Factors associated with the risk of diabetic foot in patients with diabetes mellitus in Primary Care*

Fatores associados ao risco de pé diabético em pessoas com diabetes mellitus na Atenção Primária

Factores asociados al riesgo de pie diabético en personas con diabetes mellitus en la Atención Primaria

Jefferson Abraão Caetano Lira[1]

Lídya Tolstenko Nogueira[1]

Bianca Maria Aguiar de Oliveira[1]

Débora dos Reis Soares[1]

Ana Maria Ribeiro dos Santos[1]

Telma Maria Evangelista de Araújo[1]

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[1] Universidade Federal do Piauí, Teresina, PI, Brazil.

ABSTRACT

Objective: To analyze factors associated with diabetic foot risk in patients with diabetes mellitus assisted in Primary Care. **Method:** Observational, analytic, and transversal study took place in Teresina, Piauí, with diabetic patients who are assisted in Primary Care. Data collection took place through interviews, foot clinical exams, and medical record analysis. We used the *Mann-Whitney*, *Pearson's Chi-square* and multiple logistic regression statistics tests to analyze the data. The association power among categorical variables was measured by *Odds Ratio*. **Results:** 322 patients participated. Marital status with a partner presented a protection factor (p = 0.007). Risk factors for the development of the diabetic foot are: arterial hypertension (p = 0.045), obesity (p = 0.011), smoking (p = 0.027), not being submitted to follow ups (p = 0.046), inadequate control of capillary blood glucose (p < 0.001), indisposition to the care of the foot (p=0.014), and foot self-exam less frequently (p = 0.040). **Conclusion:** Sociodemographic, clinical, and self-care aspects interfere in diabetic foot development, highlighting the necessity of effective follow up tracking and educational interventions for patients with diabetes mellitus in Primary Care.

DESCRIPTORS

Diabetes Mellitus; Diabetic Foot; Mass Screening; Primary Health Care; Nursing.

Corresponding author:
Jefferson Abraão Caetano Lira
24 de janeiro Street, 561, Centro-Sul
CEP 64001-230 – Teresina, PI, Brazil
j.abraaolira@gmail.com

INTRODUCTION

The diabetic foot is a syndrome that affects the low members of a patient with diabetes mellitus (DM) caused by a non-effective treatment that can trigger vascular and nerve complications, ulceration, and deformities[1]. This avoidable grievance is responsible for a high number of amputations and hospitalizations resulting in an increase in costs for health services and compromising the productivity and quality of life of the patient[2].

In Spain, 73% of the amputations of lower members were caused by DM, with an incidence of 11.2 for 100,000 habitants in the period from 2001 to 2014[3]. In Ceará, from 2010 to 2015, 4,182 hospitalizations for treatment of diabetic foot complications were registered, which presented a strong and positive correlation between the number of hospitalizations and amputations related to DM[4]. In Piauí, 52% of the patients with DM showed plantar protective sensitivity change, one of the predictive factors for the diabetic foot[5].

The diabetic foot occurs because of metabolic decontrol, deficit of knowledge, and the non-adherence of recommended treatment. Moreover, the precarious hygiene, the use of inappropriate shoes, inadequate nail cut, the presence and non-treatment of onychomycosis and onychocryptosis, the incorrect remotion of calluses, the inadequate treatment of neuroischemic ulcers, and the peripheral ischemia are aggravating factors for the diabetic foot[6].

Hence, we highlight the necessity of follow ups that consists of making a survey of risk factors for the development of the diabetic foot through clinical and laboratory exams[1]. Through this strategy, nurses can implement the care plan, recommendations and follow-ups that are indispensable for DM patient's care management[7]. However, a study carried out in Paraíba noted that the majority of nurses did not clinically examine the foot of patients for the plantar protective sensitivity evaluation[8].

