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RISK LEVEL EVALUATION FOR DIABETIC FOOT IN INDIVIDUALS WITH TYPE 2 DIABETES MELLITUS

AVALIAÇÃO DO GRAU DE RISCO PARA PÉ DIABÉTICO EM INDIVÍDUOS COM DIABETES MELLITUS TIPO 2

EVALUACIÓN DEL GRADO DE RIESGO PARA EL PIE DIABÉTICO EN INDIVIDUOS CON DIABETES MELLITUS TIPO 2

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ABSTRACT

Objective: to evaluate the characteristics of the feet, the level of risk for diabetic foot and the presence of an indication of neuropathy in individuals with Type 2 Diabetes Mellitus. **Method:** this is a descriptive and cross-sectional study with 67 diabetic subjects. The data were collected through a structured instrument with interview and examination of the feet. The variables were analyzed in a descriptive way and presented in tables. **Results:** participants were between 34 and 82 years old, predominantly female (83.6%), using inappropriate shoes (62.7%), with pain or discomfort in the feet (53.7%), burning, tingling and numbness (59.7%), and 53.7% of the patients presented an indication for peripheral neuropathy. Cracks and fissures were found in 67.1% of the feet, the presence of desquamative feet and areas of friction in 66.4% and 40.2%, respectively. **Conclusion:** there were 98.5% of the participants of this study in some category that constitutes a level of risk for the appearance of complications such as the diabetic foot. **Descriptors:** Diabetes Mellitus; Diabetic Foot; Risk Factors.

RESUMO

Objetivo: avaliar as características dos pés, o grau de risco para pé diabético e a presença de indicativo de neuropatia em indivíduos com Diabetes Mellitus tipo 2. **Método:** estudo quantitativo, descritivo e transversal, com 67 pessoas diabéticas. Os dados foram coletados mediante instrumento estruturado com entrevista e exame dos pés, sendo as variáveis analisadas de forma descritiva e apresentadas em tabelas. **Resultados:** os participantes tinham entre 34 e 82 anos, predominantemente femininos (83,6%), em uso de calçados inadequados (62,7%), com dor ou desconforto nos pés (53,7%), queimação, formigamento e dormência (59,7%), sendo que 53,7% dos estudados apresentaram indicativo para neuropatia periférica. Foram encontradas rachaduras/fissuras em 67,1% dos pés, presença de pés descamativos e áreas de atrito em 66,4% e 40,2%, respectivamente. **Conclusão:** dentre os participantes deste estudo, 98,5% enquadraram-se em alguma categoria que se constitui em grau de risco para o surgimento de complicações como o pé diabético. **Descritores:** Diabetes Mellitus; Pé Diabético; Fatores de Risco.

RESUMEN

Objetivo: evaluar las características de los pies, el grado de riesgo para pie diabético y la presencia de indicativo de neuropatía en individuos con Diabetes Mellitus tipo 2. **Método:** estudio cuantitativo, descriptivo y transversal, con 67 personas diabéticas. Los datos fueron recogidos mediante instrumento estructurado con entrevista y examen de los pies, las variables fueron analizadas de forma descriptivas y presentadas en tablas. **Resultados:** los participantes tenían entre 34 y 82 años, predominantemente femeninos (83,6%), en uso de calzados inadecuados (62,7%), con dolor o desconfort en los pies (53,7%), quemado, hormigueo u dormido (59,7%), siendo que 53,7% de los estudiados presentaron indicativo para neuropatía periférica. Fueron encontradas ralladuras/fisuras en 67,1% de los pies, presencia de pies descamados y áreas de atrito en 66,4% y 40,2% respectivamente. **Conclusión:** entre los participantes de este estudio, (98,5%) se encuadraron en alguna categoría que se constituye en grado de riesgo para el surgimiento de complicaciones como el pie diabético. **Descriptores:** Diabetes Mellitus; Pie Diabético; Factores de Riesgo.

