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**Knowledge, Attitudes, and Foot Self-Care Practices among Adults with
Diabetes in Cañar: A Cross-Sectional Study**
**Conocimientos, Actitudes y Prácticas de Autocuidado de los pies en Adultos
con Diabetes en Cañar: un estudio transversal**

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Abstract

Background: Diabetes-related foot complications are largely preventable, yet they remain a major source of disability, amputation risk, and avoidable health expenditure, particularly in settings where structured diabetes education and podiatric follow-up are unevenly available. **Objective:** To describe foot-care knowledge, attitudes, and self-care practices among adults with diabetes in Cañar Province, Ecuador, and to identify sociodemographic and clinical correlates of good self-care. **Methods:** An analytical cross-sectional study was conducted using an anonymized dataset of 228 adults with diabetes from Azogues, Biblián, and Déleg. Included sociodemographic variables, time since diagnosis, self-reported foot lesions, and KAP indicators. **Results:** Participants had a mean age of 59.82 years ($SD = 10.40$), and 58.3% were women. Mean diabetes duration was 8.06 years ($SD = 5.75$). Knowledge was predominantly medium (68.9%), attitudes were mostly favorable (90.4%), and foot self-care was mainly moderate (63.2%); 35.5% reached the good self-care category. Practice scores correlated positively with knowledge ($\rho = .238$, $p < .001$), age ($\rho = .143$, $p = .031$), and time since diagnosis ($\rho = .186$, $p = .005$), and were higher among women and urban residents. In adjusted logistic regression, good self-care was associated with higher knowledge score ($OR = 1.48$, $^{95\%}CI [1.24, 1.76]$, $p < .001$), older age ($OR = 1.04$, $^{95\%}CI [1.00, 1.08]$, $p = .047$), and female sex ($OR = 2.01$, $^{95\%}CI [1.07, 3.79]$, $p = .030$). **Conclusion:** The findings show favorable attitudes but only moderate practice, suggesting that positive beliefs alone may not be sufficient to ensure optimal foot self-care.

Keywords: Diabetes mellitus; Knowledge; Attitudes; Practices; Primary care.

Resumen

Antecedente: Las complicaciones en el pie relacionadas con la diabetes son en gran medida prevenibles, pero siguen siendo una fuente importante de discapacidad, riesgo de amputación y gastos sanitarios evitables, especialmente en entornos donde la educación estructurada sobre diabetes y el seguimiento podológico no están disponibles de manera desigual. **Objetivo:** Describir el conocimiento, actitudes y prácticas de autocuidado del cuidado de los pies entre adultos con diabetes en la provincia de Cañar, Ecuador, e identificar correlatos sociodemográficos y clínicos de un buen autocuidado. **Métodos:** Se realizó un estudio analítico transversal utilizando un conjunto de datos anonimizado de 228 adultos con diabetes de Azogues, Biblián y Déleg. Incluyó variables sociodemográficas, tiempo desde el diagnóstico, lesiones en el pie autoinformadas e indicadores de KAP. **Resultados:** Los participantes tenían una edad media de 59,82 años (DE = 10,40) y el 58,3% eran mujeres. La duración media de la diabetes fue de 8,06 años (DE = 5,75). El conocimiento fue predominantemente medio (68,9%), las actitudes fueron mayormente favorables (90,4%) y el autocuidado de los pies fue principalmente moderado (63,2%); El 35,5% alcanzó la categoría de buen autocuidado. Las puntuaciones de práctica se correlacionaron positivamente con el conocimiento ($\rho=0,238$, $p<0,001$), la edad ($\rho=0,143$, $p=0,031$) y el tiempo desde el diagnóstico ($\rho=0,186$, $p=0,005$), y fueron más altas entre mujeres y residentes urbanos. En la regresión logística ajustada, un buen autocuidado se asoció con una puntuación de conocimiento más alta (OR=1,48, IC^{95%} [1,24, 1,76], $p<0,001$), edad avanzada (OR=1,04, IC^{95%} [1,00, 1,08], $p=0,047$) y sexo femenino (OR=2,01, IC^{95%} [1,07, 3,79], $p=0,030$). **Conclusión:** Los resultados muestran actitudes favorables pero solo una práctica moderada, lo que sugiere que las creencias positivas por sí solas pueden no ser suficientes para garantizar un cuidado óptimo de los pies.

