Artigo Original

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Correlation between clinical findings and self-care with the feet of patients with type 2 diabetes in the city of Mossoró-RN

Correlação entre os achados clínicos e o autocuidado com os pés de pacientes diabéticos tipo 2 no município de Mossoró-RN

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Abstract

Introduction: Diabetes mellitus (DM) has a high worldwide prevalence, currently affecting around 537 million adults. The chronic hyperglycemic state promotes the development of complications, among them, the diabetic foot, which is one of the main responsible for causing the increase in the rates of non-traumatic lower limb amputations and the increase in hospital costs. In this context of the need to prevent diseases, the Sistema Salvando o Pé Diabético (SISPED) operates, a computational tool that offers greater efficiency in screening and monitoring in order to avoid serious outcomes. In addition to SISPED, self-care with the feet of patients with DM is also essential as a preventive measure in primary care. **Objective:** To correlate clinical findings and self-care with feet in patients with DM2 in primary care in the city of Mossoró-RN. **Methods:** This is an exploratory and descriptive study carried out in 5 Basic Health Units in Mossoró-RN, using the SISPED and a self-authored questionnaire about self-care of the feet directed to patients with DM2 for data collection. **Results:** In the clinical findings of the SISPED, a higher prevalence of the use of inappropriate footwear, dry/scaly feet and fissures/cracks was observed. In the assessment of self-care of the feet, the inefficiency of providing basic guidelines was verified. **Conclusions:** The high prevalence of clinical findings associated with diabetic foot is intrinsically related to inefficiency in performing self-care with the feet, requiring an immediate preventive intervention in primary health care.
Keywords: diabetes complications; diabetic foot; health education; primary health care.

Resumo

Introdução: O diabetes mellitus (DM) apresenta uma elevada prevalência mundial, acometendo atualmente em torno de 537 milhões de adultos. O estado hiperglicêmico crônico promove o desenvolvimento de complicações, dentre elas, o pé diabético que é um dos principais responsáveis por acarretar a elevação das taxas de amputações não-traumáticas de membros inferiores e elevação dos custos hospitalares. Nesse contexto de necessidade de prevenção de agravos, atua o Sistema Salvando o Pé Diabético (SISPED), uma ferramenta computacional que oferece maior eficiência no rastreio e acompanhamento a fim de evitar desfechos graves. Em complemento ao SISPED, o autocuidado com os pés de pacientes portadores de DM também é imprescindível enquanto medida preventiva na atenção primária. **Objetivo:** Correlacionar os achados clínicos e autocuidado com os pés em pacientes portadores de DM2 na atenção primária do município de Mossoró-RN. **Métodos:** Trata-se de um estudo exploratório e descritivo realizado em 5 Unidades Básicas de Saúde de Mossoró-RN, utilizando o SISPED e um questionário de autoria própria acerca do autocuidado dos pés direcionados aos pacientes portadores de DM2 para a coleta de dados. **Resultados:** Nos achados clínicos do SISPED, percebeu-se maior prevalência do uso de calçados inapropriados, pé seco/descamativo e fissuras/rachaduras. Na avaliação do autocuidado dos pés, verificou-se a ineficiência do fornecimento de orientações básicas. **Conclusões:** A elevada prevalência de achados clínicos associados ao pé diabético está intrinsecamente relacionada à ineficiência na realização do autocuidado com os pés, exigindo uma intervenção preventiva imediata na atenção primária.
Palavras-chave: complicações do diabetes; pé diabético; educação em saúde; atenção primária à saúde.

