







SENSORIMOTOR ALTERATIONS AND ASSOCIATED FACTORS IN DIABETES MELLITUS PATIENTS

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ABSTRACT

Objective: to evaluate sensorimotor alterations in the extremities of the lower limbs and associated factors in Diabetes Mellitus patients.

Method: this was a cross-sectional and analytical study, conducted in a Basic Health Unit, in Teresina (Brazil) with a sample of 102 participants between April and July 2018, by means of a semi-structured form. For the statistical analyses, the Pearson's chi-square and Fisher's exact tests were performed.

Results: among the study participants, 99 (97.1%) presented alterations, 73 (71.6%) on the skin and 40 (39.2%) on nails. The sensorimotor examination identified 40 (39.22%) individuals with tactile sensitivity alterations and 13 (12.7%) with reduced vibratory sensitivity, using the 128 Hz tuning fork. The factors associated with sensorimotor alterations detected by the 10 gram monofilament were the following: time of disease over ten years; absence of periodic foot evaluation ($p=0.003$); impaired visual acuity ($p=0.001$); presence of pain or discomfort ($p=0.003$); pain worsening at night ($p=0.008$); moderate pain intensity ($p=0.012$) and relief at rest ($p=0.015$).

Conclusion: sensory alterations in the lower limbs showed their relationship with some of the research variables, such as time of disease, foot evaluation, glycemic value, presence of pain or discomfort (worsening and relief shifts, and intensity), skin coloring and vibratory sensitivity evaluation with a tuning fork.

DESCRIPTORS: Diabetes mellitus. Diabetic neuropathologies. Diabetic foot. Primary nursing. Basic care.

HOW CITED: Brito JFP, Bezerra SMG, Oliveira AC, Sousa LS, Silva EB, Rocha ESB. Sensorimotor alterations and associated factors in diabetes mellitus patients. *Texto Contexto Enferm* [Internet]. 2020 [cited YEAR MONTH DAY]; 29:e20180508. Available from: <https://doi.org/10.1590/1980-265X-TCE-2018-0508>

ALTERAÇÕES SENSORIO-MOTORAS E FATORES ASSOCIADOS EM PACIENTES COM DIABETES *MELLITUS*

RESUMO

Objetivo: avaliar as alterações sensorio-motoras das extremidades dos membros inferiores e fatores associados em pacientes com diabetes *mellitus*.

Método: estudo transversal e analítico, realizado em uma Unidade Básica de Saúde, em Teresina (Brasil) com amostra de 102 participantes, entre os meses de abril a julho de 2018, por meio de formulário semiestruturado. Para as análises estatísticas, realizaram-se os testes qui-quadrado de Pearson e o exato de Fisher.

Resultados: dentre os participantes do estudo, 99 (97,1%) apresentaram alterações, sendo 73 (71,6%) na pele e 40 (39,2%) em unhas. A realização do exame sensorio-motor identificou 40 (39,22%) pessoas com alterações de sensibilidade tátil e 13 (12,7%), com sensibilidade vibratória reduzida, utilizando o diapasão 128 Hz. Os fatores associados às alterações sensorio-motoras detectadas pelo monofilamento de 10 gramas foram: tempo de doença acima de dez anos; ausência de avaliação dos pés periodicamente ($p=0,003$); acuidade visual prejudicada ($p=0,001$); presença de dor ou desconforto ($p=0,003$); piora da dor no período noturno ($p=0,008$); intensidade da dor moderada ($p=0,012$) e aliviada ao repouso ($p=0,015$).

Conclusão: as alterações sensoriais nos membros inferiores demonstraram sua relação com algumas das variáveis da pesquisa, como o tempo de doença, a avaliação dos pés, valor glicêmico, presença de dor ou desconforto (turno de piora, alívio e intensidade da mesma), coloração da pele e da avaliação de sensibilidade vibratória com diapasão.