Palabras clave: Diabetes mellitus; Conocimiento; Actitudes; Prácticas; Atención primaria



Introduction

Diabetes mellitus is a major and growing public health problem (Adane & Getawa, 2021; World Health Organization, 2024). The International Diabetes Federation estimated that 589 million adults aged 20-79 years were living with diabetes in 2024 and projected a continued increase by 2050 (International Diabetes Federation, 2025). In Ecuador, current IDF country estimates indicate more than half a million adults with diabetes, underscoring the need for prevention-oriented chronic care strategies at the primary care level (International Diabetes Federation, 2025). Beyond glycemic control, the prevention of diabetes-related complications is central to reducing disability, mortality, and health-system burden (Mazumder et al., 2023).

The diabetic foot is one of the most consequential and preventable complications of diabetes (Armstrong et al., 2023; Jeffcoate et al., 2018). Neuropathy, peripheral arterial disease, poor footwear, delayed recognition of skin injury, and limited access to preventive foot assessment can interact to produce ulceration, infection, hospitalization, and lower-limb amputation. International guidelines emphasize annual foot screening, risk stratification, patient education, appropriate footwear, and rapid referral when lesions are detected (American Diabetes Association Professional Practice Committee, 2026; Bus et al., 2024). These recommendations are particularly important in low- and middle-income settings, where specialized podiatric services may be limited and self-care is often the first line of prevention.

In Ecuador, evidence on diabetes-related foot disorders remains limited but clinically relevant (Baldeón et al., 2021; Benazizi et al., 2021; Puig-García et al., 2023). A community-based study in rural Ecuador reported peripheral arterial disease in 24% and peripheral neuropathy in 59% of adults with diabetes; active diabetic foot disease was present in 7%, and most participants were at moderate-to-high risk for future complications (Del Brutto et al., 2016). These findings suggest that preventive foot-care behaviors should be considered a priority for community and primary care interventions. However, knowing the clinical burden is not enough; it is also necessary to identify what patients know, believe, and do in daily life.

Knowledge, attitudes, and practices (KAP) frameworks are useful for identifying educational gaps and behavioral barriers (Algethami et al., 2024; Mafusi et al., 2024; Untari et al., 2024). Studies from different regions show that knowledge of foot care is frequently incomplete and that practice often lags knowledge or favorable attitudes (Alsalamah et al., 2025; Chiwanga & Njelekela, 2015; Elmansy & Elbqry, 2024; Pourkazemi et al., 2020; Taksande et al., 2017). A recent systematic review and meta-analysis in Africa estimated that fewer than half of adults with diabetes practiced good foot self-care, and rural residence was associated with poorer practice (Atalay et al., 2025). Recent hospital-based work in Sri Lanka similarly highlights that foot self-care depends on knowledge, service contact, and contextual access factors (Jayaweera et al., 2026).

Despite this expanding evidence base, local data from Ecuadorian settings remain scarce. The present study analyzes an anonymized dataset from Cañar Province, Ecuador, to describe KAP levels related to foot self-care among adults with diabetes and to identify associated sociodemographic and clinical factors. We hypothesized that higher knowledge scores would be associated with better foot self-care practices, and that practice would vary according to sex, residence, time since diagnosis, and educational attainment.

Methods

Study design

This was an analytical cross-sectional. The cross-sectional design was appropriate for estimating the distribution of knowledge, attitudes, and foot self-care practices and for exploring associations between KAP indicators and sociodemographic or clinical characteristics.

Participants

The analytic sample included 228 adults with diabetes. Available variables included city, age, sex, marital status, residence, educational attainment, occupation, whether the participant was a main caregiver, self-reported foot lesions, and time since diabetes diagnosis. No missing values were identified in the reconstructed dataset. Because the database did not include information on diabetes type, glycemic control, neuropathy, peripheral arterial disease, or medication use, these variables were not included in the analyses.

