

# Footcare Knowledge and Footwear Practices Among Diabetic Patients in Pune: A Rural-Urban Comparative Study

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DOI: <https://doi.org/10.52403/ijhsr.20260404>

## ABSTRACT

**Context:** Foot complications are among the most preventable yet neglected consequences of diabetes. Appropriate footwear and regular footcare can reduce ulcers and amputations, but adherence remains suboptimal. Rural–urban differences in education and access to care may influence awareness and preventive practices.

**Aims:** To assess and compare knowledge and practices related to footcare and footwear among Type 2 Diabetes Mellitus (T2DM) patients in rural and urban settings.

**Settings and Design:** Analytical cross-sectional study conducted among T2DM patients attending a tertiary care hospital (urban) and a primary health centre (rural) in Pune.

**Methods and Material:** A total of 328 participants (164 rural, 164 urban) were selected using consecutive sampling. Data were collected using a validated, semi-structured questionnaire assessing footcare and footwear practices. Statistical analysis was done using SPSS v29 with Pearson’s chi-square test or Fisher’s exact test, as appropriate depends on expected count.

**Results:** Urban participants had significantly better awareness and adherence to preventive measures than rural participants. Daily foot washing (88.4% vs 46.3%), shoe inspection (25% vs 1.2%), and therapeutic footwear use (40.9% vs 1.2%) were higher in the urban group ( $p < 0.001$ ). Despite reported education (urban 40.9%, rural 62.2%), overall adherence to daily inspection and consistent footwear use remained below 25%.

**Conclusions:** Although awareness of diabetic footcare exists, practice remains poor, especially in rural populations. Strengthening culturally appropriate education, affordable protective footwear, and regular multidisciplinary screening can reduce diabetic foot complications and improve quality of life.

**Keywords:** Type 2 Diabetes Mellitus; Footcare Practices; Footwear Awareness; Rural–Urban Comparison; Diabetic Foot Prevention; Patient Education

## INTRODUCTION

Over the past few decades, diabetes has surged dramatically, becoming a prevalent and pressing global health issue. Diabetes mellitus (DM), a common metabolic disorder

ranks among the top 10 leading causes of mortality worldwide representing a significant burden on healthcare systems, especially in low- and middle-income nations<sup>1</sup>.

According to the World Health Organization (WHO), non-communicable diseases (NCDs) were responsible for 74% of global deaths in 2019 wherein diabetes alone caused 1.6 million deaths, making it the ninth leading cause of death worldwide. By 2035, projections indicate that approximately 592 million individuals could succumb to diabetes<sup>2</sup>. In India, the prevalence of diabetes has increased from 7.1% in 2009 to 8.9% in 2019, marking a 1.8% rise over the decade. Urban areas, in specific, exhibit a higher prevalence at 11.2%. These statistics underscore the urgency of prioritizing diabetes and its associated complications<sup>3</sup>.

Type 2 diabetes mellitus (T2DM), in particular, is an important health care priority of our nation because of its ever-rising occurrence and associated complications. This is expected to lead to rising rates of morbidity and mortality even in young adults<sup>2,4</sup>.

Aside varied complications affecting the diabetic patients; none of them are more devastating than those involving the foot. Diabetic foot ulcers are among the most feared complications accounting for nearly 25% of all diabetes related hospital admissions<sup>4,5</sup>. It presents with ulcers usually accompanied by peripheral vascular disease and/or lower limb diabetic neuropathy<sup>6</sup>.

Walking barefoot is a common practice among Indians, both indoors and outdoors, which can increase the risk of injury. Poor footwear choices and inappropriate foot care are significant factors contributing to diabetic foot complication<sup>7</sup>. Apart from causing substantial economic burden, this leads to chronic disabilities significantly affecting the patient's quality of life<sup>8</sup>.

Countless studies are present giving generalised and nondescript information of Diabetic footwear and footcare practices, but guidelines must be specifically tailored to the needs of an individual, with respect to effective management and prevention of complication. However, there is no truly representative data about level of awareness of footcare and footwear practices in urban vs rural population.

Therefore, with the current unabated epidemic of non-communicable diseases in our country, there is a felt need for an increased awareness towards greater research in/of diabetes and footwear and footcare practices among diabetic patients. This could be the crucial component lacking from the proper definition of risk factors and mortality in type 2 diabetes in long-term, as well as the development of primary preventive measures.

### **Objectives:**

To assess knowledge of footwear practices among T2DM in a rural and urban setting.

