classroom. Indicate which procedure is correct:
( ) Call SAMU immediately.
( ) Call SAMU immediately and put sugar water in the mouth of the unconscious student.
( ) Call the SAMU immediately and apply an extra dose of insulin until help arrives.
( ) Transport the student to a comfortable and ventilated place and wait for him to wake up.

8-Complete: When glucose is increased in the blood it is called...
( ) hypoglycemia.
( ) hyperglycemia.
( ) Diabetes Insipidus.
( ) Type 1 diabetes mellitus.

9-Which symptom is not related to hypoglycemia?
( ) Sweating.
( ) Tremors.
( ) Pain in the feet.
( ) Tachycardia (increased heartbeat).

10-Which symptom is not related to hyperglycemia?
( ) Excessive thirst.
( ) Blurred vision.
( ) Increased urinary frequency.
( ) Fever

11-Have you ever had contact with a diabetic student?
( ) Yes
( ) No

12-Do you believe that diabetic students require special care?
( ) Yes
( ) No

13-Do you consider being able to handle an intercurrence with a diabetic student?
( ) Yes
( ) No

14-Do you believe you need to increase your knowledge about Diabetes?
( ) Yes
( ) No

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Received: 07-06-2022
Reviewed: 21-06-2022
Accepted: 05-07-2022

Conflict of interests: none

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