

## Predisposing Factors of Diabetic Foot Amputation in Diabetic Patients at a Tertiary Care Hospital

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Conflict of interest: Nil

### Abstract:

**Background:** Diabetic foot complications are among the most devastating outcomes of diabetes mellitus, often leading to lower limb amputations. Identifying associated risk factors is essential for effective prevention and intervention.

**Aim:** To recognize the risk factors for foot amputation among diabetic patients in a tertiary care hospital in North Gujarat.

**Material and Methods:** A cross-sectional study was conducted on 100 diabetic patients, including 34 who had undergone foot amputation and 66 without. Sociodemographic, clinical, and behavioral factors were analyzed for association with amputation using Chi-square analysis.

**Results:** Significant associations were found with male gender, lower socioeconomic status, poor treatment compliance, lack of diet modification, peripheral arterial disease, and neuropathy ( $p < 0.05$ ). Modifiable lifestyle factors such as smoking and sedentary behavior were also strongly associated with higher amputation rates.

**Conclusion:** Diabetic foot amputation is preventable through early risk assessment, lifestyle modification, and structured education programs for patients and caregivers.

**Keywords:** Diabetic Foot Amputation, Diabetes Mellitus, Diet, Socioeconomic Status.

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### Introduction

Diabetes mellitus (DM) has emerged as one of the most critical public health challenges worldwide, with its prevalence steadily rising in developing nations like India. As per the International Diabetes Federation (IDF), India ranks second globally in the number of people living with diabetes, with over 77 million adults affected as of 2019—a figure projected to rise significantly by 2045 [1]. One of the most debilitating complications of diabetes is diabetic foot, which often culminates in lower limb amputations due to ischemia, infection, or neuropathy [2].

Foot amputation, especially among diabetic patients, poses not only a significant economic burden but also affects patients' quality of life, functional independence, and psychosocial well-being [3]. Studies indicate that diabetic patients are up to 25 times more likely to undergo lower extremity amputation compared to non-diabetics [4]. In India, the prevalence of diabetic foot ulcers (DFUs) ranges from 4% to 10% among the diabetic population, and nearly 15% of these cases eventually require amputation [5]. Multiple risk

factors contribute to foot amputation in diabetic individuals, including peripheral neuropathy, peripheral arterial disease (PAD), poor glycemic control, infection, smoking, and duration of diabetes [6]. Socioeconomic status, lack of awareness, and inadequate foot care practices further exacerbate the problem, particularly in rural and semi-urban regions of India [7]. Moreover, delayed presentation to healthcare facilities and limited access to multidisciplinary diabetic foot care teams increase the risk of complications requiring amputation [8].

Understanding and identifying these risk factors is essential for early intervention and reducing the incidence of diabetic foot complications. Indian studies have also highlighted that poor foot hygiene, inappropriate footwear, and co-existing renal or cardiovascular conditions further increase amputation risk [9]. Therefore, comprehensive assessment and preventive strategies tailored to the Indian population are urgently needed to reduce limb loss among diabetics. With this background, the present study aims to recognize the risk factors

for foot amputation among diabetic patients in the Indian context, with a focus on improving early detection and intervention strategies in high-risk individuals [10].

### Material and Methods

Present Cross-sectional hospital-based study was conducted at a tertiary care center in North Gujarat over a period of 12 months, from March 2024 to February 2025. The primary objective of the study was to recognize the risk factors associated with foot amputation among diabetic patients.

A total of 100 diabetic patients who underwent foot amputation during the study period were enrolled.

The Institutional Ethics Committee approved the study. Confidentiality and anonymity of patient data were maintained throughout the study.

### Inclusion Criteria:

- Patients aged 18 years and above.
- Diagnosed with Type 1 or Type 2 diabetes mellitus.
- Underwent foot amputation (minor or major) during the study period.
- Provided informed written consent for participation.

### Exclusion Criteria:

- Non-diabetic patients undergoing foot amputation.
- Patients with traumatic amputations unrelated to diabetic complications.
- Patients with incomplete medical records.
- Data was collected using a structured case record form, which included:
  - Demographic details (age, gender, residence).
  - Clinical history (duration of diabetes, type of diabetes, glycemic control based on HbA1c).
  - Presence of comorbidities (hypertension, coronary artery disease, chronic kidney disease).
  - History of smoking or alcohol use.
  - Presence of peripheral neuropathy, peripheral arterial disease (PAD), foot ulcers, and infections.
- Laboratory parameters (HbA1c, serum creatinine, lipid profile).