DESCRIPTORIOS: Diabetes *mellitus*. Neuropatias diabéticas. Pé diabético. Enfermagem primária. Atenção básica.

ALTERACIONES SENSORIOMOTORAS Y FACTORES ASOCIADOS EN PACIENTES CON DIABETES *MELLITUS*

RESUMEN

Objetivo: evaluar las alteraciones sensoriomotoras de las extremidades de los miembros inferiores y los factores asociados en pacientes con diabetes *mellitus*.

Método: estudio transversal y analítico realizado en una Unidad Básica de Salud, en Teresina (Brasil) con una muestra de 102 participantes, entre los meses de abril y julio de 2018 por medio de un formulario semiestruturado. Para los análisis estadísticos se efectuaron las pruebas de chi-cuadrado de Pearson y exacta de Fisher.

Resultados: de los participantes del estudio, 99 (97,1%) presentaron alteraciones: 73 (71,6%) en la piel y 40 (39,2%) en las uñas. Al realizarse el examen sensoriomotor se identificaron 40 (39,22%) personas con alteraciones de sensibilidad táctil y 13 (12,7%), con sensibilidad vibratoria reducida, utilizando un diapasón de 128 Hz. Los factores asociados a las alteraciones sensoriomotoras detectadas por el monofilamento de 10 gramos fueron las siguientes: tiempo de la enfermedad superior a diez años, ausencia de una evaluación periódica de los pies ($P=0,003$), agudeza visual afectada ($p=0,001$), presencia de dolor o malestar ($p=0,003$); empeoramiento del dolor durante la noche ($p=0,008$), intensidad de dolor moderada ($p=0,012$) y alivio del dolor en reposo ($p=0,015$).

Conclusión: las alteraciones sensoriales en los miembros inferiores demostraron su relación con algunas de las variables de la investigación, como el tiempo de la enfermedad, la evaluación de los pies, el valor glicémico, la presencia de dolor o malestar (turnos de empeoramiento y mejora del dolor, e intensidad del dolor), coloración de la piel y la evaluación de la sensibilidad vibratoria con un diapasón.

DESCRIPTORIOS: Diabetes *mellitus*. Neuropatías diabéticas. Pie diabético. Enfermería primaria. Atención básica.

INTRODUCTION

Diabetes *Mellitus* (DM) is conceptualized as a metabolic disorder evidenced by persistent hyperglycemia due to a defect in insulin production, in its action or the two combined mechanisms, generating long-term repercussions.¹

Such repercussions imply high costs for the health systems of all countries in the world and, according to estimates, the trend is for an increase in the number of people with DM along with the complications, aggravating the situation. The prevention of complications is the main way to reduce the numbers and some measures are necessary such as disease control, lifestyle alterations, and routine monitoring through consultations and exams.²

The main complications of DM are categorized as macrovascular and microvascular disorders, resulting in several problems, including peripheral neuropathy, which is usually found in two out of three diabetics during clinical evaluation or physical examination, affecting 50% of diabetic individuals worldwide.³

Diabetic neuropathy, as one of the complications that affect the peripheral sensory, motor and autonomic nervous system, culminates in the loss of painful sensitivity, pressure perception, temperature and proprioception, muscles atrophy that generate skin deformities and dryness, leading to cracks and fissures, diffusely or isolatedly, and may or may not be reversible, advancing silently or with evident symptoms.⁴⁻⁵

Thus, individuals with DM and peripheral neuropathy have a great potential for the appearance of foot ulcers, which may precede the amputation of a limb or part of it. It is estimated that 40 to 70% of the non-traumatic lower extremities' amputations are due to diabetes and, of these, 85% are preceded by an ulcer that has not been avoided.⁶