Therefore, nurses perform a significant role in assisting patients with DM because he/she possesses specific abilities and skills for the care and the promotion of health. That way, the effectiveness of diabetic foot follow ups, by this professional, is crucial for the better management of health and the reduction of this frequent grievance in the scope of Primary Care[9].

Aiming to investigate the functioning of diabetic foot follow ups and to contribute to the establishment of a care line directed to the integrality of the assistance of patients with DM, this study aims to analyze the factors associated with the risk of diabetic foot in patients with mellitus diabetes attended in Primary Care.

METHOD

DESIGN OF STUDY

Observational, analytic, and transversal study.

SCENARIO

The study was carried out in Teresina, Piauí, in the Primary Care, in six Basics Health Units (BHU) of the region of Center-North given its superior demand of patients with DM in the city.

POPULATION AND SAMPLE

The population consists of 2,015 DM patients registered in the Hiperdia Program of Family Health Strategy from the referred region that carried out routine medical examinations in June 2018. Patients integrated the sample according to the inclusion criteria: people over 18 years with type 1 or 2 DM diagnosis; and exclusion: those with neuropathy related to other factors. We used the estimation formula from the population proportion to the finite population to calculate the minimum sample necessary, with a 95% confidence level, presumed prevalence of 50%, and a maximum error of 5%, resulting in 322 patients. Nonprobability sampling was carried out by convenience.

DATA COLLECTION

Before the collecting phase, we pre-tested 32 participants to try the instrument's application. The data collection was carried out from February to August 2019 in three phases.

In the first phase, we did interviews by utilizing an adapted form to collect clinical and sociodemographic aspects[10], and the Admission to the Self-care with Feet for Diabetic patients quiz to evaluate self-care practices[11]. We highlight that all variables regarding foot self-care, for instance, the indisposition to foot care, were collected by an oral report with the interviewed patients.

In the second phase, we did a clinical examination of the foot through the Michigan Neuropathy Screening Instrument (MNSI), considering the presence of neuropathy equal or greater than 2.5, with at least one sign or symptom[12]. The classification of risk of developing diabetic foot was carried out by the instrument for diabetic foot examination in 3 minutes[13]. Patients were considered with a diabetic foot when there were open wounds or ulcerative areas with or without signs of foot infection.

Patients were properly guided and seated on the stretcher or on a chair to ease the examination. Previous demonstrations of the procedure were carried out so that the patient could understand the stimulus they could feel during the examination of the feet, besides being oriented to keep their eyes closed during the examination, to prevent inaccurate results. For the tests, we utilized 10 g *Semmes–Weinstein* monofilament, 128 Hz tuning fork, and the neurological hammer.

In the third phase, we analyzed the handbook for the anthropometric data collection and laboratory exams. We emphasize that we collected the data during the a day when the patient had a scheduled consultation with the Hiperdia Program, before seeing the patients in a reserved room in the BHU.

The independent variables were sociodemographic, clinical, and related to self-care and dependent to the risk of developing diabetic foot, the outcome was having or not the risk of developing diabetic foot.

DATA ANALYSIS AND TREATMENT

Data tabulation, with double digitations, was carried out on Microsoft Excel 2013. Subsequently, we exported the data to the Software Statistical Package for Social Science (SPSS), 22.0 version. For the analysis, we held descriptive and inferential statistics. In the descriptive, for numerical variables, we calculated median, minimum and maximum values. For the categorical, we utilized absolute frequency and percentage. In the inferential statistic, we applied bivariate and multivariate statistical tests.

To verify the numerical distribution of the variable pattern, we utilized the *Kolmogorov-Smirnov* normality test, which demonstrated nonnormality in the distribution. In the inferential analysis, for bivariate statistics, we applied *Mann-Whitney* tests to compare a numerical variable with a dichotomous categorical, and *Pearson's Chi-square* to verify the association between two categorical variables. The *Odds Ratio* (OR), with 95% Confidence Intervals (IC), was utilized to verify the association strength between the categorical variables. We highlight that the adopted reference category occurred based on clinical importance.