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Introduction

Diabetes mellitus (DM) is characterized by a chronic hyperglycemic state resulting from peripheral insulin resistance and/or insufficient insulin secretion by pancreatic beta cells, which can occur due to multiple distinct etiologies. In this perspective, according to its etiopathogenesis, DM must be classified into: type 1 DM (T1DM), type 2 DM (T2DM), gestational diabetes mellitus (GDM), and other types of diabetes. Such classification allows for a more appropriate therapeutic choice, as well as facilitates the screening of comorbidities and chronic complications.[1] Among the types mentioned, T2DM is the most prevalent etiology, accounting for 90 to 95% of people with diabetes.[2]

According to the International Diabetes Federation (IDF), DM currently affects approximately 537 million adults aged 20 to 79 years, which corresponds to 1 in 10 adults. However, IDF estimates suggest that this number of people living with diabetes will reach around 783 million by 2045. In Brazil, the IDF estimates that the number of adults with diabetes will be around 15.7 million in 2021, responsible for 214,000 deaths in the same year.[3] The exorbitant dimensions of this public health problem are evident, as diabetes and the prevention of its possible complications are highly sensitive to the primary care approach.[4]

The chronic hyperglycemic state characteristic of DM promotes the formation of advanced glycation end products (AGEs), which trigger the production and release of pro-inflammatory cytokines, pro-sclerotic cytokines, and reactive oxygen species. In this process, the genesis and progression of microvascular complications associated with DM occur, including diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy. Additionally, it is essential to highlight the macrovascular complications of DM, represented by acute myocardial infarction, stroke, and peripheral vascular disease, which are responsible for approximately 80% of deaths in DM patients.[5]

Combining the aspects of microvascular and macrovascular complications, the development of diabetic foot occurs, which is defined by the International Working Group on the Diabetic Foot (IWGDF) as the presence of infection, ulceration, and/or tissue destruction in the foot associated with neuropathy and/or peripheral arterial disease in individuals with diabetes mellitus.[6] In this context, it is worth noting that diabetic foot is one of the main causes of non-traumatic lower limb amputations (LLAs), prolonged hospitalization, and increased mortality.[7]

Non-traumatic LLAs are considered sentinel events, meaning an event that warrants thorough investigation to understand the potential failures in risk screening, stratification, and ulcer treatment. Such a meticulous investigation should be prioritized in individuals with diabetes mellitus, who are up to 13 times more likely to undergo LLAs compared to the general population.[8]

The Diabetic Foot Saving System (SISPED) is designed to assist in cases of diabetic foot, offering greater efficiency in screening and follow-up to avoid severe outcomes. Furthermore, the Brazilian Diabetes Society affirms that the software's proficiency is sufficient to elevate the diagnostic efficacy to the specialist level. Thus, the evaluation of patients through SISPED directly contributes to the prevention and management of health problems, as it can also be used to collect relevant data for reviewing healthcare delivery strategies by primary care teams.[9]

Complementing the importance of using SISPED, self-care of the feet of patients with DM is also essential to prevent severe outcomes in primary care. Therefore, according to the IWGDF guidelines on the prevention and treatment of diabetic foot, it

is possible to highlight the need to fulfill five main elements for ulcer prevention: identifying the foot at risk, regularly inspecting and examining the at-risk foot, educating the patient, family, and healthcare professionals, ensuring the routine use of appropriate footwear, and treating risk factors for ulceration.[6]

Considering the exposed aspects, this study aims to correlate clinical findings and foot self-care in patients with type 2 diabetes mellitus in primary care in the city of Mossoró-RN.

Materials and Methods

Study Design

This was an exploratory and descriptive study with a qualitative-quantitative approach, conducted through the application of a questionnaire developed by the SISPED software and a self-developed questionnaire for assessing foot self-care.

Study Setting

The study was conducted in primary care settings in Mossoró, Rio Grande do Norte, Brazil, between September 2021 and May 2022. The aim was to cover the 5 health areas proposed by the municipal health department for dividing the municipality: north, south, east 1, east 2, and west. One Basic Health Unit (UBS) was chosen in each of these areas to broaden the sample distribution and improve the results of this research. The selected UBSs were: Dr. Chico Costa UBS (north), Dr. Sueldo Câmara UBS (south), Duclécio Antônio de Medeiros UBS (east 1), Dr. Epitácio da Costa Carvalho UBS (east 2), and Dr. Lucas Benjamim UBS (west).

