

Housing area and foot health in diabetics: association with socioeconomic profile, clinical conditions, and self-care

Área de moradia e saúde dos pés em diabéticos: associação com perfil socioeconômico, condições clínicas e autocuidado

Área de vivienda y salud de los diabéticos en diabéticos: asociación con perfil socioeconómico, condiciones clínicas y autocuidado

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Abstract

Introduction: Diabetic foot is one of the chronic complications with the highest morbidity, mortality, and socioeconomic impact, especially among more vulnerable individuals and those living in rural areas. **Objective:** To assess the relationship between area of residence and foot health in individuals with Diabetes Mellitus (DM), considering socioeconomic profile, clinical conditions, and self-care practices. **Methods:** This is an observational, cross-sectional, and quantitative study approved by the Ethics and Research Committee of the Federal University of the São Francisco Valley. It was conducted in Primary Health Care Units in Petrolina, Pernambuco (PE) and included 103 individuals with diabetes, residing in urban (n=75) and rural (n=28) areas. Data collection involved a structured questionnaire addressing socioeconomic variables, clinical conditions, and foot self-care practices, as well as an assessment of protective sensation loss (PSL) using a 10 g Semmes-Weinstein monofilament. **Results:** The sample had a mean age of 58.3± years, mostly composed of women (75.7%), self-declared as Brown (55.3%) and Black (29.1%), and single, widowed, or divorced (55.3%). There was a predominance of low educational attainment (illiterate or with incomplete primary education) (61.2%) and low socioeconomic levels – class C (63.1%). Most participants had been diagnosed with DM for over 5 years (54.4%), were non-insulin dependent (69.9%), and had comorbidities such as obesity combined with hypertension (37.9%) or isolated hypertension (25.2%), as well as complications like diabetic retinopathy (15.9%). The majority (85.4%) had no history of previous foot ulcers. Adherence to regular physical activity was low (26.2%), but health monitoring indicators were satisfactory (70% had undergone two or more monitoring tests, and 88.4% attended two or more medical consultations in the past year). Periodic foot assessments were reported by 59.2% of participants, and PSL was found in 31.1%. The comparison between housing areas revealed a significant association only with lower education levels among rural residents and higher PSP among urban residents ($p < 0.005$). Social class did not predict previous ulcers, therapeutic choices, or protective sensation loss ($p > 0.05$). **Conclusions:** The findings suggest that protective sensation loss is more associated with urban residence, contradicting the expected greater vulnerability in rural areas.

Keywords: Diabetic foot; Diabetes mellitus; Self care; Social determinants of health; Primary Health Care.

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Resumo

Introdução: O pé diabético é uma das complicações crônicas de maior morbimortalidade e impacto socioeconômico, especialmente em indivíduos mais vulneráveis e residentes em áreas rurais. **Objetivo:** Avaliar a relação entre área de moradia e saúde dos pés em pessoas com Diabetes Mellitus (DM), considerando perfil socioeconômico, condições clínicas e práticas de autocuidado. **Métodos:** Trata-se de um estudo observacional, transversal e quantitativo, aprovado pelo Comitê de Ética e Pesquisa da Universidade Federal do Vale do São Francisco. Ocorreu em Unidades Básicas de Saúde (UBS) em Petrolina – PE e avaliou 103 diabéticos, residentes em zona urbana (n=75) e rural (n=28), por meio de questionário estruturado sobre variáveis socioeconômicas, condições clínicas e autocuidado com os pés; e de exame de Perda de Sensibilidade Protetora (PSP) com monofilamento de Semmes-Weinstein de 10 g. **Resultados:** A amostra apresentou uma média de 58,3± anos de idade, composta majoritariamente por mulheres (75,7%), autodeclarados pardos (55,3%) e pretos (29,1%), e solteiros, viúvos ou divorciados (55,3%). Houve predomínio de baixa escolaridade (analfabetos ou com ensino fundamental incompleto) (61,2%) e baixos níveis socioeconômicos – classe C (63,1%). Predominou, também, o diagnóstico de DM há mais de 5 anos (54,4 %), com tratamento não insulino dependente (69,9%), comorbidades como obesidade associada à Hipertensão Arterial Sistêmica (HAS) (37,9%) e HAS isolada (25,2%), e complicações como a retinopatia diabética (15,9%). A maioria dos participantes (85,4%) não apresentou histórico de lesões ulcerosas prévias nos pés. Houve baixa adesão à prática regular de atividades físicas (26,2%), porém bons índices de acompanhamento em saúde (70% com realização de 2 ou mais exames de monitoramento, enquanto 88,4% compareceram a 2 ou mais consultas no último ano). A avaliação periódica dos pés era realizada por 59,2% dos participantes, com PSP presente em 31,1%. A comparação entre áreas de moradia revelou associação significativa apenas com menor escolaridade em moradores rurais e maior PSP entre moradores urbanos (p<0,005). A classe social não previu ocorrência prévia de úlceras, escolha terapêutica ou perda de sensibilidade protetora (p>0,05). **Conclusões:** Os resultados sugerem que a perda de sensibilidade protetora está associada à moradia urbana, contrariando expectativas de maior vulnerabilidade na área rural.