Thus, it is important to emphasize how Nursing care for the person with DM can be the differential for the prevention of complications resulting from peripheral neuropathy, when it is necessary to evaluate criteria to avoid injuries, such as paying attention to the presence of hyperkeratosis, xerodermia and fissures, nails integrity, presence of fungi, blisters, erythema, and circulatory and sensory aspects.⁶ Nursing consultations in patients with inadequate glycemic control should be made every two or three months, four to six times a year; however, it is not a procedure performed in the routine care of patients with diabetes.⁷

For the detection of the neurological alterations, the validated test to identify the risk of future lesions is the examination with the Semmes-Weinstein 10 g monofilament, which evaluates the vibratory, painful and protective sensitivities, being an indication of population risk screening.⁸

The 10 g monofilament is frequently used in association with other tests, such as the 128 Hz tuning fork, bite perception and the Aquileu reflex. In all tests, at least three repetitions are used, interspersed with a simulated application, being normal when the patient feels two of the three applications.⁵⁻⁶

Several studies have shown that the earlier the detection of sensitivity alterations in the feet of individuals with DM with the use of the 10 g monofilament and periodic foot exams, performed by health professionals, especially nurses, the better the prevention of injuries and the improvement of quality of life since, in most cases, the impaired sensory function may evolve to motor function loss. Due to this fact, it is necessary to have a differentiated look, planning in order to prevent aggravation and treat the needs of the person with DM in a timely manner.⁹

Studies of this nature allow for the detection of sensitivity alterations that can cause lesions in the feet of individuals with DM, as well as the identification of factors that may be associated with peripheral neuropathy and the comparison of results with scientific evidence, helping in the development

of nursing interventions and guidance for public health policies that prioritize improvements in care to individuals with DM.

Thus, the objective of this study was to evaluate sensorimotor alterations and associated factors in patients with diabetes mellitus.

METHOD

A cross-sectional and analytical study, developed in a Basic Health Unit in the city of Teresina, Brazil. The location was chosen because it is the main meeting place for diabetic people who make routine appointments. In the Basic Health Unit (*Unidade Básica de Saúde*, UBS), there are four teams divided into two in the morning and two in the afternoon shifts. Previously, permission from nurses and other team members who agreed to participate and contribute to the research was obtained.

Data was collected by the study researchers between April and July 2018, before or after the medical/nursing care, addressing the DM patient on issues regarding foot care. Convenience sampling was used, consecutively listing all the accessible individuals who met the inclusion criteria.

For the selection of participants, the following inclusion criteria were used: patients older than 18 years old, with a confirmed diagnosis of DM, regardless of the time of the disease. Individuals with neurological, vascular and musculoskeletal impairments not related to diabetes, such as leprosy, quadriplegia or paraplegia were excluded.

The construction of the collection instrument consisted of three stages: reading the Ministry of Health's "Diabetic foot manual: strategies for the caring of the person with chronic disease", which addresses the importance of foot care for the person with DM.⁶ After this stage, the main information was gathered for the construction of the collection material and, finally, a pre-test with 10% of the sample was performed in a separate UBS from the research unit, in order to detect possible difficulties in the form understanding by the potential participants. The analysis of the tests made it possible to identify that the instrument did not require any structural or grammatical changes.

The instrument was composed of information containing sociodemographic data, anamnesis, and feet physical examination, lower limbs' vascular and neurological evaluation, which was asked to the study participants and recorded by the own interviewer in a room in the unit, with an mean duration of 20 minutes, respecting the individuality and ethical aspects of the research.

Initially, an interview was conducted with the participants on feet evaluation, last visit's glycemic value, history of limb ulcers, amputations, smoking, visual acuity, presence of pain or discomfort, pain worsening period and its intensity classification, hygiene and foot protection, and the type of footwear used.