Inclusion and Exclusion Criteria

The inclusion criteria for this research were: patients with type 2 DM located in the areas covered by the UBSs determined as the study site. Meanwhile, the exclusion criteria were: patients with type 1 DM, patients with acute or chronic health conditions that prevented the application of the questionnaires, mental incapacity to answer the proposed questions, and those under 18 years of age.

Data Collection Procedure

The data collection procedure followed the ethical and legal determinations proposed by the Research Ethics Committee (CEP) of the Universidade do Estado do Rio Grande do Norte (UERN), which issued a favorable opinion for the start of data collection and also approved the Free and Informed Consent Term (TCLE) produced to safeguard the rights of research participants. After that, a letter of authorization was also requested from the municipal government of Mossoró-RN authorizing research activities in the Basic Health Units of the municipality. The research did not receive funding for its conduct.

The data collection process was enhanced by the exceptional participation of community health workers who conducted an active search to recruit most of the research participants. In addition, the consultation days of the HIPERDIA program, which focused on the care of hypertensive and diabetic patients, in the selected units were also used to recruit participants. In this context, it is important to emphasize that the ethical and legal principles that guide scientific research on human beings were followed, so that participants could transparently understand the risks and benefits involved in data collection, making evident the fundamental right of patients to refuse to participate in the research at any time.

After selecting participants according to the inclusion and exclusion criteria, data collection occurred through the application of the SISPED software questionnaire, which involved the collection of data related to foot inspection and examination (including the identification of appropriate footwear and the presence of lesions associated with the

diabetic foot), peripheral vasculopathy investigation, and diabetic neuropathy investigation.

The foot self-care assessment questionnaire, in turn, was developed to evaluate variables sensitive to primary care actions, which are recommended by the IWGDF Guidelines on the prevention and treatment of diabetic foot.[6] Thus, the variables chosen were: frequency of foot observation, frequency of observation of the inside of footwear, frequency of drying between the toes, use of moisturizer, use of tight footwear, guidance on the correct way to cut nails, guidance on the correct choice of footwear, and guidance on the treatment of calluses and warts.

The application of the aforementioned questionnaires was not only directed at collecting data for the research but also provided health education measures for patients, family members, and health professionals regarding foot care, considering the cultural and socioeconomic differences of each of these participants.

Results

According to the sample collected by the research, the mean age of the 50 selected participants was 62.82 ± 11.13 years, with a predominance of the female sex. Regarding the time of DM diagnosis, it is possible to verify that there was a statistical equivalence between the participants when divided into two groups: one group with less than 10 years of DM and another with more than 10 years. It is also possible to assess that there was a predominance of the use of oral drugs as the main treatment modality.

Table 1 – Descriptive profile of participants.

Variable		N	%
Gender	Female	35	70
	Male	15	30
Age	31 - 40	1	2
	41 - 50	6	12
	51 - 60	11	22
	61 - 70	19	38
	71 - 80	10	20
	81 - 90	3	6
DM for 10 years or more	Yes	25	50
	No	25	50
Treatment	None	2	4
	Only oral medication	38	76
	Oral medication and insulin	9	18
	Only insulin	1	2

Regarding the clinical findings collected through the SISPED software, it is possible to highlight that there was a high prevalence of participants who used inappropriate footwear for the diabetic foot examination, totaling 64% of the respondents. In addition, other findings of equal statistical relevance were patients with dry or scaly feet and fissures or cracks, representing 80% and 66% of the sample, respectively.

Given that the clinical entity represented by the diabetic foot is frequently associated with peripheral vasculopathy, as well as diabetic neuropathy, it is relevant to highlight that 12 participants in the research (24%) presented with suspected peripheral vasculopathy, while 9 (18%) were identified as suspected of developing diabetic neuropathy. The remaining clinical findings collected are presented in Table 2.

Table 2 – Main Clinical Findings from the Diabetic Foot Exam.