Palavras-chave: Pé diabético; Diabetes mellitus; Autocuidado; Determinantes sociais da saúde; Atenção Primária à Saúde.

Resumen

Introducción: El pie diabético es una de las complicaciones crónicas con mayor morbi-mortalidad e impacto socioeconómico, especialmente en individuos más vulnerables y residentes en zonas rurales. **Objetivo:** Evaluar la relación entre el área de residencia y la salud de los pies en personas con diabetes mellitus (DM), considerando el perfil socioeconómico, las condiciones clínicas y las prácticas de autocuidado. **Métodos:** Se trata de un estudio observacional, transversal y cuantitativo, aprobado por el Comité de Ética en Investigación de la Federal University of the São Francisco Valley. Se llevó a cabo en Unidades Básicas de Salud de Petrolina – PE y evaluó a 103 personas con diabetes, residentes en zonas urbanas (n=75) y rurales (n=28), mediante un cuestionario estructurado sobre variables socioeconómicas, condiciones clínicas y autocuidado de los pies, además de una evaluación de la pérdida de la sensibilidad protectora (PSP) utilizando un monofilamento de Semmes-Weinstein de 10 g. **Resultados:** La muestra presentó una edad promedio de 58,3± años, compuesta mayoritariamente por mujeres (75,7%), personas autodeclaradas de raza parda (55,3%) y negra (29,1%), y solteras, viudas o divorciadas (55,3%). Predominó el bajo nivel educativo (analfabetos o con educación primaria incompleta) (61,2%) y niveles socioeconómicos bajos – clase C (63,1%). La mayoría tenía diagnóstico de DM desde hacía más de 5 años (54,4 %), no usaban insulina como tratamiento (69,9%), y presentaban comorbilidades como obesidad asociada a hipertensión arterial sistémica (HAS) (37,9%) e hipertensión arterial aislada (25,2%), además de complicaciones como la retinopatía diabética (15,9%). La mayoría de los participantes (85,4%) no tenía antecedentes de úlceras en los pies. Se observó baja adherencia a la práctica regular de actividad física (26,2%), aunque se encontraron buenos índices de seguimiento en salud (70% realizaron dos o más exámenes de monitoreo y el 88,4% asistieron a dos o más consultas en el último año). El examen periódico de los pies era realizado por el 59,2% de los participantes, y la PSP estuvo presente en el 31,1%. La comparación entre áreas de vivienda reveló una asociación significativa solo con niveles de educación más bajos entre los residentes rurales y un PSP más alto entre los residentes urbanos (p<0,005). La clase social no predijo antecedentes de úlceras, elección terapéutica o pérdida de la sensibilidad protectora (p>0,05). **Conclusiones:** Los resultados sugieren que la pérdida de la sensibilidad protectora está asociada a la residencia en áreas urbanas, lo que contradice las expectativas de mayor vulnerabilidad en zonas rurales.