At the time of the physical examination, the integrity of the nails and skin were evaluated and the sensitivity test with the 10 g monofilament was performed, when ten points were tested as they are specific posterior tibial nerve territories (first, second and third toes, and metatarsus, foot lateral regions) and the deep branch of the fibular nerve (back of the foot between the first and second metatarsus).¹⁰ Despite several studies regarding the points to be investigated, there is no consensus regarding the number of sites where the monofilament should be applied.¹¹

It is worth mentioning that the objective this study was to evaluate the Loss of Protective Sensitivity (LPS) detected by means of the 10 g monofilament, based on the recommendations given by the Ministry of Health and by the Brazilian Society of Diabetes, which guide risk tracking in the lower limbs of individuals with diabetes.^{1,6} Thus, the person who was sensitive to the monofilament at the tested points was considered with no sensorimotor alteration. We interpreted as sensorimotor alteration when the individual presented an altered monofilament at one or more of the points tested and described above.⁶

For the evaluation of vibratory sensitivity, the 128 Hz tuning fork was used over the hallux distal phalanx's dorsal bone part perpendicularly, being positive (altered) when the participant loses the vibration sensation while the examiner still perceives the vibration in at least two of three applications. The test is considered normal after two of the three correct answers.⁶

The study's data were inserted in databases in Microsoft Excel and later processed in the Statistical Package for the Social Sciences (SPSS) software, version 22.0. Descriptive statistics was performed by determining the measures of central trend (absolute and relative frequencies, mean, minimum and maximum interval) and of dispersion (standard deviation). The Pearson's chi-square and Fisher's exact tests were used for inferential analysis. We considered as statistically significant the results of the tests that presented $p \leq 0.05$.

Only after the consent of the interviewee and signing of the Free and Informed Consent Form, data collection was initiated, respecting all ethical precepts established in Resolution No. 466/12.

RESULTS

From the 102 study participants, there was a prevalence of females (75.5%), literate (49%), with complete elementary education (21.6%) and with no history of ulcers (80.4%). Age ranged from 34 to 85 years old, with a mean of 60.1 (± 10.9).

Regarding the feet's physical examination of individuals with DM, Table 1 shows that 97.1% of the participants presented alterations in it. Among the main alterations, the most important were those of the skin (71.6%) and the unguinal ones (45.1%). Inadequate nail clipping was observed in most cases (62.7%), with the performance of hygiene care and foot protection (63.7%) and the predominance of flip-flops use (52%).

Among the people evaluated, the time of disease between one and ten years (44.1%) in which they had never performed foot evaluation was 87.3%, with a glycemic value from 101 to 200 mg/dL (34.3%) and impaired visual acuity (56.9%). Regarding pain, the majority reported pain or discomfort (68.6%), with worsening in the night shift (27.5%), with mild pain (23.5%) and pain relieved at rest (38.2%) standing out (Table 2).

The presence of pedal (91.2%) and posterior tibial (92.2%) pulses was predominant. The majority of the participants did not present any alteration in skin coloring (91,2%) or in foot temperature (88,3%). Regarding the evaluation of sensitivity with a tuning fork, individuals without alterations prevailed (87.3%).

In Table 2, it was also observed that 40 (39.2%) individuals presented sensorimotor alterations by means of the ten gram monofilament test. The sensorimotor alterations presented significant associations and higher percentages with the following factors: time of disease over ten years ($p=0.035$); never had feet evaluated ($p=0.003$); impaired visual acuity ($p=0.001$); presence of pain ($p=0.004$); worsening of pain at night ($p=0.008$); moderate pain ($p=0.012$) and pain relieved at rest ($p=0.015$); with no alteration in skin coloring ($p=0.001$) and no alteration in sensitivity with tuning forks ($p<0,001$).