In the multivariate statistics, we created a multiple logistic regression model through the stepwise forward method, in which we first introduced the variable of greatest statistical significance and, later, the other variables, following the decreasing order of identified association in the bivariate analysis. The variable inclusion criteria in the multivariate model was the value of $p \leq 0.20$ obtained in the bivariate analysis[14]. We identified the multicollinearity between independent variables through the Variance Inflation Factor (VIF), in which the value greater than four was adopted as a point of cut for the diagnosis of VIF multicollinearity[15]. The value of $p < 0.05$ was considered significant for all statistical tests.

ETHICAL ASPECTS

This study followed the ethical aspects of the 466/2012 Resolution of the National Health Council and it was approved by the Ethics Research Committee from the Unversidade Federal do Piauí, in 2018, under the No. 2.817.426

RESULTS

In the sociodemographic characterization, the characteristics which prevailed in participants were: being a young elder (53.4%), female (70.2%), brown skin (70.2%), living with partner in a marital status (62.4%), and had a personal income of one minimum wage salary[1] (64.0%). Part of them were retired (33%) and did not complete elementary school (44.4%).

Regarding the clinical aspects, the characteristics which prevailed in participants were: being diagnosed with DM type 2 (94.4%), under oral medication (as predominant medication type) (86.0%), and inadequate glycemic control (51.9%). In addition, 58.7% reported that they were living with the disease for less than 10 years, 66.1% had dyslipidemia, and 72.0% arterial hypertension. However, the majority did not present retinopathy (55.6%), nephropathy (82.0%) and obesity (72.7%), besides not smoking (89.8%) nor using alcohol (82.6%). On the other hand, 76.7% had low visual acuity.

With regards to diabetic foot follow ups, 86.3% of patients with DM had never been submitted to the clinical foot exam, 59.0% had diabetic neuropathy, 3.1% diabetic foot, and 69.6% risk of developing diabetic foot. Besides, 57.8% reported that they did not receive any type of monitoring.

In the clinical foot exam, the foot that most showed abnormal appearance was the right one (68.9%), in which dry skin and/or calluses were the most common complications (57.1%), and 1.9% presented ulcer. The presence of ankle reflex (57.1%) and the plantar protective sensibility to 10 g monofilament (68.3%) prevailed in the right foot. However, the left foot had more numbers of absence of vibration perception from the hallux to the tuning fork of 128 Hz (42.9%).

Their age ($p = 0.046$), DM diagnosis time ($p < 0.001$), education completion ($p = 0.008$), and the number of foot complications ($p < 0.001$) presented statistical significance for the development of the diabetic foot (Table 1).

Table 1 - Sociodemographics and clinical variables differences in relation to the risk of developing diabetic foot - Teresina, Piauí, Brazil, 2019.

Variables	Median	Minimum	Maximum	*p value*
Age in years	62.0	26.0	87.0	**0.046**
Years of study	7.5	0.0	18.0	**0.008**
Income in *reais*	998.0	0.0	5998.0	0.429
DM diagnosis time in years	6.5	0.0	63.0	**< 0.001**
BMI	27.9	19.1	46.4	0.195
Number of foot complications	2.0	0.0	8.0	**< 0.001**

Mann-Whitney test.
n = 322

We identified that arterial hypertension (OR:1.96; IC:1.17-3.26) and obesity (OR:1.85; IC:1.04-3.29) increased the chances of developing the diabetic foot. However, marital status with a partner (OR:0.70; IC:0.51-0.98) and follow ups (OR:0.57; IC:0.33-0.99) are protection factors according to Table 2.

Table 2 - Sociodemographic and clinical aspects association with the risk of developing the diabetic foot - Teresina, Piauí, Brazil, 2019.