- Type and level of amputation (minor: toe/forefoot; major: below knee/above knee).

**Statistical Analysis:** The collected data were entered into Microsoft Excel and analyzed using SPSS software version 25. Descriptive statistics such as mean, standard deviation, and frequency were used for demographic and clinical variables. Chi-square test and logistic regression analysis were applied to assess the association between risk factors and type of foot amputation. A p-value of less than 0.05 was considered statistically significant.

### Results

Figure 1 shows the distribution of participants based on gender. Out of the total 100 diabetic patients included in the study, 58% were males and 42% were females. This indicates a male predominance among the study population.

Figure 2 illustrates the educational status of participants. A majority, 61%, had education below the metric level, while 39% had education above the metric level. This highlights that a considerable proportion of the diabetic patients in the study had lower educational attainment, which could potentially influence their awareness and self-care practices.

Table 1 presents the association between various demographic, lifestyle, and clinical variables with the occurrence of diabetic foot amputation. Among the 100 diabetic patients, 34 had undergone foot amputation while 66 had not. Significant associations were observed between foot amputation and several factors including gender ( $p=0.0005$ ), socioeconomic status ( $p=0.005$ ), lack of diet modification ( $p=0.002$ ), poor compliance with treatment ( $p=0.004$ ), smoking ( $p=0.001$ ), sedentary lifestyle ( $p=0.0009$ ), and presence of comorbidities like hypertension ( $p=0.007$ ), ischemic heart disease ( $p=0.02$ ), stroke ( $p=0.01$ ), peripheral neuropathy ( $p=0.002$ ), and peripheral arterial disease ( $p=0.0004$ ). These findings emphasize the multifactorial risk profile of patients who progress to diabetic foot amputation.

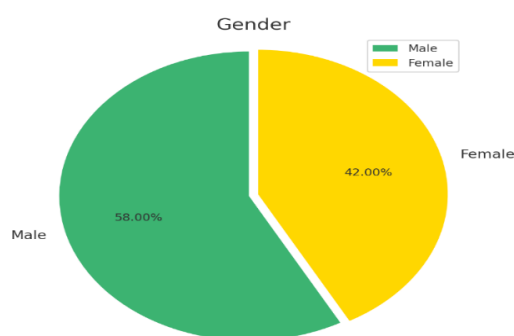


Figure 1: Distribution of participants based on gender.

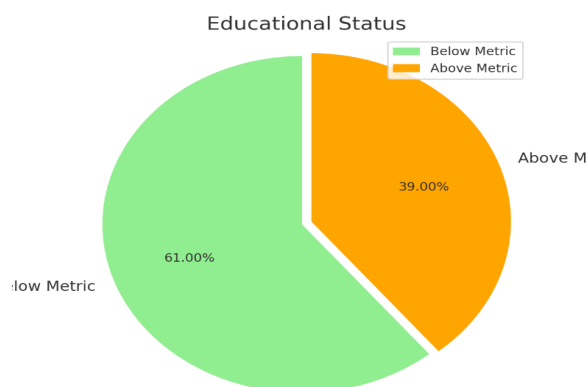


Figure 2: Distribution of participants based on educational status.

Table 1: Association of study variables with diabetic foot amputation.