Palabras clave: Pie diabético; Diabetes mellitus; Autocuidado; Determinantes sociales de la salud; Atención Primaria de Salud.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic condition characterized by persistent hyperglycemia resulting from defects in insulin secretion and/or action, which may lead to microvascular, macrovascular, and neuropathic complications.^{1,2} Among these, diabetic foot is one of the most severe complications and is defined as infection, ulceration, and/or tissue destruction of the lower extremities associated with neuropathy and peripheral arterial disease.² It is estimated that up to 20% of individuals with diabetes develop foot lesions and that up to 13% require amputations.^{3,4} In 2021, Brazil was among the three countries with the highest direct expenditures on DM, totaling US\$42.9 billion.⁴ In 2014 alone, the Unified

Health System (*Sistema Único de Saúde – SUS*) allocated approximately US\$361 million to diabetic foot care, with 87% directed to outpatient services and the remaining 13% to hospitalizations, generally associated with more severe complications, such as infections and amputations.⁵

The presence of protective sensory loss (PSL), typically asymptomatic, precedes the appearance of visible lesions and represents an important marker of neuropathy associated with ulcer development.^{2,6} Early identification enables the implementation of preventive measures, which may reduce complications by up to 50%.⁷⁻⁹

The guidelines of the International Working Group on the Diabetic Foot (IWGDF) propose a prevention framework structured around five pillars: identification of at-risk feet, regular examinations, patient education, use of appropriate footwear, and control of risk factors.² In Brazil, Primary Health Care (PHC) constitutes the strategic level for implementing these measures, given its role in health promotion, prevention of complications, and longitudinal patient follow-up. Through the Family Health Strategy (FHS), multidisciplinary teams promote health, prevent complications, and provide longitudinal care for individuals with DM.¹ However, the delivery of such care is challenged by inequalities in access, particularly in rural areas, where factors such as geographic distance, low income, and shortages of health professionals hinder continuous follow-up.¹⁰⁻¹²

The literature indicates that rural populations present poorer socioeconomic and health indicators, with a higher prevalence of chronic noncommunicable diseases, such as DM, exacerbated by difficulties in accessing health care and adopting healthy lifestyle behaviors.¹³⁻¹⁵ Nevertheless, there is a paucity of studies specifically evaluating foot health among individuals with diabetes in these populations.¹² Therefore, the present study aimed to assess the association between area of residence (urban or rural) and foot health in individuals with DM, considering their socioeconomic characteristics, clinical conditions, and self-care practices.

METHODS

This observational, cross-sectional study with a quantitative approach was conducted in Primary Health Care Units (*Unidades Básicas de Saúde – UBS*) in the municipality of Petrolina, state of Pernambuco, located in the semi-arid region of northeastern Brazil. Approximately 25% of the municipality's population resides in rural areas, and the local economy is based on agriculture and livestock farming.^{16,17} The municipality has 61 UBS, of which 38 are located in urban areas and 23 in rural areas.¹⁸ Data collection was carried out between February and May 2025 in eight UBS selected with the consent of the FHS teams, maintaining proportionality between urban and rural areas.

According to data from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística – IBGE*),¹⁶ the municipality of Petrolina has an estimated population of 386,791 inhabitants. Considering a diabetes mellitus prevalence of 7.4%,¹⁹ a population of 26,594 individuals with diabetes was used for sample size calculation. A margin of error of 10%, a 95% confidence level, and a proportion of 50% were adopted to maximize the sample size, resulting in a minimum sample of 96 participants.

Sampling was non-probabilistic and based on convenience, considering participants' presence at the UBS during the data collection period. Individuals of both genders were included if they had a confirmed diagnosis of DM, were aged 18 years old or older, and were registered at the participating UBS. Individuals with active foot ulcers or impaired cognitive function, such as difficulty understanding the study procedures or the sensory testing, were excluded.

After obtaining informed consent, data collection was conducted through individual interviews and assessments of loss of protective sensation in the lower limbs, performed in a private area within the UBS. Data were collected using a self-developed, semi-structured questionnaire, designed based on a review of national and international literature, particularly studies addressing diabetic foot and diabetic neuropathy, and incorporating approaches to self-care practices and social determinants of health, with an emphasis on research conducted in PHC and rural settings. The selection of variables followed a theoretical-analytical framework, encompassing socioeconomic dimensions, clinical conditions related to diabetes mellitus, and foot self-care practices, in accordance with recommendations from national and international guidelines. The instrument included socioeconomic variables (Table 1), clinical conditions (Table 2), and foot self-care

Table 1. Socioeconomic characteristics of individuals with diabetes in Petrolina – PE (n=103).