Variables	Risk of diabetic foot		OR raw	IC 95%	p value
	Yes	No			
	n (%)	n (%)			
Marital status					
With a partner*	148 (73.6)	53 (26.4)	0.70	0.51 – 0.98	**0.046**
No partner	76 (62.8)	45 (37.2)			
Diabetes type					
Diabetes type 1*	14 (77.8)	4 (22.2)	1.57	0.50 – 4.89	0.436
Diabetes type 2	210 (69.1)	94 (30.9)			
Arterial hypertension					
Yes*	171 (73.7)	61 (26.3)	1.96	1.17 – 3.26	**0.010**
No	53 (58,9)	37 (41.1)			
Obesity					
Yes*	69 (78.4)	19 (21.6)	1.85	1.04 – 3.29	**0.034**
No	155 (66.2)	79 (33.8)			
Smoking					
Yes*	28 (84.8)	5 (15.2)	2.66	0.99 – 7.10	**0.044**
No	196 (67.8)	93 (32.2)			
Alcohol use					
Yes*	38 (67.9)	18 (32.1)	0.91	0.49 – 1.69	0.760
No	186 (69.9)	80 (30.1)			
Follow ups					
Yes*	25 (56.8)	19 (43.2)	0.57	0.33 – 0.99	**0.048**
No	199 (71.6)	79 (28.4)			
Monitoring					
Yes*	92 (67.6)	44 (32.4)	0.86	0.53 – 1.38	0.522
No	132 (71.0)	54 (29.0)			

* Reference category.
Pearson's Chi-square test.
n = 322

Associating the self-care with the risk of developing the diabetic foot, inadequate glycemic control (OR:3.47; IC:2,11-5.70), indisposition to the care of the foot (OR:3.45; IC:1.73-6.87), non-square cut shape of the nails (OR:1.88; IC:1.16-3.07), and not using moisturizer (OR:2.16; IC:1.33-3.50) increase the chances of developing the diabetic foot. The self-exam of the foot (p < 0.001), checking the shoes before wearing them (p = 0.009), drying the gaps between the toes (p = 0.016), and using homemade solution for dressing (p = 0.004) showed significant association with the risk of developing the diabetic foot statistically, according to the Table 3.

Table 3 - Self-care association with the risk of developing diabetic foot - Teresina, Piauí, Brazil, 2019.

Variables	Risk of diabetic foot		RawOR	IC 95%	p value
	Yes	No			
	n (%)	n (%)			
Patient searches for professional health care whenever she/he has a problem with her/his foot					
No*	123 (72.8)	46 (27.2)	1.38	0.86 – 2.22	0.187
Yes	101 (66.0)	52 (34)			

…continuation

Variables	Risk of diabetic foot		RawOR	IC 95%	p value
	Yes	No			
	n (%)	n (%)			
Patient has someone who encourages or helps her/him in the care of the foot					
No*	130 (69.9)	56 (30.1)	1.04	0.64 – 1.68	0.881
Yes	94 (69.1)	42 (30.9)			
Patient practices physical activity for at least 30 minutes/day					
Not once*	133 (72.7)	50 (27.3)	1.4	0.87 – 2.26	0.164
At least once a week	91 (65.5)	48 (34.5)			
Patient controls the capillary blood glucose levels					
No*	154 (80.2)	38 (19.8)	3.47	2.11 – 5.70	**< 0.001**
Yes	70 (53.8)	60 (46.2)			
Patient takes prescribed medications as recommended					
No*	16 (76.2)	5 (23.8)	1.43	0.51 – 4.02	0.495
Yes	208 (69.1)	93 (30.9)			
The health professional advises about the care of the foot					
No*	159 (71.0)	65 (29.0)	1.24	0.75 – 2.07	0.403
Yes	65 (66.3)	33 (33.7)			
Patient has disposition to take care of the foot					
No*	68 (86.1)	11 (13.9)	3.45	1.73 – 6.87	**< 0.001**
Yes	156 (64.2)	87 (35.8)			
Patient exams the foot frequently					
No	122 (80.3)	30 (19.7)	_	_	**< 0.001**
Weekly	71 (64.0)	40 (36.0)			
Daily	31 (52.5%)	28 (47.5)			
Patient dries the gaps between her/his toes					
No	100 (77.5)	29 (22.5)	_	_	**0.016**
Weekly	73 (68.2)	34 (31.8)			
Daily or after each bath	73 (68.2)	34 (31.8)			
Patient checks the shoes before wearing them					
No	65 (79.3)	17 (20.7)	_	_	**0.009**
Rarely	73 (73.7)	26 (26.3)			
Always	86 (61.0)	55 (39.0)			
Patient cuts the toes' nails in a square shape					
Never*	117 (76.5)	36 (23.5)	1.88	1.16 – 3.07	**0.010**
Yes, although it is not possible to assume how frequently	107 (63.3)	62 (36.7)			
Patient applies moisturizer in the foot					
Never*	134 (77.0)	40 (23.0)	2.16	1.33 – 3.50	**0.002**
Every day or almost every day	90 (60.8)	58 (39.2)			
Patient makes dressings at home with homemade solutions or with other products					
Yes*	63 (82.9)	13 (17.1)	2.56	1.33 – 4.91	**0.004**
No	161 (65.4)	85 (34.6)			