Table 1 – Physical examination of the feet of the individuals with diabetes mellitus registered in Primary Care. Teresina, Brazil, 2018. (n=102)

Variables	n	%
Presents any alteration in the physical examination?		
Yes	99	97.1
No	3	2.9
Skin alterations (hyperkeratosis, xerodermia, and fissures)		
Yes	73	71.6
No	29	28.4
Ungual alterations (nail dystrophy and onychomycosis)		
Yes	46	45.1
No	56	54.9
Friction bubbles		
Yes	4	3.9
No	98	96.1
Ulcers		
Yes	3	2.9
No	99	97.1
Tinea pedis or interdigital		
Yes	5	4.9
No	97	95.1
Inadequate nail cutting		
Yes	64	62.7
No	38	37.3
Hygiene care measures and foot protection		
Yes	65	63.7
No	37	36.3
Types of footwear		
Filp-flops	53	52.0
Open	32	31.4
Closed	17	16.6

Table 2 – Association of the clinical, vascular and neurological variables with the 10g monofilament sensitivity test. Teresina, PI, Brazil, 2018. (n=102)

Variables	n (%)	With alteration		p-value
		n (%)	Without alteration n (%)	
Time of disease				
Up to 1 year	14(13.8)	2(5.0)	12(19.4)	0.035*
Between 1 and 10 years	45(44.1)	17(42.5)	28(45.2)	
Over 10 years	40(39.2)	21(52.5)	19(30.6)	
Not informed	3(2.9)	0	3(4.8)	
Have you already had your feet evaluated?				
Yes	13(12.7)	10(25.0)	3(4.8)	0.003*
No	89(87.3)	30(75)	59(95.2)	
Glycemia value at last consultation?				
Below 60	1(1.0)	0	1(1.6)	0.798*
Between 60 and 100	7(6.9)	4(10.0)	3(4.8)	

Table 2 – Cont.

Variables	n (%)	With alteration	Without alteration	p-value
		n (%)	n (%)	
From 101 to 200	35(34.3)	12(30.0)	23(37.2)	
Above 201	18(17.6)	7(17.5)	11(17.7)	
Not informed	41(40.2)	17(42.5)	24(38.7)	
Visual acuity				
Preserved	43(42.1)	9(22.5)	34(54.8)	0.001[†]
Impaired	58(56.9)	30(75.0)	28(45.2)	
Absent	1(1.0)	1(2.5)	0	
Presents pain or discomfort?				
Yes	70(68.6)	34(85.0)	36(58.1)	
No	32(31.4)	6(15.0)	26(41.9)	0.004^b
Pain worsening shift				
Morning	21(20.6)	13(32.5)	8(12.9)	0.008[†]
Evening	21(20.6)	7(17.5)	14(22.6)	
Night	28(27.4)	14(35.0)	14(22.6)	
Does not present pain	32(31.4)	6(15.0)	26(41.9)	
Pain intensity				
No pain	32(31.4)	6(15.0)	26(41.9)	0.012[†]
Slight pain	24(23.6)	9(22.5)	15(24.2)	
Moderate pain	23(22.5)	14(35.0)	9(14.5)	
Intense pain	23(22.5)	11(27.5)	12(19.4)	
Pain relief				
Relieved when moving	31(30.4)	16(40.0)	15(24.2)	0.015[†]
Relieved at rest	39(38.2)	18(45.0)	21(33.9)	
Does not present pain	32(31.4)	6(15.0)	26(41.9)	
Palpation of the pedal pulses				
Present	93(91.2)	34(85.0)	59(95.2)	0.095 [†]
Diminished	7(6.8)	4(10.0)	3(4.8)	
Absent	2(2.0)	2(5.0)	0	
Posterior tibial pulse				
Present	94(92.2)	35(87.5)	59(95.2)	
Diminished	8(7.8)	5(12.5)	3(4.8)	0.257 [†]
Absent	0(0.0)	0	0	
Skin coloring				
Pale	5(4.9)	5(12.5)	0	0.001[†]
Reddish	4(3.9)	3(7.5)	1(1.6)	
Without alterations	93(91.2)	32(80.0)	61(98.4)	
Foot temperature				
Cold	9(8.8)	3(7.5)	6(9.7)	1.000 [†]
Hot	3(2.9)	1(2.5)	2(3.2)	
Without alterations	90(88.3)	36(90.0)	54(87.1)	
Sensitivity evaluation with tuning fork				
With alteration	13(12.7)	12(30.0)	1(1.6)	<0.001[†]
Without alteration	89(87.3)	28(70.0)	61(98.4)	

*Fisher's Exact Test; †Pearson's Chi-Square Test.