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INTRODUCTION

Diabetes Mellitus (DM) is a public health problem and it is expanding all over the world. According to data, estimates in the 7th Report of the International Diabetes Federation (IDF), an entity linked to the World Health Organization, there were 415 million adults with the disease in 2015, with projections that in 2040 increase to 642 million, and Type 2 DM (T2DM) is responsible for about 90% of the diagnosed cases.¹

This type of DM is caused by the association of genetic and environmental factors, characterized by a deficiency in insulin action and secretion. The main risk factors for the development of the disease are sedentary lifestyle, obesity, inadequate diet and old age, and it is usually diagnosed after 40 years old.²

DM is related to complications such as renal dysfunctions, ocular dysfunctions, neuropathies and diabetic foot with lower limb amputation, which can significantly impact the quality of life.³

Diabetic neuropathy is a result of damage to the nervous system, which can occur at varying levels and reaching high levels, increasing its prevalence with increasing age. Its symptoms vary according to the class of fibers being affected. The most common are pain, paresis, paresthesia predominating in the lower limbs, and may progress to diabetic foot syndrome.⁴

Diabetic foot is caused by infection, ulceration and/or destruction of soft tissues associated with neurological abnormalities and peripheral arterial disease (PAD).⁵ Due to limb involvement, diabetic foot has been a cause of disabling hospitalization and amputation.⁶

Considered as one of the most serious complications of diabetes, diabetic foot affects about 15% of diabetic individuals.⁷ Its treatment raises the costs of the health system. In this sense, it is estimated that in 2013, the United States of America spent between nine and thirteen billion dollars on diabetes care.⁸

The contributions of the literature and the lack of similar studies in the State of Sergipe actually motivated the study.

OBJECTIVE

- To evaluate the characteristics and risk levels to develop diabetic foot in patients with T2DM in an outpatient clinic.

METHOD

This is a quantitative, descriptive and cross-sectional study developed in two outpatient health clinics in the city of Aracaju (SE), Brazil, from July 2015 to February 2016. The sample consisted of 67 individuals with T2DM.

The study included individuals aged 18 years and over, referenced by the Basic Health Units of the city of Aracaju/SE, who agreed to participate in the study by signing the Informed Consent Form and attending consultations during the data collection. Pregnant women and those with psychiatric disorders were excluded from the study. After the approval of the Research Ethics Committee of the Federal University of Sergipe, under CAAE: 45758815.0.0000.5546 issued on June 12, 2015, the data collection was started.

Nursing consultations were conducted with interview and examination of the feet, using the Information System Saving the Diabetic Foot (SISPED) as reference⁹. Neuropathic Compromising Score (ECN) was used to assess the neurological signs caused by DM.

The consultations were held in a private room, previously scheduled. Patients' records were also consulted to complement information. At the conclusion of the consultation, the patients were advised about the importance of performing the follow-up in the outpatient clinic, foot care and, later, referred to specialists in cases of presence of changes.

After the examination, according to the alterations presented in the feet, the risk assessments were performed, divided into four categories: category 0 - normal (without changes); category 1 - pre-ulcer and/or neuropathy (3 to 10, 14 to 19, 21), category 2 - ulcer, neuropathy plus deformities (11 to 13, 20) and category 3 - ulcer and/or previous amputation (1 to 2).

Also, the study participants were also classified through the Neuropathic Symptoms Score (ESN), for the indication of neuropathy. The subjects were questioned about the presence of sensation (cramp, pruritus, burning, numbness), place of sensation (feet, calf or others), time they felt (day, day and night or only night), if felt when waking up

and how the symptoms improved (sitting, lying down, standing or walking).

For data analysis and tabulation, a database was prepared in Excel. The qualitative variables were presented using percentages and absolute numbers, and for the quantitative analysis, the central trend measures were used: mean and standard deviation.

RESULTS

The population of this study consisted of adults and elderly individuals aged between 34 and 82 years old, with a mean of 59 ± 11.5 years old, most of them were female (83.6%) and self-declared to have a brown skin color (37.3%).

The mean time of diagnosis was 11.1 ± 8.3 years and the mean BMI was 29.3 ± 5.6 kg/m². It was verified that 38.8% were overweight and the same percentage had some degree of obesity.

Regarding treatment, 58.2% used one or more types of oral antidiabetic drugs (ADO), 23.9% used combination therapy (ADO and insulin) and 17.9% were exclusively treated with insulin.

Among the comorbidities presented by the patients, there was the visual deficit (70.1%),

followed by hypertension (65.7%) and dyslipidemia (52.2%).

Regarding glycemic rates, postprandial plasma glucose ranged from 39 mg/dL to 461 mg/dL. Of the total patients, 70.6% had altered values of this parameter. Fasting capillary glycemia ranged from 69 mg/dL to 315 mg/dL, and in 75.8% of patients, these values were altered.