* Reference category.
Pearson's Chi-square test.
n = 322

At the final model of the multiple logistic regression, the marital status with a partner was a factor of protection for the development of the diabetic foot (ORa:0.47; IC:0.27–0.81). The time of diagnosis of DM (ORa:0.92; IC:0.88-0.95) and the number of foot complications (ORa:0.63; IC:0.51–0.77) resulted in a negative association, in other words, patients with a shorter time of diagnosis and the least number of complications have lower chances of developing the diabetic foot. Arterial hypertension (ORa:1.83; IC:1.01-3.32), obesity (ORa:2.27; IC:1.21-4.28), smoking(ORa:3.18; IC:1.14-8.86), not going through follow ups (ORa:2.1; IC:1.01-4.39), inadequate control of the capillary blood glucose levels ORa:3.02; IC:1.74-5.25), indisposition to the foot care (ORa:2.90; IC:1.24-6.79), and not self-examining the foot frequently (ORa:2.11; IC:1.03-4.32) increase the chances of developing the diabetic foot (Table 4).

Table 4 - Multiple logistic regression of the sociodemographics, clinical and self-care aspects with the risk of developing the diabetic foot. Teresina, Piauí, Brazil, 2019.

Variables	OR adjusted	IC 95%	p value*
Age in years	0.99	0,96 – 1.01	0.604
Years of study	1.04	0.97 – 1.11	0.201
Marital status			
With a partner	0.47	0.27 – 0.81	**0.007**
Time of diagnosis in years	0.92	0.88 – 0.95	**< 0.001**
Arterial hypertension			
Yes	1.83	1.01 – 3.32	**0.045**
Obesity			
Yes	2.27	1.21 – 4.28	**0.011**
Smoking			
Sim	3.18	1.14 – 8.86	**0.027**
Follow ups			
No	2.10	1.01 – 4.39	**0.046**
Patient controls the capillary blood glucose levels			
No	3.02	1.74 – 5.25	**< 0.001**
Patient has disposition to take care of the foot			
No	2.90	1.24 – 6.79	**0.014**
Patient self-exams the foot frequently			
No	2.11	1.03 – 4.32	**0.040**
Patient dries the gaps between the toes			
No	1.03	0.48 – 2.19	0.928
Patient checks the shoes before wearing them			
No	0.98	0.42 – 2.30	0.977
Patient cuts the toes nails in a square shape			
Never	0.55	0.27 – 1.12	0.103
Patient applies moisturizer in the foot			
Never	1.00	0.51-1.96	0.989
Patient makes dressings at home with homemade solutions or with other products			
Yes	1.86	0.85 – 4.03	0.117
Number of foot complications	0.63	0.51 – 0.77	**< 0.001**

*Multiple logistic regression
n = 322

DISCUSSION

The sociodemographic characterization of this research converges, partly, with another study carried out in Paraná, in which the majority of patients with DM were, on average, 60 years old, female (62.0%), 69.6% were with a partner, 67.7% had a low educational level, with less than six years of study. However, it differed in respect to skin color, which prevailed white (71.8%)[16].