Variable		N	%
Inappropriate footwear	Yes	32	64
	No	18	36
Dry/scaly foot	Yes	40	80
	No	10	20
Cracks/fissures	Yes	33	66
	No	17	34
Onychomycosis	Yes	23	46
	No	27	54
Interdigital fungal infection	Yes	9	18
	No	41	82
Onychocryptosis	Yes	6	12
	No	44	88
Callus/friction areas	Yes	22	44
	No	28	56
Blister	Yes	2	4
	No	48	96
Deformities	Yes	17	34
	No	33	66
Plantar ulcer	Yes	1	2
	No	49	98
Gangrene	Yes	1	2

Variable		N	%
	No	49	98
Amputation	Yes	2	4
	No	48	96
Suspected peripheral vasculopathy	Yes	12	24
	No	38	76
Suspected diabetic neuropathy	Yes	9	18
	No	41	82

Regarding the assessment of foot self-care, it is feasible to present the relevant variables already mentioned in the methodology. In this focus, it is essential to highlight that 50% of the research participants reported not using any moisturizer for their feet. However, the variables that deserve to be highlighted due to their higher incidence are the orientations that should be performed by primary care professionals, which include the correct way to cut nails, the choice of footwear, and the treatment of calluses and warts. The numerical distribution of the data on foot self-care assessment can be visualized in more detail in Table 3.

Table 3 – Assessment of Foot Self-Care.

Variable		N	%
Frequency of foot observation	Never	8	16
	1 or 2 times per month	3	6
	Once a week	2	4
	Several days per week	7	14
	Daily	30	60
Frequency of inspecting the inside of footwear	Never	13	26
	1 or 2 times per month	4	8
	Once a week	0	0
	Several days per week	4	8
	Daily	29	58
Frequency of drying between the toes	Never	20	40
	1 or 2 times per month	3	6
	Once a week	4	8
	Several days per week	2	4
	Daily	21	42

Variable		N	%
Use of moisturizer on feet	Yes	25	50
	No	25	50
Use of tight footwear	Yes	8	16
	No	42	84
Guidance on the correct way to cut nails	No	34	68
	Once	12	24
	More than once	4	8
Guidance on choosing the correct footwear	No	40	80
	Once	10	20
	More than once	0	0
Guidance on treating calluses and warts	No	43	86
	Once	5	10
	More than once	2	4

Discussion

The predominance of the female sex in this research is highlighted in several other studies, which can be justified by women's greater search for healthcare and the higher life expectancy of women. In a study by Tavares and collaborators, conducted with 92 patients with DM in the city of Maceió-AL in 2013, a very similar sample was also found regarding the female sex, with a percentage of 71.7% of all participants.[10]

According to Vilar, the prevalence of type 2 DM increases with age, which can be explained by the decrease in the mass of pancreatic beta cells, as the amount of apoptosis exceeds the replicative capacity of these cells.[11] Among the participants in this research, there was a higher occurrence of individuals between 61 and 70 years old, and it should be emphasized that only 14 of the 50 participants were under 50 years old. Therefore, this finding proves that the sample was consistent with the literature.

According to the IWGDF Guidelines, the use of inappropriate footwear is one of the main causes of trauma that precedes the formation of ulcers in diabetic people. In this context, the appropriate footwear should be wide enough to accommodate the foot without excessive pressure on the skin, be 1 to 2 cm longer than the foot, and have a sufficient height to accommodate all the toes, considering possible deformities.[6] In the foot examination, it was evident that 64% of patients did not have adequate footwear to meet these essential criteria, contributing to the formation of calluses detected in 44% of participants, as well as deformities not being considered in 34% of the interviewees. In addition, the use of inappropriate footwear correlates with the 80% of volunteers who never received any guidance on the correct choice of footwear from healthcare professionals.

The most prevalent clinical finding of the study was dry or scaly feet, which was found in 80% of the patients studied and was accompanied by a high percentage

of fissures or cracks (66%). According to Caiafa and collaborators, skin dryness is associated mainly with the occurrence of autonomic neuropathy that affects the autonomic nervous system and leads to the development of anhidrosis, also precipitating the appearance of fissures and, subsequently, cracks.[12] In this context, a highly valid intervention consists of using moisturizing creams, which was only reported by 50% of the study participants, but most reported not using them daily or not using urea-based creams.[6]

The correlation between diabetes and dermatomycosis was evidenced by the study of De Jesus and collaborators who found a difficulty in the in vitro phagocytic activation of phagocytes removed from diabetic mice, which would be a possible justification for the development of these fungal diseases in diabetic people.[13] In this work, the presence of onychomycosis in 46% of participants can be associated mainly with the reduced frequency of drying between the toes, which provides an ideal humid environment for the proliferation of fungi.