Of the participants, 38.8% were former smokers and 3% were smokers. Regarding alcohol consumption, 28.4% reported consuming alcohol rarely or socially.

Foot evaluation showed that most of the patients used inappropriate footwear (62.7%), felt pain or discomfort in the feet (53.7%), lameness (17.9%), ingrown toenail (14.9%), ulcer (9%), amputation (3%) and poor hygiene conditions (3%).

When the changes in the feet of the patients were investigated, 67.1% had cracks/fissures in the feet, 66.4% had desquamative feet and 40.2% contained areas of friction, as can be seen in Table 1.

Table 1. Distribution of the feet of patients with T2DM, according to the presence of alterations. Aracaju (SE), Brazil, 2016. (n=134)**

Foot alterations*	n	%
Cracks/Fissures	90	67.1
Desquamative Foot	89	66.4
Areas of Friction	54	40.2
Onychomycosis	49	36.5
Interdigital mycosis	20	14.9
Callus	38	28.3
Hallux Vague (bunion)	21	15.7
Cavoid Foot	12	8.9
Claw Fingers	6	4.5
Plantar arch collapse	6	4.5
Bubble	5	3.7
Hemorrhagic Callus	5	3.7
Current ulcer	5	3.7
Prominence	3	2.2

* Multiple answers; ** Equivalent to two feet of each patient

As to the presence of neuropathic symptoms, the presence of burning, tingling, and numbness, with a foot location during the diurnal period were not mentioned when they were not felt on waking and improved with rest, as shown in Table 2.

Table 2. Distribution of patients with T2DM, according to the presence of symptoms of neuropathic impairment. Aracaju (SE), Brazil, 2016.

Symptoms of neuropathic impairment		n	%
Symptoms	Burning, tingling, and numbness	40	59.7
	Absence of suspicious sensations	19	28.3
	Fatigue, cramp, and itching	6	9.0
	Without information	2	3.0
Location	Foot	35	76.1
	Calf	6	13.0
	Other location	5	10.9
Time	Day and night	23	50.0
	Night	15	32.7
When waking up	Day	8	17.3
	Yes	17	37.0
	No	29	63.0
Improvement	Sitting or lying down	24	52.2
	Walking	20	43.5
	Standing	2	4.3

The result of the neuropathic impairment score allowed the patients to be classified as indicative of neuropathy. Of the total number of patients evaluated, 53.7% had an indication for peripheral neuropathy, considering that the score was greater than 5 points.

After the inspection of the feet, according to the type of alterations they presented, the

risk for the development of the diabetic foot was evaluated. Also, the behaviors suggested in the instrument were performed according to each level of risk. The categories with the highest number of framed patients (91%) were 1 and 2, as shown in Table 3.

Table 3. Distribution of patients with T2DM, according to risk evaluation. Aracaju (SE), Brazil, 2016. (n=67).

Evaluation of the risk level		n	%
Categories	0 - Normal	1	1.5
	1 - Pre-ulcer lesion and/or neuropathy	38	56.7
	2 - Ulcer, neuropathy plus deformities	23	34.3
	3 - Ulcer and/or previous amputation	5	7.5
Total		67	100

DISCUSSION

In this study, the female was the one with the highest population, with 83.6%. Also, the age between 54 and 63 years old was predominant. Similar results were also found in a study carried out in Minas Gerais with 31 individuals with diabetes mellitus.¹⁰

Regarding the time of diagnosis, 32.8% reported already having T2DM of 1 to 5 years. The literature shows that there is a directly proportional relationship between the time of disease and the appearance of chronic complications, such as the diabetic foot.¹¹

Most patients were treated with ADO alone (58.2%). Similar data were found in another study, where 58.8% used ADO.¹² The use of hypoglycemic medication is an important element in the treatment of diabetes, providing better glycemic control and favoring the prevention of diabetic foot.¹³

Regarding BMI, 38.8% of the patients were classified with some degree of obesity. A similar result was found in another study.¹⁴

Lifestyle behaviors, including diet, are associated with the development of diabetes and cardiovascular disease, dietary modifications for weight and blood glucose control are important and considered as first-line treatment for newly diagnosed diabetics.¹⁵

The most common comorbidity found in this study was the visual deficit (70.1%), which is linked to another finding of the study, Retinopathy (19.4%), which is one of the chronic complications for T2DM. A recent study in Australia identified retinopathy as the most important cause of amputation in patients with diabetic foot, reaffirming the importance of prevention and early detection of this diabetic complication.¹⁶