The marital status with a partner, in the multivariate model, presented protection factor for the development of the diabetic foot, that can be explained by the emotional and social support offered by a partner while facing DM, which improved the adherence to the treatment through monitoring of glycemic control, use of medication, promotion of self-care, and lifestyle changes.

In Ireland, the advanced age, being male, having a smoking background, low level of physical activity, and high cholesterol diagnosis predicted macrovascular complications. Likewise, DM diagnosis of 10 years of more, the smoking background, and the arterial hypertension were associated with increased risk of macrovascular complications[17]. These results partially corroborated with this research because arterial hypertension and smoking increases the chances of developing diabetic foot, while the age and education level did not present any statistically significant association.

A transversal study carried out in Saudi Arabia also demonstrated prevalence on the type 2 DM (89.1%) and that oral hypoglycemic agents are the selected treatment for 57.2% of the patients. Regarding the associated comorbidities, the percent of nephropathy was similar to this research (7.6%). However, arterial hypertension (47.2%) and dyslipidemia (16.7%) were different, with lower values registered in this study[18]. We highlight that DM associated with arterial hypertension and dyslipidemia causes an increase in cardiovascular risk and, consequently, in developing diabetic foot.

For the prevention of ulceration and amputation of lower members in patients with DM, performing clinical examination of the foot through anamnesis and physical exam are crucial. However, the majority of patients in this research reported that they had never been submitted to the clinical examination of the foot. This data denounces lack of integrality in the care of patients with DM, highlighting the necessity to implement a more robust care line for the Primary Care issues we face.

We noted that most of the patients were positive for diabetic neuropathy. Even though the majority did not present diabetic foot, the risk percentage of developing the diabetic foot was significant, which reinforces the necessity of clinical examination of the foot, investigating and controlling the risk factor in Primary Care. Converging with these results research carried out in Distrito Federal identified that 41.9% of patients had painful diabetic polyneuropathy and 86.6% with a risk of foot ulceration[7].

The main complications identified were: dry skin, caused by lack of moisturizing, and calluses, given the friction, and plantar pressure, due to inappropriate shoes. Daily use of moisturizer prevents dry skin and fissure[10]. On the other hand, comfortable, fitting, and seamless footwear is the most adequate because thin nozzled shoes and flip flops cause pressure points on the foot, which can lead to calluses and injuries[19]. These self-care orientations must be intensified by the nurse during the care of patients with DM.

The examination to verify the vibratory sensitivity, through a tuning fork of 128 Hz, was the one that identified the highest number of changes between both feet. Although it effectively tracks the risk of developing diabetic foot and

recommended by the Health Ministry[1], we noticed that this device is not available for Primary Care Nurses in research scenarios, which hampers the complete clinical examination of the foot in DM patients.

The DM diagnosis time, in the multivariate model, presented a significant statistical association with the risk of developing the diabetic foot because those who had the least time with the disease also presented less risk of developing the diabetic foot. It is known that hyperglycemia, in the long term, compromises the nervous and cardiovascular system, for that reason, patients with a longer time of diagnosis are more likely to have foot complications[20-21].

Obese patients presented 2.1 times more chances of developing diabetic foot. Indeed, overweight is one of the main factors that contributes to the hyperglycemia maintenance, through numerous physiological mechanisms, for instance the increase of free fatty acids in the blood flow, the decrease of adiponectin, and cytokine secretion through adipose tissue, which causes cellular resistance to insulin[22-24].