Measures

Foot-care knowledge was assessed with 10 dichotomous items coded 0 = no and 1 = yes, yielding a total knowledge score from 0 to 10. Attitudes were assessed with five dichotomous items coded 0 = no and 1 = yes, yielding a total attitude score from 0 to 5. Foot self-care practices were assessed with eight items. Six practice items were dichotomous, whereas two items captured periodicity of foot-related behaviors and were coded from 0 to 2. The total practice score ranged from 0 to 10. Included categorical classifications for knowledge (poor/deficient, medium, good/high), attitude (less favorable, favorable), and foot self-care practice (low, moderate, good). Therefore, item-level and categorical interpretations were emphasized alongside total scores.

Statistical analysis

Descriptive statistics were calculated as frequencies and percentages for categorical variables and as means, standard deviations, medians, interquartile ranges, and ranges for continuous variables. Given the ordinal and non-normally distributed nature of several variables, bivariate associations were examined using *Spearman* correlations, *Mann-Whitney U tests*, *Kruskal-Wallis tests*, and chi-square tests, as appropriate. Effect sizes included epsilon-squared for *Kruskal-Wallis tests* and Cramer V for chi-square tests. A multivariable logistic regression model was fitted to identify predictors of good foot self-care, defined as membership in the good self-care category versus low or moderate self-care. Predictors included knowledge score, attitude score, age, time since diagnosis, sex, residence, educational attainment, and self-reported foot lesions. Odds ratios (ORs), 95% confidence intervals (CIs), and p values were reported. Statistical significance was set at $p < .05$.

Results

The sample included 228 adults with diabetes. The mean age was 59.82 years (SD = 10.40; range = 37-85), and the mean time since diagnosis was 8.06 years (SD = 5.75; range = 1-33). Women represented 58.3% of the sample.

Most participants were married (75.4%), 56.6% lived in rural areas, and 20.2% reported being the main caregiver. Self-reported foot lesions were present in 4.4%. Participants were distributed across Azogues (40.4%), Biblián (28.1%), and Déleg (31.6%). Table 1 provides the full sociodemographic and clinical profile.

Table 1
Sociodemographic and clinical characteristics of participants (n = 228).

Variable	n (%) or M (SD)	Median [IQR]	Range
Age, years	59.82 (10.40)	59.0 [52.0, 67.2]	37-85
Time since diagnosis, years	8.06 (5.75)	7.0 [4.0, 11.0]	1-33
City			
Azogues	92 (40.4)		
Biblián	64 (28.1)		
Déleg	72 (31.6)		
Sex			
Hombre	95 (41.7)		
Mujer	133 (58.3)		
Marital status			
Casado	172 (75.4)		
Divorciado/separado	16 (7.0)		
Soltero	15 (6.6)		
Unión de hecho	4 (1.8)		
Viudo	21 (9.2)		
Residence			
Rural	129 (56.6)		
Urbana	99 (43.4)		
Educational attainment			
Ninguna	2 (0.9)		
Primaria completa	66 (28.9)		
Primaria incompleta	37 (16.2)		
Secundaria completa	51 (22.4)		
Secundaria incompleta	35 (15.4)		
Superior	37 (16.2)		
Occupation			
Empleada doméstica	29 (12.7)		
Empleado del Estado	15 (6.6)		
Empleado privado	15 (6.6)		
Jornalero	10 (4.4)		
Ninguno	73 (32.0)		
Trabajo por cuenta propia	86 (37.7)		
Main caregiver			
No	182 (79.8)		
Si	46 (20.2)		
Foot lesions			
No	218 (95.6)		
Si	10 (4.4)		

Note. Percentages are based on the full analytic sample. IQR = interquartile range; M = mean; SD = standard deviation.