The presence of arterial hypertension was verified in 67.5% of the study participants, dyslipidemia in 52.2% and changes in

metabolic glycemia control in 70% of the patients. A study in Thailand showed that these findings are characterized as risk factors significantly associated with a high risk of diabetic foot ulcers.¹⁷

Most of the individuals studied seem to be already aware of the need to avoid smoking, which can be verified through the data found: 38.8% are former smokers and 3% are smokers. With regard to alcohol, 28.4% still consumes it rarely or socially. A study conducted in the USA showed that the use of tobacco and alcohol is strongly associated with hypertension and hyperglycemia.¹⁸

In this study, it was apparent that most patients were using inadequate shoes, most of them tight and open. Similar findings were found in a study carried out in Piauí. This fact may be related to the lack of knowledge about the type of footwear that should be used. It is important to emphasize that the knowledge about proper foot care favors the delay of alterations that lead to the appearance of ulcers and amputations.¹⁹

The use of tight shoes for a long time can cause several deformities and lesions, which favor the development of the diabetic foot. Redistribution of plantar pressure can be achieved through the use of adequate insoles and footwear, which can reduce the number of ulcerations by up to 50 %.²⁰

Most of the interviewees reported pain or discomfort in the feet (53.7%) and some of them still presented lameness. The presence of lameness may limit the practice of physical exercises, being associated with functional decline with worsening of quality of life.²¹

In 14.9% of the patients attended, the presence of nails was impaired during the examination and, during the interview, they reported several episodes per year. The lack of knowledge about the proper nail cutting favors the appearance of lesions on the sides of the nails, contributing to ingrown nails.²² In this way, the need to intensify the information regarding a basic care that can avoid future complications is necessary.

During the interview, 9.0% of the patients reported that they had an ulcer in the lower limbs and 3.0% already had some level of amputation. The presence of ulcers has been considered the precursor agent to 85% of amputations related to diabetic foot, the findings of the study are consistent with the worldwide prevalence of diabetic foot ulcers ranging from 1-2%.²³

It was evidenced that 3.0% of the participants presented poor foot hygiene. This is also a risk factor for the appearance of

injuries. Thus, it is important to emphasize at each visit the importance of proper cleaning and drying of the feet, as this is an essential care to prevent complications such as the presence of fungi and even ulcers.²²

There were 46 of the 67 patients evaluated for some sensory impairment, mainly numbness, burning or tingling. These findings are sensory signs and symptoms found in patients with DM. A study conducted in Taiwan showed that these findings are poorly valued and investigated by health professionals, especially primary care. It is also important to analyze the symptoms to prevent extremity ulcerations and amputations.²⁴

Among the characteristics found during physical examination of the feet, the highest percentage was cracks and fissures. Similar data were found in a study carried out in Santa Catarina, where it was observed that 59.29% presented these findings. It can be inferred that there is not adequate foot care by the participants of the two studies.¹⁴

Regarding the risk level, it was observed that (56.7%) of the research participants were classified in category 1. Similar results were found in a recent study carried out in Minas Gerais.²⁵

It can be verified that (98.5%) of those studied are categorized in some level of risk for the development of diabetic foot and its complications. These findings reinforce the need for specialized care by a multidisciplinary team to prevent the appearance of complications related to the foot.¹³

Thus, this study reinforces the data presented in the literature regarding the characteristics of the feet, which usually present patients with T2DM. These data reiterate the importance of reinforcing each education consultation for the self-care of this type of patient, emphasizing preventive care to avoid the complications resulting from the disease, such as foot care.

It is important to record that in one of the fields of study the patients were attended by the multi-professional team and participated in an educational program and in the other, they were attended only by the medical professional. Although it was not the objective of this study to make a comparison between these patients, it should be emphasized that there was a difference in the understanding of the guidelines regarding foot care, and the understanding among patients who were attended by a multi-professional team was better.

CONCLUSION

The foot characteristics of the participants of this study were inappropriate footwear use (62.7%), with pain or discomfort in the feet (53.7%), burning, tingling and numbness (59.7%), and at night in 50%, cracks/fissures (67.1%), desquamative feet (66.4%) and areas of friction (40.2%).

The presence of these factors contributed to the increase of the risk level to develop diabetic foot. This was confirmed by the data obtained during the research, where 98.5% fit into one of the categories that indicate risk for developing diabetic foot.

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