The number of foot complications is associated with the risk of developing diabetic foot. Corroborating the results, a study identified that diabetic patients with foot complications had 29.85% more chances of ulceration if compared to those without abnormalities. Regarding the complications, plantar calluses, also emphasized by this research, were the main factor of risk for foot ulceration[25].

Lack of follow ups appeared to be a risk factor for the development of the diabetic foot, and that is explained because the majority of DM patients, in the Teresina scenario, were not submitted to a clinical examination routine of the foot. Besides, we found that most of the patients were not monitored, through risk stratification and specialist follow-up, which hampers the maintenance of the care. This precariousness in the assistance, still unchanged, was reported in 2011 when 79.5% of DM patients affirmed not being submitted to clinical examination during the care, and 96.4% had not gone through the feet sensitivity test in the previous 12 months[26].

The glycemic control presented an association with the risk of developing the diabetic foot because patients with inadequate glycemic control had 3.02 times more chances of developing diabetic foot. A study carried out in Pernambuco reported that inadequate glycemic control was more frequent in DM patients with three or more complications of the disease and in those patients who in the previous 12 months were not sent to the endocrinologist or cardiologist. The glycemic unmanageability was also prevalent when the drug treatment became more complex, which emphasizes that the drug orientation, by the nurse, is indispensable[27].

Not inspecting the foot daily is statistically significantly associated with the risk of developing diabetic foot. Research carried out in Spain verified that only 48.0% of participants knew the specific self-care for preventing diabetic foot, 50.6% did daily inspection, 97.0% washed the feet daily, 45.2% moisturized the feet, and 65.7% cut the nails properly, pointing out that the self-care deficit with the feet is also a problem for developed countries[28].

In Taiwan, 62.8% of DM patients had never monitored their blood glucose level when they had foot ulceration, and 63.8% had never searched for treatment for ulceration if it was not painful. Also, the self-care with the feet behavior, the inadequate treatment, and the bad financial status influenced patients to self-manage the DM[29]. Although there was no statistical significance for not searching health professionals to treat ulceration, in the bivariate model, and for dressing at home with homemade solutions, in the multivariate model, a considerable portion of patients in this study carried out these erroneous practices.

Feeling indisposed to foot care presented a statistically significant association with the risk of developing diabetic foot. That is because the disposition is a variable that boosts other self-care practices with the feet. Although drying the gaps between the toes, checking the shoes before wearing them, cutting the nails in a square shape, and moisturizing the feet have no association with the risk of developing diabetic foot, in the multivariate model, these types of care are fundamental to maintain feet's health.

By comparing the situational diagnosis of feet self-care in diabetic patients from Teresina, Piauí, we noted, in a study carried out in Picos, Piauí, that 49.4% of the patients with DM did not know how to correctly sanitize their feet and neither what they should observe on the self-exam. Besides, 56.5% did not know how to properly cut their nails, and that the care, for instance, the washing, drying, moisturizing, and massaging, should be done together, although 80% had disposal to do it, emphasizing the need for educational strategies to sensitize the patients and encourage health professionals, aiming to ensure the effectiveness of the diabetic foot prevention[30].

This study brought evidence to Primary Care nursing because it determined that the care provided to DM patients is still fragmented, discontinuous, and that the diabetic foot follow ups, recommended by the Health Ministry, is not performed enough or done incompletely. We expect that these results will propel holistic nursing practices and the effective promotional health policies, aiming to reduce the number of DM complications.

We highlight as a limitation of this study the fact that some patients with DM presented outdated laboratory exams, precluding the collection of some clinical variables that could have been a risk factor for the development of the diabetic foot.

CONCLUSION

We found that the marital status with a partner, the quick diagnosis of DM and the least number of complications in the foot are factors of protection for the development of the diabetic foot. Obesity, arterial hypertension, smoking, inadequate control of the capillary blood glucose, indisposition to the care of the foot, and foot self-exam with less frequency are factors of risk for the development of the diabetic foot. In that sense, we highlight the importance of a sequence of effective care in Primary Care directed to the tracking of the diabetic foot and to the self-care in order to guarantee systematic and preventive actions of care.