Characteristics	Frequency	
	n	%
Area of residence		
Urban area	75	72.8
Rural area	28	27.2
Gender		
Female	78	75.7
Male	25	24.3
Self-reported skin color		
Brown	57	55.3
Black	30	29.1
White	14	13.6
Indigenous	1	1
Yellow	1	1
Education level		
Illiterate / Incomplete elementary school I	38	36.9
Complete elementary school I / Incomplete elementary school II	25	24.3
Complete elementary school II / Incomplete high school	18	17.5
Complete high school / Incomplete higher education	19	18.4
Complete higher education	3	2.9
Marital status		
Married	44	42.7
Single	25	24.3
Widowed	13	12.6
Divorced	19	18.4
Cohabiting union	2	1.9
Social class		
A	2	1.9
B1	6	5.8
B2	30	29.1
C1	35	34
C2	30	29.1

Source: Research data, 2025.

Note: Social class calculated according to the scoring system of the Brazilian Economic Classification Criterion.²⁰

Table 2. Clinical characteristics of individuals with diabetes in Petrolina – PE (n=103).

Characteristics	Frequency	
	n	%
Time since diagnosis of diabetes mellitus		
<5 years	47	45.6
5–10 years	28	27.2
10–15 years	16	15.5
>15 years	12	11.7
Type of pharmacological treatment		
Insulin-dependent	31	30.1
Non–insulin-dependent	72	69.9
Presence of chronic complications		
Diabetic neuropathy only	5	4.9
Diabetic retinopathy only	12	11.7
Diabetic neuropathy and retinopathy	2	1.9
Diabetic nephropathy and retinopathy	3	2.3
None	60	58.3
Does not know	21	20.4
Presence of comorbidities		
Obesity only	11	10.7
Hypertension only	26	25.2
Active smoking only	4	3.9
Obesity and hypertension	39	37.9
Obesity and active smoking	1	1
Hypertension and active smoking	2	1.9
Obesity, hypertension, and active smoking	4	3.9
None	16	15.5
Previous occurrence of lower limb ulcerative lesions		
Yes	15	14.6
No	88	85.4
Regular physical activity		
Yes	27	26.2
No	76	73.8
Number of glycated hemoglobin tests in the past year		
None	9	8.7
1	21	20.4
2	36	35
3 or more	36	35
Does not know	1	1
Number of follow-up consultations in SUS in the past year		
None	3	2.9
1	9	8.7
2	28	27.2
3 or more	63	61.2

Source: Research data, 2025.

Obesity: defined as Body Mass Index (BMI) > 30.

SUS: Unified Health System (*Sistema Único de Saúde*).

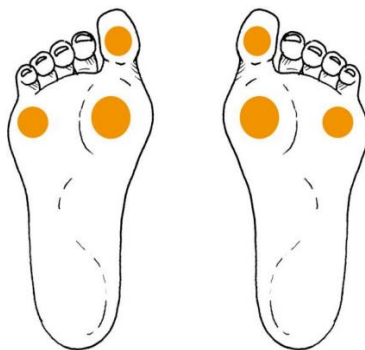
practices (Table 3). Economic classification was performed according to the criteria established by the Brazilian Association of Research Companies (*Associação Brasileira de Empresas de Pesquisa – Abep*).²⁰

Clinical assessment of PSL was performed using a 10 g Semmes–Weinstein monofilament, in accordance with IWGDF guidelines,² at three points on each foot (hallux, medial plantar surface, and lateral plantar surface) (Figure 1). PSL was considered present when the participant failed to correctly identify the stimulus in two of the three applications at each point.

Table 3. Foot self-care characteristics of individuals with diabetes in Petrolina – PE (n=103).

Characteristics	Frequency	
	n	%
Adequate foot hygiene		
Yes	70	78
No	33	32
Dries between the toes		
Yes	50	48.5
No	53	51.5
Performs periodic foot inspection		
Yes	61	59.2
No	42	40.8
Performs foot soaking		
Yes	4	3.9
No	99	96.1
Walks barefoot		
Yes	28	72.8
No	75	27.2
Uses appropriate footwear		
Yes	70	68
No	33	32
Proper nail trimming (straight across)		
Yes	55	53.4
No	48	46.6

Source: Research data, 2025.