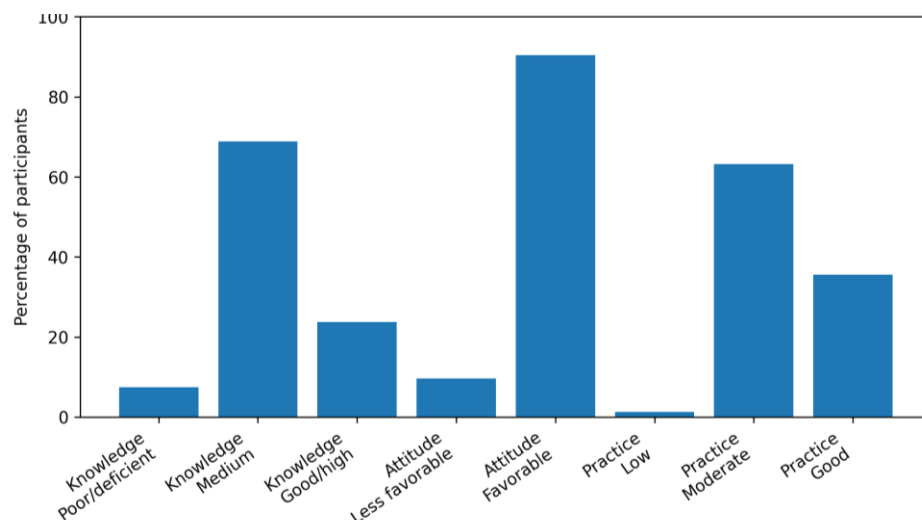
Knowledge scores averaged 6.04 out of 10 (SD = 1.91), with most participants classified in the medium knowledge category (68.9%). Only 23.7% reached the good/high knowledge category, while 7.5% were classified as poor/deficient. Attitudes were strongly favorable: the mean attitude score was 4.26 out of 5 (SD = 1.15), and 90.4% of participants were classified as having favorable attitudes. However, practice was less optimal. The mean practice score was 6.86 out of 10 (SD = 1.25), and 63.2% of participants had moderate self-care, while 35.5% reached good self-care. The distribution suggests a gap between favorable attitudes and consistent high-level practice. Table 2 presents the domain-level descriptive results, and Figure 1 summarizes the categorical distribution.

Table 2
Knowledge, attitudes, and foot self-care practice levels.

Domain / category	Score range	M (SD)	Median [IQR]	n (%)
Knowledge score	0-10	6.04 (1.91)	6.0 [4.0, 7.0]	
Good or high				54 (23.7)
Medium				157 (68.9)
Poor the disabled				17 (7.5)
Attitudes score	0-5	4.26 (1.15)	5.0 [4.0, 5.0]	
Favorable				206 (90.4)
Unfavorable				22 (9.6)
Foot self-care practices score	0-10	6.86 (1.25)	7.0 [6.0, 8.0]	
Poor self-care				3 (1.3)
Medium to moderate self-care				144 (63.2)
Good self-care				81 (35.5)

Item-level responses indicated generally high endorsement of attitude items, with positive responses ranging from 81.6% to 91.2%. Knowledge items showed more variability, with positive responses ranging from 51.8% to 69.3%. Practice items also varied: the highest endorsement was observed for practice item 1 (91.2%), whereas practice item 2 was endorsed by 60.5%. For periodic practice indicators, 65.4% reported the behavior coded as once per year for item 7, and 78.1% reported once per year for item 8. Because the item wording was not included in the exported metadata, item-level results are reported by item code in Appendix A and should be matched with the original questionnaire before final submission.

Figure 1
Distribution of knowledge, attitudes, and foot self-care practice categories.



Higher practice scores were positively associated with higher knowledge scores ($\rho = .238$, $p < .001$), age ($\rho = .143$, $p = .031$), and time since diagnosis ($\rho = .186$, $p = .005$). Practice scores were also higher among women than men and among urban residents than rural residents. Knowledge scores were higher among urban residents and among participants reporting foot lesions; the latter association may reflect increased education after lesion occurrence rather than a protective effect.

Practice categories were significantly associated with knowledge categories, chi-square (4) = 24.83, $p < .001$, Cramer V = .233. Attitude categories were not significantly associated with knowledge categories, chi-square (2) = 3.94, $p = .140$. Table 3 presents the main bivariate findings.

Table 3

Bivariate associations among KAP scores and participant characteristics.