In an attempt to clear a path to new investigations, to assist the strengthening of public policies targeting DM patients, and to instigate care modifications, we suggest: clinical examination of the foot as a routine in the care of patients with DM, aiming to decrease the number of ulceration; application of the risk stratification of the diabetic foot to facilitate the follow-up of the care; reinforcement of educational interventions directed to the self-care aiming to decrease complications in the foot; and access, for Primary Care Nurses, to necessary materials to clinical examination of the foot in the care of patients with DM.

RESUMO

Objetivo: Analisar os fatores associados ao risco de pé diabético em pessoas com diabetes mellitus atendidas na Atenção Primária. **Método:** Estudo observacional, analítico e transversal realizado em Teresina, Piauí, com pessoas diabéticas atendidas na Atenção Primária. A coleta de dados ocorreu mediante entrevista, exame clínico dos pés e análise do prontuário. Os dados foram analisados utilizando os testes estatísticos *Mann-Whitney, Qui quadrado de Pearson* e regressão logística múltipla. A força de associação entre as variáveis categóricas foi aferida pela *Odds Ratio*. **Resultados:** Participaram 322 pessoas. A situação conjugal com companheiro apresentou fator de proteção (p = 0,007). A hipertensão arterial (p = 0,045), obesidade (p = 0,011), tabagismo (p = 0,027), não ter sido submetido ao rastreamento (p = 0,046), o controle inadequado da glicemia capilar (p < 0,001), a não disposição para cuidar dos pés (p = 0,014) e a não realização do autoexame dos pés com frequência (p = 0,040) se mostraram fatores de risco para o desenvolvimento do pé diabético. **Conclusão:** Os aspectos sociodemográficos, clínicos e autocuidado interferem no risco de desenvolvimento do pé diabético, destacando a necessidade do rastreamento e de intervenções educativas eficientes para pessoas com diabetes mellitus na Atenção Primária.

DESCRITORES

Diabetes Mellitus; Pé Diabético; Programas de Rastreamento; Atenção Primária à Saúde; Enfermagem.

RESUMEN

Objetivo: Analizar los factores asociados al riesgo de pie diabético en personas con diabetes mellitus en la Atención Primaria. **Método:** Se trata de un estudio observacional, analítico y transversal realizado en Teresina, Piauí, con personas diabéticas en la Atención Primaria. La recogida de datos se realizó mediante entrevistas, examen clínico de los pies y análisis de las historias clínicas. Los datos se analizaron por medio de las pruebas estadísticas de Mann-Whitney, Qui cuadrado de Pearson y regresión logística múltiple. La fuerza de la asociación entre las variables categóricas se midió con la Razón de Momios (*Odds Ratio*). **Resultados:** Participaron 322 personas. La situación marital con compañero se presentó como un factor de protección (p = 0,007). La hipertensión arterial (p = 0,045), la obesidad (p = 0,011), el tabaquismo (p = 0,027), el no haber sido sometido a seguimientos (p = 0,046), el control inadecuado de la glicemia capilar

(p < 0,001), la falta de disposición para cuidarse los pies (p = 0,014) y la no realización del autoexamen de los pies a menudo (p = 0,040) se revelaron como factores de riesgo para el desarrollo del pie diabético. **Conclusión:** Los aspectos sociodemográficos, clínicos y de autocuidado interfieren en el riesgo de desarrollar pie diabético, lo que pone de manifiesto la necesidad de rastreos e intervenciones educativas eficaces para las personas con diabetes mellitus en la Atención Primaria.

DESCRIPTORES
Diabetes Mellitus; Pie Diabético; Tamizaje Masivo; Atención Primaria de Salud; Enfermería.

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