Source: IWGDF Guidelines on the Prevention and Treatment of Diabetic Foot (IWGDF, 2023).

Figure 1. Sites tested for loss of protective sensation using the 10 g Semmes-Weinstein monofilament.

Data were collected using an electronic form (Google Forms[®]), exported to a spreadsheet (Microsoft Excel[®]), organized into a single database, and subjected to consistency checks. Statistical analysis was performed using Jamovi[®] software (version 2.6.26), with descriptive statistics applied to characterize the sample. Missing data were handled using valid case analysis for each variable, without imputation. Logistic regression models were employed to evaluate socioeconomic class as a potential predictor of clinical outcomes and loss of protective sensation, considering the dichotomous nature of the dependent variables and the theoretical plausibility of the tested associations. The level of significance was set at 5% ($p < 0.05$). It is acknowledged that the sample size, particularly in the rural population, may limit the statistical power of some analyses, and the findings should therefore be interpreted with caution. Additionally, the absence of formal validation of the instrument may introduce a risk of measurement bias, potentially affecting the reproducibility of the results.

The study was approved by the Research Ethics Committee of Universidade Federal do Vale do São Francisco, under opinion No. 7.392.473 and CAAE No. 84124124.3.0000.0282, in accordance with National Health Council Resolutions No. 466/2012 and No. 510/2016.

RESULTS

As shown in Table 1, a total of 103 individuals with diabetes were evaluated, of whom 72.8% resided in urban areas. The mean age was 58.3 years (± 12.2), with a predominance of females (75.7%). Most participants self-identified as Brown (55.3%) or Black (29.1%), and 55.3% did not have a spouse or partner. A high prevalence of low educational attainment was observed, with 61.2% being illiterate or having only incomplete primary education. The majority of participants belonged to social classes C1 (34%), C2 (29.1%), and B2 (29.1%). The mean number of residents per household was $3.06 \pm$, with an average monthly household income of R\$ 2,355 \pm and a per capita income of R\$ 889 \pm .

Regarding clinical conditions (Table 2), 54.4% of participants had been diagnosed with DM for more than 5 years, and 69.9% were receiving non-insulin-dependent treatment. The most frequent comorbidities were obesity associated with hypertension (37.9%) and isolated hypertension (25.2%). Diabetic retinopathy was the most prevalent complication (15.9%), while 20.4% of participants were unaware of the presence of any complications. Regular physical activity was reported by only 26.2% of participants; however, 70% had undergone two or more glycated hemoglobin (HbA1c) tests, and 88.4% had attended two or more consultations within SUS in the previous year.

Table 3 presents the results related to foot self-care, with only 59.2% of participants reporting periodic foot assessment.

PSL (Table 4) was identified in 31.1% of the sample, with a statistically significant association ($p = 0.031$), indicating a higher prevalence (Table 5) among urban residents (37.3%). No significant associations were observed between area of residence and variables such as time since diagnosis, type of treatment, presence of comorbidities, physical activity, frequency of HbA1c testing, or number of consultations in the previous year.

As shown in Table 6, a statistically significant association was observed between rural residence and lower levels of education ($p < 0.001$).

Among self-care practices, only foot hygiene (Table 7) showed a trend toward statistical significance ($p = 0.063$), with a higher frequency of inadequate hygiene observed among rural residents.

In the logistic regression analysis, no significant association was observed between social class and PSL, type of pharmacological treatment, or history of ulcerative lesions (Table 8).

Table 4. Characteristics of protective sensory loss in individuals with diabetes in Petrolina – PE (n=103).

Characteristics	Frequency	
	n	%
Protective sensory loss		
Yes	32	31.1
No	71	68.9

Source: Research data, 2025.

Table 5. Association between area of residence and protective sensory loss in individuals with diabetes in Petrolina – PE (n=103).