DISCUSSION

The physical examination of a person with DM is essential to avoid the development of lesions, a considerable factor in this study, was the percentage 97.1% of the participants had some alteration, especially on the skin (71.6%) and nails (45.1%). The presence of hyperkeratosis, fissures and xeroderma means a certain degree of autonomic commitment, i.e., reduction or suppression of sweat production, causing such alterations.¹²

In study carried out in a university hospital in Pará (Brazil), the same result was obtained, where xerosis (55.2%) and onychomycosis (43.9%) stood out during the physical examination. With compromised skin, the installation of serious infections and amputation of the limb becomes viable, since this is one of the body's protection against external agents.¹³ Other studies also corroborate what was found in this study; in this opportunity, with a predominance of skin alterations such as dry skin (90%) and cracks (63%).¹⁴

Among the participants, 62.7% had inadequate nail cutting and 36.3% had unsatisfactory hygiene, the latter not being less important because it is an essential point to avoid future injuries. Nail clipping and foot hygiene are strengths in the prevention of diabetic foot. The nails should be cut straight, without exposing the corners, avoiding injury and/or jamming, as it may be an entrance door for microorganisms. As for cleaning, the orientation is to keep the feet clean and dry, especially in interdigital spaces, avoiding mycoses and infections.¹⁵

Self-care is important to reduce these lesions. A study carried out in Piauí, (Brazil) showed that only 38.7% of the patients underwent foot examinations five to seven days a week, which is a worrying fact because the patient needs to have adequate guidance and perform self-care to prevent complications and amputations.¹⁶

The predominance of inappropriate footwear was evident in this study, especially regarding the use of flip-flops (52%). About 50% of the amputations occur due to improper use of the shoes, whereas 80% of these lesions may decrease with proper use, reducing plantar pressure, absorbing the shock and distributing the weight correctly on the feet.¹⁷ Similarly, another study carried out in Piauí reports that only 9.2% uses appropriate footwear and, in another one carried out in the State of Paraná, more than half (59%) uses footwear inappropriately.^{14,18}

The monofilament sensitivity test detected alterations in 39.22% of the participants. A study carried out in a UBS from the state of Minas Gerais (Brazil), using the Semmes-Weinstein monofilament in the tactile neurological evaluation of the lower limbs showed that about 34.8% of the study participants had alterations in protective sensitivity at some of the points.¹⁹ Several prospective studies demonstrate that, when there is no plantar pressure sensation using the monofilament, there is a high prediction for ulceration to occur and early detection leads to preventive measures, preventing the appearance and progression of the lesion.²⁰

Also, studies have shown that the reduction in sensitivity is related to factors inherent to the health condition of the person with DM. Among them is the time of disease, where the longer the time, the more likely it is to develop nerve damage and future damage,²¹ such as the findings of this study, which obtained an association with the time of disease over ten years and alteration in the sensitivity test.

The non-performance of the foot evaluation showed statistical significance with the presence of sensory alterations. This information becomes worrying, considering that the research was conducted in a UBS, whose focus is to work on the prevention, promotion, and recovery of health, as it should be the place of support for conducting these consultations and prevention of future injuries in diabetic patients. It is possible to observe in the literature that this is not an isolated case, similarities being found in it.²²

It is important to highlight that the periodic examination of the feet is an effective method during the DM patient consultation since it is by means of the thoroughness of the examination that entry doors for the installation of lesions are found, besides the loss of protective sensitivity.²³

Visual acuity was also associated with altered sensitivity in this study. The close relationship between these factors is due to the high glycemic indexes present in individuals with retinopathy, predisposing them to neurological damage in the lower limbs and, consequently, to the development of peripheral neuropathies.²⁴