It is important to point out that the Diabetic Foot Manual, made available by the Ministry of Health, recommends cutting nails straight, as improper cutting can lead to onychocryptosis, with the possibility of local trauma and infection risk.[14] Despite this formal guidance, 68% of the interviewees reported never receiving any guidance on the correct way to cut their nails and only 12% presented onychocryptosis on physical examination. With this, it is possible to verify that there was no direct correlation between the participants who did not receive guidance on nail cutting and the amount of them who developed onychocryptosis.

Conclusions

The present study found that the high prevalence of clinical findings related to the diabetic foot is widely related to the inefficiency of performing self-care of the feet. Furthermore, it was noted that participants did not have access to understandable and relevant information that would enable them to assume a central role in their own care.

Therefore, the family health team has an essential role in preventing complications related to the diabetic foot, acting through effective screening and follow-up, which can be potentiated by the inclusion of support tools such as SISPED, which was widely used in this study. In addition, continuous investment should be made in promoting health education measures for patients, families, and healthcare professionals regarding foot care.

Bibliographic References

1. Rodacki M, Teles M, Gabbay M, Montenegro R, Bertoluci M. Classificação do diabetes. Diretriz Oficial da Sociedade Brasileira de Diabetes; 2022.

2. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes–2020. Diabetes Care. 2020; 43: 14-31.

3. International Diabetes Federation. IDF Diabetes Atlas. 10th edition. Brussels, Belgium: International Diabetes Federation; 2021.

4. Alfradique ME, Bonolo P de F, Dourado I, Lima-Costa MF, Macinko J, Mendonça CS, et al. Internações por condições sensíveis à atenção primária: a construção da lista brasileira como ferramenta para medir o desempenho do sistema de saúde (Projeto ICSAP – Brasil). Cad. Saúde Pública. 2009; 25: 1337-1349.

5. Tschiedel B. Complicações crônicas do diabetes. JBM. 2014; 102: 7-12.

6. International Working Group on the Diabetic Foot. IWGDF Guidelines on the prevention and management of diabetic foot disease. IWGDF; 2019. 194 p.

7. Brasileiro JL, Oliveira WTP, Monteiro LB, Chen J, Pinho Jr EL, Molkenthin S, et al. Pé diabético: aspectos clínicos. J Vasc Br. 2019; 4: 11-21.

8. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes 2019-2020. Brasília: Sociedade Brasileira de Diabetes; 2019. 491 p.

9. Carvalho M, Silva L, Rezende K. Um sistema para monitoramento do pé diabético. In: Anais do III Workshop de Informática Médica; 2003.

10. Tavares TA, Costa LJSF da, Sales ML da H, Moraes MM de. Fatores de risco para ulceração e amputação de extremidades inferiores em portadores de diabetes mellitus. Rev Bras Promoc Saúde. 2016; 29: 278-287.

11. Vilar L. Endocrinologia clínica. 7. ed. Rio de Janeiro: Guanabara Koogan; 2021.

12. Caiafa JS, Castro AA, Fidelis C, Santos VP, Silva ES da, Sitrângulo Jr CJ. Atenção integral ao portador de pé diabético. J Vasc Br. 2011; 10: 1-32.

13. Jesus WA de, Galinari CB, Arita GS, Mosca VAB, Bonfim-Mendonça P de S, Svidzinski TIE. Estudo sobre a presença simultânea de dermatomicoses e diabetes em pacientes residentes em zona rural de um município do Estado do Paraná. RSD. 2021; 10: e14810917781- e14810917781.

14. Ministério da Saúde (BR). Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Manual do pé diabético: estratégias para o cuidado da pessoa com doença crônica. Brasília: Ministério da Saúde; 2016. 64 p.

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