Association	Statistic / effect size	p
Knowledge score and practice score	0.238	< .001
Attitude score and practice score	0.052	0.438
Knowledge score and attitude score	-0.082	0.220
Practice score and age	0.143	0.031
Practice score and time since diagnosis	0.186	0.005
Practice score and sex (1=men, 2=women)	0.155	0.019
Practice score and residence (1=urban, 2=rural)	-0.190	0.004
Knowledge score and residence (1=urban, 2=rural)	-0.307	< .001
Knowledge score and foot lesions (1=yes, 2=no)	-0.170	0.010
Practice score across knowledge categories	H = 15.79; epsilon-squared = 0.061	< .001
Attitude score across knowledge categories	H = 12.84; epsilon-squared = 0.048	0.002
Practice score across cities	H = 10.55; epsilon-squared = 0.038	0.005

<i>Practice category by knowledge category</i>	<i>Chi-square</i> = 24.83; df = 4; Cramer V = 0.233	< .001
<i>Attitude category by knowledge category</i>	<i>Chi-square</i> = 3.94; df = 2; Cramer V = 0.131	0.140

Note. Spearman rho was used for monotonic associations. Kruskal-Wallis tests are reported as H statistics with epsilon-squared. Chi-square tests are reported with *Cramer V*.

The multivariable logistic regression model was statistically significant, likelihood-ratio $p < .001$, and explained approximately 13.4% of the variance in good self-care status (McFadden pseudo- $R^2 = .134$). Higher knowledge score independently increased the odds of good self-care by 48% per additional point ($OR = 1.48$, 95% CI [1.24, 1.76], $p < .001$). Older age was also associated with good self-care ($OR = 1.04$, 95% CI [1.00, 1.08], $p = .047$), and women had approximately twofold higher odds of good self-care than men ($OR = 2.01$, 95% CI [1.07, 3.79], $p = .030$). Attitude score, time since diagnosis, educational attainment, and self-reported foot lesions were not significant predictors in the adjusted model. Rural residence showed a trend toward lower odds of good self-care ($OR = 0.55$, 95% CI [0.29, 1.02], $p = .059$). Table 4 presents the adjusted model.

Table 4
Multivariable logistic regression predicting good foot self-care.

Predictor	OR	95% CI	p
<i>Knowledge score</i>	1.48	1.24-1.76	< .001
<i>Attitude score</i>	1.09	0.84-1.41	0.521
<i>Age (years)</i>	1.04	1.00-1.08	0.047
<i>Time since diagnosis (years)</i>	1.01	0.94-1.07	0.877
<i>Women vs. men</i>	2.01	1.07-3.78	0.030
<i>Rural vs. urban residence</i>	0.54	0.29-1.02	0.059
<i>Educational attainment (ordinal)</i>	1.09	0.88-1.36	0.438
<i>Foot lesions: yes vs. no</i>	0.29	0.06-1.38	0.118

Note. Outcome: good foot self-care versus low/moderate self-care. OR = odds ratio; CI = confidence interval. Reference groups: men, urban residence, no foot lesions.

Discussion

This study provides local evidence on diabetes-related foot-care knowledge, attitudes, and practices among adults from Cañar Province, Ecuador. The findings indicate that favorable attitudes were common, but optimal behavior was not universal. Most participants had medium knowledge and moderate self-care practices, and only about one-third achieved good self-care. This pattern suggests that positive attitudes toward foot care may be necessary but insufficient for high-quality daily prevention behaviors. Skills-based education, practical demonstrations, and repeated

reinforcement during primary care visits may be needed to translate attitudes into consistent action (Dorresteijn et al., 2014).

The positive association between knowledge and practice aligns with prior international evidence showing that better awareness is linked to more preventive foot-care behaviors (Chiwanga & Njelekela, 2015; Pourkazemi et al., 2020; Taksande et al., 2017). In the adjusted model, knowledge was the most robust predictor of good self-care. Each additional knowledge point increased the odds of good self-care by nearly 50%. This finding has direct public health relevance: educational interventions should not be limited to general messages but should target concrete knowledge gaps that can be converted into daily behaviors, including foot inspection, footwear safety, hygiene, drying between toes, nail care, and timely consultation when warning signs appear.