To assess knowledge of footcare practices among T2DM in a rural and urban setting.

To compare awareness of footcare and footwear practices among T2DM in rural vs urban areas.

### **MATERIALS & METHODS**

Type of study design: Analytical study – cross sectional

**Sample size:** A study conducted by SW Naomi Nancy, reported that 70% of the diabetic participants were unaware about footwear practices. By assuming this estimate, a sample size of 164 was calculated for this study with [absolute] 10% of 70 allowable error and 95% CI<sup>9</sup>. As subgroup analysis (rural vs. urban) was planned, the sample size was doubled to ensure adequate representation and stable estimates across groups. Thus, the final sample size included 328 participants.

**Study population:** The study participants were recruited from the Medicine and Endocrinology OPD (urban) and from Nasarapur Primary Health Centre (rural) using a consecutive sampling technique.

**Study setting:** The study was conducted in a tertiary care hospital (urban) and Primary Health Centre (rural).

### **Selection criteria:**

#### **Inclusion:**

1. Patients with Type 2 Diabetes Mellitus (T2DM), aged 18-70 years of either sex.

2. Diagnosed with T2DM for more than 5 years.
3. Patients willing to give informed consent.
4. On stable doses of anti-diabetic medications for 3 months.

**Exclusion:**

1. Patients unwilling to give informed consent.
2. Patients with T2DM below 18 years of age.
3. Patients with Type 1 Diabetes Mellitus.
4. Patients with diabetic foot ulcers or any other diabetic complications.
5. Critically ill patients.
6. History of carcinoma, chronic kidney, liver, lung disease.
7. Patients with neurological disability, like dementia, Alzheimer’s disease and Parkinson disease.

**METHODOLOGY**

Data collection tool: A pre-designed, pilot-tested, validated semi-structured questionnaire was used for data collection. This questionnaire was designed to assess footwear and footcare routines in urban and rural areas of Pune City. The data collected was subdivided into the following groups:

1. Socio-demographic variables which includes occupation, social class, marital status, time since diagnosed with T2DM
2. Footcare practices
3. Footwear practices
4. General health and awareness

Sampling Method: A bilingual (Marathi and English languages) paper based self-administered questionnaire was used.

**Data collection:** Upon voluntary participation by the patient with an informed consent form, a participant informant sheet was provided to the patient describing the research study and his/her role as a

participant. The participants were then asked to fill the questionnaire on their daily footwear choices and footcare routines, both while they are indoors as well as out-doors. The questionnaire also included questions on family, personal and disease (T2DM) history.

A semi-structured questionnaire was prepared based on previous literature and reviewed by all the investigators. It consisted of four sections: socio-demographic details, clinical information, knowledge and practices of foot self-care, and footwear-related questions. Correct responses were scored as “1,” while incorrect responses were scored as “0.”

**Ethical considerations:** Institutional Ethics Committee (IEC) approval was obtained from the University Medical College as well as the Institutional Review Board (IRB) of the designated hospital.

Participants were assured of complete confidentiality of their health information. All collected data were used solely for academic, scientific, and research purposes, and no identifying information was disclosed at any stage.

**Statistical Analysis**

Descriptive statistics [mean (SD), frequency (%)] was used to depict the baseline characteristics of the study population. The proportion of awareness of footcare and footwear practices was estimated using percentage (%) and 95% confidence intervals.

Association between categorical variables (e.g., gender, type of footwear) and awareness was assessed using Pearson’s chi-square test or Fisher’s exact test, as appropriate depends on expected count.