Area of residence		Protective Sensory Loss		N e % Total	p
		Yes	No		
Urban	Observed	28	47	75	0.031*
	Row %	37.3	62.7	100.0	
Rural	Observed	4	24	28	
	Row %	14.3	85.7	100.0	
Total	Observed	32	71	103	
	Row %	31.1	68.9	100.0	

Source: Research data, 2025.

*Fisher's Exact Test (p<0.005): statistically significant.

Table 6. Association between area of residence and education level of individuals with diabetes in Petrolina – PE (n=103).

Area of residence		Education level					N e % Total	p
		I/IE1	CE1/IE2	CE2/IHS	CHS/IHE	CHE		
Urban	Observed	21	15	18	18	3	75	<0.001*
	Row %	28.0	20.0	24.0	24.0	4.0	100.0	
Rural	Observed	17	10	0	1	0	28	
	Row %	60.7	35.70	0.0	3.6	0.0	100.0	
Total	Observed	38	25	18	19	3	103	
	Row %	36.9	24.00	17.5	18.4	2.9	100.0	

Source: Research data, 2025

I/IE1: Illiterate/Incomplete Elementary I. CE1/IE2: Complete Elementary I/Incomplete Elementary II. CE2/IHS: Complete Elementary II/Incomplete High School. CHS/IHE: Complete High School/Incomplete Higher Education. CHE: Complete Higher Education. *Fisher's Exact Test (p<0.005): statistically significant.

Table 7. Association between area of residence and adequate foot hygiene in individuals with diabetes in Petrolina – PE (n=103).

Area of residence		Adequate foot hygiene		N and % Total	p
		Yes	No		
Urban	Observed	55	20	75	0.063
	Row %	73.3	26.7	100.0	
Rural	Observed	15	13	28	
	Row %	53.6	46.4	100.0	
Total	Observed	70	33	103	
	Row %	68	32	100.0	

Source: Research data, 2025.

Table 8. Analysis of social class as a predictor of protective sensory loss, type of pharmacological treatment, and presence of previous ulcerative lesions in the lower limbs of individuals with diabetes in Petrolina – PE (n=103).

Independent characteristic	Predictor	Estimates	p-value	R ² _{cs}
Protective sensory loss	Intercept	0.7802	0.032	0.020
	C2 – C1	-0.2336	0.657	
	B2 – C1	0.0671	0.901	
	B1 – C1	0.8293	0.473	
	A – C1	14.7859	0.989	
Type of pharmacological treatment	Intercept	0.9163	0.014	0.013
	C2 – C1	-0.2231	0.679	
	B2 – C1	-0.0690	0.900	
	B1 – C1	-0.2231	0.813	
	A – C1	14.6498	0.989	
Presence of previous ulcerative lesions in lower limbs	Intercept	-1.792	<.001*	0.047
	C2 – C1	0.602	0.353	
	B2 – C1	-0.847	0.334	
	B1 – C1	0.182	0.879	
	A – C1	-14.774	0.993	

Source: Research data, 2025.

Note. The estimates represent the log odds of “Protective Sensory Loss = No” versus “Protective Sensory Loss = Yes”; “Type of pharmacological treatment = Non-insulin-dependent” versus “Type of pharmacological treatment = Insulin-dependent”; and “Presence of previous ulcerative lesions in lower limbs = Yes” versus “Presence of previous ulcerative lesions in lower limbs = No”
*Logistic regression analysis (p<0.005): statistically significant.

DISCUSSION

This study identified significant differences in socioeconomic profile and foot health between individuals with DM residing in urban and rural areas, reinforcing the influence of social determinants of health and clinical conditions on self-care practices and the risk of complications. The findings further underscore the role of social determinants of health and territorial organization in the production of health inequities, demonstrating that socioeconomic status, educational level, and access to health services modulate both the risk of complications and the capacity to adhere to self-care practices. In this context, urban and rural settings should be understood not merely as distinct geographic spaces, but as territories with specific social, economic, and healthcare dynamics that influence the prevention and management of diabetes mellitus complications.

Regarding education, low educational attainment was prevalent, with 61.2% of participants being illiterate or having incomplete primary education. According to official data from the National Household Sample Survey – Continuous Education 2024 (*Pesquisa Nacional por Amostra de Domicílios Contínua Educação 2024*),²¹ the illiteracy rate among individuals aged 15 years old or older was 5.3%. Among Brazilians aged 25 years old or older, 5.5% had no formal education, and 26.2% had incomplete primary education. In contrast, the proportion observed in the present sample was nearly twice that reported for the national adult population.