In this study, the presence of pain with worsening at night and relieved under rest indicates that those who had some discomfort were associated with alteration in the lower limbs' sensitivity. A study conducted in a university outpatient clinic in Paraná (Brazil) also evaluated the pain level of the participants and, similarly to this study, found a similarity between moderate (34.2%) and severe (39.5%) symptoms.¹⁴

We know that, for neuropathy diagnosis, investigations beyond the use of monofilament are necessary, such as investigating the presence of pain and discomfort in the lower limbs. Pain is found in people with greater impairment of nerve or vascular fibers due to DM. Pain such as burning, tingling or "stinging", with worsening at night and relieved under movement, indicates a neuropathy diagnosis. On the other hand, when cramps and weight are present when walking, relieved at rest, it is believed that there is a peripheral vascular injury.⁶

Pale and reddish skin coloring was present in the sensorimotor alteration. The observation of skin coloring is part of the vascular lesion tracking and, consequently, of the detection of ulceration because, when the skin is pale at limb elevation and reddish or cyanotic when down, this indicates peripheral arterial disease, leading to the onset of diabetic foot.^{7,25}

In the study 12.7% of those evaluated with altered vibratory sensitivity by using the tuning fork stood out. Similar results were found in another study, when the tuning fork was also used to evaluate vibratory sensitivity, with 13.15% of the participants with no vibration of the instrument, converging with this research.¹⁷

Also, the result showed the association among people who had reduced foot protective sensitivity, because they also had alterations with the tuning fork. The alterations in both sensitivity tests are suggestive of the involvement of thick fibers, as it occurs in diabetic neuropathy, and their identification allows for a more accurate decision making process regarding care to avoid the appearance of lesions.¹⁹

Given the cited information, we believe that peripheral neuropathy should be discussed with greater attention. This is because it commonly occurs in DM and has great possibilities of incapacitating the individual, thus causing loss of thermal, painful and tactile sensitivity as a result of blood glucose decompensation.²⁶

There were limitations in the study, such as the repetition of users during the months following the data collection for the quarterly return and the reduction of the sample size in the glycemic control variable in the last visit, because this datum was not recorded. The contributions were diverse, such as the health education process by means of meetings with the team and patients with diabetes in which we clarified the main pieces of doubt found regarding foot care, alterations that should be a reason for warning of major complications, prevention of ulcers and amputations.

CONCLUSION

The sensory alterations found through the Semmes-Weinstein monofilament test showed its relation to some variables of the research, mainly time of disease, foot evaluation, glycemic value, presence of pain or discomfort (worsening and relief shifts, and intensity), skin coloring and vibratory sensitivity evaluation with a tuning fork), demonstrating that the evaluation brief moment, using the monofilament and the health professional perception, especially the nurse, leads to discoveries about the patient's real health situation, besides coinciding with the studies in the area.

The absence of the physical examination of the feet of individuals with DM, especially the evaluation of sensitivity with the 10 g monofilament, is included as one of the risk factors that lead to ulcerations, in addition to other associated factors, such as dermatological and vascular alterations. Such evaluations are among the guidelines in the prevention of diabetic foot, which is why professionals should add them to their care routine.

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NOTES

ORIGIN OF THE ARTICLE

Extracted from the Conclusion Course Work - Sensorimotor alterations and associated factors in Diabetes Mellitus Patients, presented to the undergraduate Nursing course of the *Universidade Estadual do Piauí*, in 2018.

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APPROVAL OF ETHICS COMMITTEE IN RESEARCH

Approved by the Committee of Ethics in Research with Human Beings of the *Universidade Estadual do Piauí* under Opinion No.2,609,733 and Certificate of Presentation for Ethical Appreciation No 84197318.2.0000.5209.

CONFLICT OF INTEREST

There is no conflict of interest.

HISTORY

Received: February 05, 2019.

Approved: June 24, 2019.

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