**RESULT**

**Table 1: Distribution of Footcare Responses Across Rural and Urban Groups**

Footcare Questions	Response Categories	Area Of Residence				p value
		Rural (n=164)	%	Urban (n=164)	%	
Do you inspect your feet daily?	No	103	62.80%	98	59.76%	0.571
	Yes	61	37.20%	66	40.24%	
How often do you inspect your feet?	Daily	18	29.51%	28	42.42%	0.304
	Monthly	14	22.95%	11	16.67%	
	Rarely	15	24.59%	10	15.15%	
	Weekly	14	22.95%	17	25.76%	
What do you look for during foot inspections? (cracks)	No	164	100.00%	159	96.95%	0.024
	Yes	0	0.00%	5	3.05%	
What do you look for during foot inspections? (cuts)	No	164	100.00%	143	87.20%	0.001
	Yes	0	0.00%	21	12.80%	
What do you look for during foot inspections? (sores)	No	164	100.00%	150	91.46%	0.001
	Yes	0	0.00%	14	8.54%	
What do you look for during foot inspections? (swelling)	No	164	100.00%	131	79.88%	0.001
	Yes	0	0.00%	33	20.12%	
Do you use a mirror or assistance to inspect parts of your feet that are hard to see? (Yes/No)	No	33	54.10%	34	51.52%	0.771
	Yes	28	45.90%	32	48.48%	
Do you wash and dry your feet daily? (Yes/No)	No	88	53.66%	19	11.59%	0.001
	Yes	76	46.34%	145	88.41%	
Do you moisturize your feet regularly? (Yes/No)	No	76	46.34%	108	65.85%	0.001
	Yes	88	53.66%	56	34.15%	
How do you manage your toenails? (Cut regularly/Seek professional help/Other)	Cut Regularly	130	79.27%	152	92.68%	0.002
	No	2	1.22%	0	0.00%	
	Other	17	10.37%	3	1.83%	
	Seek Professional Help	15	9.15%	9	5.49%	

Table 1: This table provides a comparative analysis of foot-inspection habits, the specific signs checked during inspections, and routine foot-care practices among rural

and urban participants. The findings indicate that urban individuals generally demonstrate more consistent and comprehensive foot-care behaviors.

**Table 2: Comparison of Diabetes-Related Footcare Education, Ulcer History, and Treatment Methods Between Rural and Urban Populations**

Footcare Questions	Response Categories	Area Of Residence				p value
		Rural (n=164)	%	Urban(n=164)	%	
Have you received education on footcare specific to diabetes management? (Yes/No)	No	62	37.80%	97	59.15%	0.001
	Yes	102	62.20%	67	40.85%	
If yes, from whom did you receive education? (Doctor/Nurse/Podiatrist/Diabetes educator/Other)	Doctor	102	100.00%	60	89.55%	0.195
	Nurse	0	0.00%	1	1.49%	
	Other	0	0.00%	6	8.96%	
Have you ever had a foot ulcer or infection? (Yes/No)	No	150	91.46%	155	94.51%	0.28
	Yes	14	8.54%	9	5.49%	

If yes, how was it managed/ treated?	treated with antibiotics	0	0.00%	1	11.11%	=
	Antibiotics	0	0.00%	1	11.11%	
	it is taken care of by visiting the doctor	0	0.00%	1	11.11%	
	needed dressing	0	0.00%	3	33.33%	
	taken care of by putting coconut oil	0	0.00%	1	11.11%	
	treated with antibiotics	0	0.00%	2	22.22%	

Table 2: This table outlines differences in diabetes-specific foot-care education, prior ulcer or infection history, and treatment approaches between rural and urban

populations. Rural participants report higher rates of receiving foot-care education, while ulcer occurrence and management patterns show minimal variation between groups.

**Table 3: Assessment of Shoe Use, Sock Habits, and Therapeutic Footwear in Rural vs. Urban Populations**

	Response Categories	Area Of Residence				p value
		Rural (n=164)	%	Urban(n =164)	%	
Do you wear shoes both indoors and outdoors? (Yes/No)	No	137	83.54%	93	56.71%	0.001
	Yes	27	16.46%	71	43.29%	
What type of shoes do you usually wear? (Athletic Shoes)	No	164	100.00 %	154	93.90%	-
	Yes	0	0.00%	10	6.10%	
What type of shoes do you usually wear? (Shoes)	No	164	100.00 %	135	82.32%	
	Yes	0	0.00%	29	17.68%	
What type of shoes do you usually wear? (Sandals)	No	164	100.00 %	147	89.63%	
	Yes	0	0.00%	17	10.37%	
What type of shoes do you usually wear? (Slippers)	No	164	100.00 %	38	23.17%	
	Yes	0	0.00%	126	76.83%	
Do your shoes fit well? (Yes/No/Not sure)	No	0	0.00%	28	17.07%	0.001
	Yes	164	100.00 %	136	82.93%	
How often do you check the inside of your shoes for foreign objects or damage? (Daily/Weekly/Monthly/Rarely/ Never)	Daily	2	1.22%	41	25.00%	0.001
	Monthly	1	0.61%	5	3.05%	
	Never	145	88.41%	22	13.41%	
	No	1	0.61%	0	0.00%	
	Not Sure	8	4.88%	0	0.00%	
	Rarely	0	0.00%	92	56.10%	
	Weekly	2	1.22%	4	2.44%	
	Yes	5	3.05%	0	0.00%	
Do you wear socks with your shoes? (Yes/No)	Never	5	3.05%	0	0.00%	0.001
	No	143	87.20%	99	60.37%	