The findings indicate that the higher frequency of low educational attainment in rural areas reflects a well-documented national pattern. Reviews of PHC in rural settings show that this population has lower average levels of schooling and worse socioeconomic indicators compared with urban populations.²² Studies focusing on individuals with diabetes living in rural areas indicate that approximately two-thirds have up to four years of schooling, a condition directly associated with an increased risk of complications.¹² These results are consistent with national evidence pointing to persistent challenges in access to and continuity of care in rural areas, related to geographical barriers, reduced availability of services, and limitations in team composition. Such factors may compromise longitudinal follow-up and the effective implementation of preventive actions in PHC.

The higher prevalence of PSL among urban residents, contrary to the traditional expectation of greater vulnerability in rural areas, may represent a study-specific finding, as no significant association was observed between PSL and other classic variables (sedentary lifestyle, use of inappropriate footwear, time since diagnosis, or regular follow-up). The small number of participants from rural areas, although reflecting the demographic proportion of the municipality in which the study was conducted, may have limited the statistical power to detect true differences between groups. This limitation warrants caution in the interpretation of the results and highlights the need for future studies with larger samples to confirm these findings.

In the context of the supported self-care model, self-care practices play a central role in preventing diabetic foot complications and improving the quality of life of individuals with diabetes mellitus, particularly when supported by continuous educational actions, longitudinal follow-up, and multidisciplinary approaches in Primary Health Care. The low adherence to simple measures, such as proper hygiene, periodic foot assessment, and the use of appropriate footwear observed in this study highlights the need to strengthen health education and supported self-care strategies, as advocated by Mendes in the chronic care model.²³ Brazilian studies emphasize that health education in PHC is a fundamental tool for supporting self-care in diabetes, promoting patient autonomy and shared responsibility in treatment.²⁴ Similarly, national evidence highlights the challenges faced by PHC in the prevention and management of diabetic foot, underscoring the importance of systematic follow-up and multidisciplinary care to reduce complications and amputations.²⁵

This study has limitations that should be considered when interpreting the results. The cross-sectional design precludes the establishment of causal relationships, and the use of convenience sampling limits the generalizability of the findings to other contexts. Furthermore, the small number of participants residing in rural areas may have reduced the statistical power to detect differences between the groups analyzed. Another limitation is the absence of analysis of the race/color variable, which is recognized in the literature as relevant to outcomes related to DM and its complications. Additionally, the use of a data collection instrument without formal validation may introduce a risk of measurement bias; therefore, the results should be interpreted with caution.

CONCLUSION

The findings of this study indicate that the area of residence influences foot health in individuals with DM, mediated by socioeconomic, clinical, and self-care factors. The higher frequency of loss of protective sensation among urban residents and the lower educational attainment among rural residents highlight territorial inequalities that affect the prevention of diabetic foot complications.

In the context of primary health care, these results reinforce the need for active surveillance of diabetic foot, including periodic assessment of protective sensation, intensification of educational actions focused on self-care, and strengthening of longitudinal follow-up, particularly among more socially vulnerable populations. Tailored strategies according to territorial context, including multidisciplinary approaches and the adaptation of actions to the specificities of rural areas, are essential for preventing avoidable outcomes, such as ulcerations and amputations.

Future studies with longitudinal designs, larger sample sizes, and more robust multivariate analyses are needed to enhance understanding of the territorial and social determinants associated with foot health in individuals with diabetes mellitus. Investigations exploring the organization of care within PHC, as well as interventions based on the supported self-care model, may contribute to improving strategies for the prevention of diabetic foot and reducing health inequities.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

CVML: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Validation, Visualization, Writing – Original Draft, Writing – Review & Editing. VCG: Data Curation, Investigation. MVRMP: Data Curation, Investigation. LMN: Data Curation, Investigation. AOC: Conceptualization, Methodology, Supervisão, Writing – Review & Editing. KRS: Conceptualization, Formal Analysis, Investigation, Methodology, Supervisão, Validation, Writing – Review & Editing.

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