Parameters	N=100 (%)	Amputation (n=34)	Non-Amputation (n=66)	Chi Square Analysis
<b>Gender</b>				0.0005
Male	58 (58.00)	25 (73.53)	33 (50.00)	
Female	42 (42.00)	9 (26.47)	33 (50.00)	
<b>Educational Status</b>				0.0012
Below Metric	61 (61.00)	20 (58.82)	41 (62.12)	
Above Metric	39 (39.00)	14 (41.18)	25 (37.88)	
<b>Socioeconomic Status</b>				0.005
Lower Class	53 (53.00)	28 (82.35)	25 (37.88)	
Middle Class	47 (47.00)	6 (17.65)	41 (62.12)	
<b>Duration of Diabetes</b>				0.09
Longer	60 (60.00)	19 (55.88)	41 (62.12)	
Shorter	40 (40.00)	15 (44.12)	25 (37.88)	
<b>Diet Modification</b>				0.002
Yes	45 (45.00)	9 (26.47)	36 (54.55)	
No	55 (55.00)	25 (73.53)	30 (45.45)	
<b>Blood Sugar Monitoring</b>				0.0007
Yes	30 (30.00)	6 (17.65)	24 (36.36)	
No	70 (70.00)	28 (82.35)	42 (63.64)	
<b>Lifestyle</b>				0.0009
Active	31 (31.00)	6 (17.65)	25 (37.88)	
Sedentary	69 (69.00)	28 (82.35)	41 (62.12)	
<b>Type of Therapy</b>				0.03
Insulin	25 (25.00)	11 (32.35)	14 (21.21)	
Oral Hypoglycemic Agents	62 (62.00)	15 (44.12)	47 (71.21)	
Both	13 (13.00)	8 (23.53)	5 (7.58)	
<b>Compliance with Treatment</b>				0.004
Good	40 (40.00)	8 (23.53)	32 (48.48)	
Poor	60 (60.00)	26 (76.47)	34 (51.52)	
<b>Smoking</b>				0.001
Yes	27 (27.00)	13 (38.24)	14 (21.21)	
No	73 (73.00)	21 (61.76)	52 (78.79)	
<b>Hypertension</b>				0.007
Yes	41 (41.00)	20 (58.82)	21 (31.82)	
No	59 (59.00)	14 (41.18)	45 (68.18)	
<b>Ischemic Heart Disease</b>				0.02
Yes	26 (26.00)	13 (38.24)	13 (19.70)	
No	74 (74.00)	21 (61.76)	53 (80.30)	

<b>Stroke</b>				0.01
Yes	12 (12.00)	6 (17.65)	6 (9.09)	
No	88 (88.00)	28 (82.35)	60 (90.91)	
<b>Peripheral Neuropathy</b>				0.002
Yes	42 (42.00)	22 (64.71)	20 (30.30)	
No	58 (58.00)	12 (35.29)	46 (69.70)	
<b>Peripheral Arterial Disease</b>				0.0004
Yes	39 (39.00)	23 (67.65)	16 (24.24)	
No	61 (61.00)	11 (32.35)	50 (75.76)	

## Discussion

The present study aimed to identify risk factors associated with foot amputation among diabetic patients in a tertiary care hospital in North Gujarat. Our findings highlight a complex interplay of demographic, behavioral, and clinical variables contributing to limb loss in this high-risk population. A significant association was observed between male gender and foot amputation, which aligns with existing literature suggesting that men are more prone to neglect foot care and seek medical attention at advanced stages of diabetic foot complications [11].

Educational status also appeared to influence outcomes, with individuals having lower educational levels showing a higher prevalence of amputations. This may be attributed to limited health literacy, poor awareness of diabetic foot complications, and inadequate self-care practices, as noted in other low-resource settings [12]. Socioeconomic status emerged as a major determinant of amputation risk, with lower-class individuals facing a substantially higher burden.

Financial constraints often limit access to preventive care, specialized wound management, and multidisciplinary foot care teams, contributing to delayed treatment and worse outcomes [13]. Clinical variables such as the presence of peripheral neuropathy, peripheral arterial disease (PAD), and comorbidities like hypertension and ischemic heart disease were significantly associated with amputations in our study.

These findings are consistent with earlier research suggesting that neuropathy and PAD together create a “high-risk foot” profile, increasing the likelihood of ulcers and infections progressing to non-healing wounds [14].

Moreover, poor compliance with treatment, absence of diet modification, sedentary lifestyle, and lack of routine blood sugar monitoring were significantly higher in the amputation group, indicating modifiable risk factors that need targeted intervention. Importantly, this study also underscores the need for structured education programs and regular foot examinations, particularly in under-resourced regions. Previous studies have shown that patient education, coupled

with early screening and timely referral to foot care services, can dramatically reduce the incidence of amputations [15]. While this study provides valuable insights, it is limited by its single-center design and relatively small sample size.

Nevertheless, the results emphasize the critical need for community-level awareness programs, enhanced screening efforts, and integrated diabetic foot clinics to prevent amputations in vulnerable diabetic populations.

## Conclusion

Diabetic foot amputation remains a serious consequence of poorly controlled diabetes, with multiple modifiable and non-modifiable risk factors playing a significant role. The study emphasizes the importance of early identification of high-risk individuals, improved patient education, and integrated care approaches to reduce amputation rates in diabetic patients.

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