The finding that women had higher odds of good self-care is consistent with several studies reporting sex differences in health-seeking behavior and self-management. Men may require targeted strategies that address lower engagement with preventive care, work-related barriers, or delayed consultation. Older age was also associated with good self-care. One possible interpretation is that older adults or those living longer with diabetes may have had more contact with health services and more opportunities to receive advice. However, this interpretation must be cautious because age and disease duration may also increase clinical risk. Prevention programs should therefore combine education with risk screening rather than assuming that older adults are protected by experience alone.

Residence emerged as an important contextual factor. Urban participants had higher knowledge and practice scores, and rural residence showed a trend toward lower adjusted odds of good self-care. This is consistent with regional and international evidence suggesting that rural patients may experience reduced access to specialist services, preventive education, appropriate footwear, and regular follow-up (Atalay et al., 2025; Del Brutto et al., 2016). In Cañar Province, community-based strategies could include nurse-led education, family participation, pictorial materials for low-literacy groups, and structured foot checks during routine chronic disease appointments.

An important result was the low prevalence of self-reported foot lesions (4.4%) compared with the moderate level of self-care practice. This may reflect successful prevention among some participants, underreporting, or limited clinical examination in the dataset. Previous Ecuadorian evidence from the Atahualpa Project found a substantial burden of neuropathy and arterial disease even when active foot disease was less frequent (Del Brutto et al., 2016). Therefore, future research should include objective foot examination, neuropathy screening, peripheral arterial assessment, footwear evaluation, and clinical history of ulcers or amputations.

The modest reliability of the knowledge and practice scores deserves attention (Omosho et al., 2024). Knowledge items may represent heterogeneous content areas, and practice items appear to function as a behavioral checklist rather than a single latent scale. For clinical and public health use, this is not necessarily a limitation if the instrument is intended to identify specific behaviors requiring intervention. However, for research publication, the original questionnaire wording, scoring criteria, and validation evidence should be added. If the authors have access to the complete instrument, future analyses could examine dimensionality, item discrimination, and whether a shorter or domain-specific scoring approach improves measurement quality.

The findings have practical implications. First, foot-care education should be repeated and behaviorally specific, not delivered as a single informational session. Second, clinical visits should include a brief assessment of both knowledge and actual practice. Third, rural participants and men may benefit from targeted educational follow-up. Fourth, community health workers and primary care nurses could use brief checklists to identify patients who know the importance of foot care but do not consistently perform it. These actions are consistent with international guideline emphasis on prevention, patient education, foot screening, and early referral (American Diabetes Association Professional Practice Committee, 2026; Bus et al., 2024).

The study has several strengths. It analyzes a local Ecuadorian dataset from three cantons, includes both sociodemographic and clinical variables, and reports domain-level, item-level, and adjusted regression results. The focus on KAP indicators provides directly actionable information for primary care and health education programs (Mafusi et al., 2024).

Several limitations should be considered. First, the cross-sectional design prevents causal inference. Second, the dataset did not include diabetes type, HbA1c, neuropathy, peripheral arterial disease, body mass index, medication use, previous ulcers, amputations, or objective foot examination. Third, self-reported foot lesions may underestimate clinical risk. Fourth, the item wording and original scoring manual were not embedded in the exported dataset, which limits item-level interpretation. Fifth, internal consistency was low for knowledge and practice, suggesting heterogeneity of indicators. Finally, the sample was geographically restricted to Cañar Province and may not represent all adults with diabetes in Ecuador.

Conclusion

Among adults with diabetes in Cañar Province, Ecuador, foot-care attitudes were largely favorable, but knowledge was mostly medium and self-care practice was commonly moderate rather than good. Higher knowledge, older age, and female sex were independently associated with good self-care. The results support the need for targeted, practical, and repeated foot-care education within primary care, with additional attention to men and rural residents. Future studies should incorporate clinical foot-risk assessment and validate the KAP instrument in Ecuadorian populations.

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