	<b>Sometimes</b>	6	3.66%	9	5.49%	
	<b>Yes</b>	10	6.10%	56	34.15%	
<b>What material are your socks made of? (Cotton/Synthetic/Blend/Wool/Other)</b>	<b>Cotton</b>	11	7.43%	66	98.51%	0.001
	<b>No</b>	134	90.54%	0	0.00%	
	<b>Other</b>	1	0.68%	0	0.00%	
	<b>Woolen</b>	0	0.00%	1	1.49%	
	<b>Yes</b>	2	1.35%	0	0.00%	
<b>How often do you change your socks? (Daily/Weekly/Monthly/Rarely/ Never)</b>	<b>Daily</b>	0	0.00%	52	74.29%	0.001
	<b>Never</b>	0	0.00%	1	1.43%	
	<b>Weekly</b>	39	100.00 %	17	24.29%	
<b>Have you ever been prescribed therapeutic footwear by your physician? (Yes/No)</b>	<b>No</b>	162	98.78%	97	59.15%	0.001
	<b>Yes</b>	2	1.22%	67	40.85%	
<b>If yes, do you wear them regularly?</b>	<b>No</b>	2	100.00 %	58	84.06%	0.539
	<b>Yes</b>	0	0.00%	11	15.94%	

Table 3: This table evaluates footwear choices, sock-wearing habits, shoe-inspection practices, and the use of therapeutic footwear in rural and urban

settings. The results show that urban participants tend to follow more appropriate footwear and sock practices and are more frequently prescribed therapeutic footwear.

**Table 4: General Footcare Awareness and Healthcare Utilization Among Rural and Urban Diabetic Populations**

General Questions	Response Categories	Area Of Residence				p value	
		Rural (n=164)	%	Urban(n=164)	%		
<b>Are you aware of the importance of footcare in diabetes management? (Yes/No)</b>	<b>No</b>	133	81.10%	93	56.71%	0.001	
	<b>Yes</b>	31	18.90%	71	43.29%		
<b>How often do you see a healthcare provider for diabetes management? (Every 3 months/Every 6 months/Once a year/Only when necessary/Never)</b>	<b>Every 3 months</b>	3	50	30.49%	59	35.98%	0.001
	<b>Every 6 months</b>	6	28	17.07%	17	10.37%	
	<b>Every Month</b>	0	0	0.00%	8	4.88%	
	<b>Never</b>	0	0	0.00%	7	4.27%	
	<b>Once a year</b>	42	25.61%	24	14.63%		
	<b>Only when necessary</b>	44	26.83%	49	29.88%		
<b>Do you have any other conditions affecting your feet? (e.g., neuropathy, peripheral vascular disease)</b>	<b>Itching on foot</b>	0	0	0.00%	1	0.61%	0.337
	<b>Knee pain</b>	0	0	0.00%	2	1.22%	
	<b>loss of sensation</b>	0	0	0.00%	2	1.22%	
	<b>Neuropathy</b>	1	0.61%	0	0.00%		
	<b>None</b>	142	86.59%	133	81.10%		
	<b>Numbness</b>	9	5.49%	13	7.93%		
	<b>paralysis</b>	0	0.00%	1	0.61%		
<b>Spondylitis</b>	0	0.00%	1	0.61%			

	<b>tingling sensation</b>	12	7.32%	11	6.71%	
<b>Have you ever received a foot examination by a healthcare professional? (Yes/No)</b>	<b>No</b>	126	76.83%	126	76.83%	0.999
	<b>Yes</b>	38	23.17%	38	23.17%	
<b>If yes, how often?</b>	<b>Daily</b>	0	0.00%	1	25.00%	=
	<b>Once</b>	0	0.00%	2	50.00%	
	<b>Thrice</b>	0	0.00%	1	25.00%	

Table 4: This table presents a comparison of general foot-care awareness, healthcare-seeking behavior, associated foot conditions, and the frequency of professional foot examinations. The data suggest higher awareness and more regular healthcare follow-ups among urban participants, while both groups exhibit similar rates of receiving foot examinations.

## DISCUSSION

Diabetic foot complications remain one of the most common causes of preventable morbidity in patients with diabetes mellitus. They result from a complex interaction of peripheral neuropathy, peripheral vascular disease, and impaired wound healing, often compounded by inadequate footcare practices and improper footwear. Previous studies have consistently demonstrated that appropriate patient education and preventive practices significantly reduce the incidence of ulcers and lower-limb amputations<sup>10</sup>.

In the present study, urban participants demonstrated better adherence to recommended footcare practices, including routine foot inspection and appropriate footwear use, compared with rural participants. Similar findings have been reported in several studies where urban populations exhibited higher awareness levels and better preventive behavior, largely due to improved access to healthcare services, educational exposure, and regular medical follow-ups<sup>11</sup>. The higher awareness observed in urban populations may also reflect better patient counseling and availability of specialized diabetic clinics.

Our study also showed that while rural participants reported receiving footcare education more frequently, this did not necessarily translate into better preventive

practices. This discrepancy between knowledge and actual behavior has been documented in other studies assessing diabetic footcare practices. Research suggests that although patients may be aware of preventive measures, practical barriers such as socioeconomic limitations, cultural habits, and lack of access to protective footwear often hinder proper implementation<sup>12</sup>. In rural settings, these barriers may be more pronounced due to limited healthcare infrastructure and lower availability of affordable protective footwear.

Footwear practices in our study differed significantly between rural and urban groups. Urban participants were more likely to use appropriate footwear, inspect shoes before wearing them, and were more frequently prescribed therapeutic footwear. Proper footwear plays a critical role in reducing pressure points and preventing foot trauma, which are major risk factors for ulcer formation. Previous clinical guidelines emphasize that therapeutic footwear can significantly reduce ulcer recurrence in high-risk patients<sup>13</sup>. However, the use of specialized footwear remains limited in many populations due to cost constraints and lack of awareness among both patients and healthcare providers.

Another important finding in this study was the relatively low overall compliance with preventive footcare measures in both groups. Even though urban participants demonstrated better practices compared with rural participants, the overall adherence to recommended preventive measures was still suboptimal. Similar trends have been reported in global studies where diabetic patients often neglect routine foot examination, regular washing and drying of

feet, and early reporting of lesions<sup>14</sup>. This highlights the persistent gap between recommended guidelines and real-world practices.

Healthcare utilization patterns observed in the study also revealed that urban participants had higher levels of general footcare awareness and more frequent healthcare follow-ups. Regular clinical examinations are crucial for early detection of neuropathy, deformities, and minor lesions before they progress to ulcers. Multidisciplinary diabetic foot clinics have been shown to significantly reduce amputation rates through early screening and patient education<sup>15</sup>. Strengthening such services, especially in rural areas, may therefore play a key role in preventing diabetic foot complications.

The findings of this study emphasize the importance of targeted educational interventions tailored to rural populations. Structured diabetes education programs have been shown to improve footcare knowledge, self-examination practices, and timely healthcare seeking behavior<sup>16</sup>. Community-based awareness initiatives, training of primary healthcare workers, and integration of diabetic foot screening into routine diabetes care could substantially improve preventive practices.

Overall, the study highlights a clear rural–urban disparity in diabetic footcare awareness and practices. While urban patients show relatively better adherence, both groups demonstrate inadequate compliance with recommended preventive measures. Addressing these gaps requires a multifaceted approach involving patient education, improved accessibility to healthcare services, and the promotion of affordable protective footwear. Strengthening preventive strategies at the primary healthcare level may significantly reduce the burden of diabetic foot complications and associated.

## CONCLUSION

Although awareness of diabetic footcare exists, practice remains poor, especially in

rural populations. Strengthening culturally appropriate education, affordable protective footwear, and regular multidisciplinary screening can reduce diabetic foot complications and improve quality of life.

## Key Messages:

Urban diabetic patients demonstrated better awareness and adherence to footcare and footwear practices than rural patients. However, overall compliance with preventive measures remains low, highlighting the need for continuous education, affordable footwear solutions, and regular screening to reduce diabetic foot complications.

## Declaration by Authors

**Ethical Approval:** Approved

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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How to cite this article: Himani Jain, Shilpa Patankar, Ishika Gill, Sanjana Jhanbia, Juhi Shisode, Sara Manoj Sankhe. Footcare knowledge and footwear practices among diabetic patients in Pune: a rural–urban comparative study. *Int J Health Sci Res*. 2026; 16(4):25-33. DOI: [10.52403/ijhsr.20260404](https://doi.org/10.52403/ijhsr.20260404)

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