

# A Study on the Prevalence of Foot Ulcer in Type 2 Diabetes Mellitus in Tribals of Jharkhand

Dr Sandeep Marcus Horo

Senior Resident, Department of General Medicine, Rajendra Institute of Medical Sciences (RIMS), Ranchi

Dr Aditya Anurag

MD, General Medicine (std), Rajendra Institute of Medical Sciences (RIMS), Ranchi

---

## Abstract: -

India is known as the diabetic capital of the world. One of the common complications of diabetes is foot ulcer. It can be prevented by proper glycemic control. Many tribal populations in India are devoid of basic medical facility. So, good glycemic control in these population is a distant reality. This study aims to analyze the prevalence of foot ulcers among tribals with diabetes.

---

Date of Submission: 20-08-2021

Date of Acceptance: 05-09-2021

---

## I. Introduction

Diabetic foot ulcers are a major cause for diabetic foot infection.<sup>1,2</sup> About 10%±30% of diabetic patients with a foot ulcer will eventually progress to an amputation.<sup>1, 3</sup> The prevalence of foot ulcers among diabetic patients ranges from 2% to 12%.<sup>4,5</sup> In addition, the lifetime risk of a diabetic person developing a foot ulcer could be as high as 25%.<sup>6</sup> The main risk factors for diabetic foot ulcers include sensory neuropathy, lower limb ischemia, and trauma. However, most of these risk factors are preventable.<sup>6</sup>

This study investigates the prevalence of diabetic foot ulcers and its associated risk factors among diabetic patients attending the Rajendra Institute of Medical Sciences, Ranchi, Jharkhand. A similar study was also conducted at National Center for Diabetes, Endocrinology, and Genetics (NCDEG) at the University of Jordan (Amman, Jordan) in year 2010.

## Aims and Objectives

The aim of this study is to see the prevalence of foot ulcer in diabetic patients who are tribals.

## Inclusion criteria:

1. Patients who have type 2 diabetes for more than 1 year.
2. Age criteria: 40- 60 years.

## Exclusion criteria:

1. Type 1 Diabetes.
2. Foot ulcers due to other reasons like trauma, leprosy etc.

## II. Material And Methods

### Statistical Analysis

Statistical analysis was performed using SPSS 23 software. Responses were shown using percentages and cross tabulations and presented in tables. Informed consent was obtained from participants after providing them with sufficient information about the study. Participants were also assured of the confidentiality of the information provided.

## III. Results

A total of 100 diabetes patients were enrolled into the study. The sex distribution of the study participants was 31% males and 69% females with a mean age of 53.8 years. Sociodemographic characteristics of the participants are shown in Table 1. The prevalence of DFU in patients suffering from type 2 diabetes for <5 years, 5-10 years, 11-15 years, 16-20 years and >20 years were seen to be 11.1%, 12.5%, 31.25%, 27.27% and 40% respectively. The overall prevalence of diabetic foot ulcers (DFU) was 18% (Table 2).

**Table 1:** Sociodemographic characteristics of study participants.

Characteristics	Frequency (%/Mean±SD)
Mean Age (years)	53.8±13.8
Age groups	
18-29	5 (5)
30-39	12 (12)
40-49	18 (18)
50-59	25 (25)
≥60	40 (40)
Sex	
Male	31 (31)
Female	69 (69)

**Table 2:** Prevalence of DFU.

Characteristic	DFU (%)	No DFU (%)
Diabetes duration (years)		
<5	36 (100)	4 (11.1) 32 (88.9)
5-10	32 (100)	4 (12.5) 28 (87.5)
11-15	16 (100)	5 (31.25) 11 (68.75)
16-20	11 (100)	3(27.27) 8 (72.72)
>20	5 (100)	2 (40) 3 (60)

#### IV. Discussion

##### *Etiology*

Risk factors associated with DFU are as follows: gender (male), duration of diabetes longer than 10 years, advanced age of patients, high Body Mass Index and other comorbidities such as retinopathy, diabetic peripheral neuropathy, peripheral vascular disease, glycated hemoglobin level (HbA<sub>1C</sub>), foot deformity, high plantar pressure, infections, and inappropriate foot self-care habits<sup>[1,12,20-22]</sup>

Although the literature has identified a number of diabetes related risk factors that contribute to lower-extremity ulceration and amputation, to date most DFU has been caused by ischemic, neuropathic or combined neuroischemic abnormalities[6]. Today, numerous investigations have shown that elevated plantar pressures are associated with foot ulceration.

Unfortunately, often patients are in denial of their disease and fail to take ownership of their illness along with the necessary steps to prevent complication and to deal with the many challenges associated with the management of DFU. However, numerous studies have shown that proper management of DFU can greatly reduce, delay, or prevent complications such as infection, gangrene, amputation, and even death[6].

The primary management goals for DFU are to obtain wound closure as expeditiously as possible. As diabetes is a multi-organ systemic disease, all comorbidities that affect wound healing must be managed by a multidisciplinary team for optimal outcomes with DFU. Based on National Institute for Health and Clinical Excellence strategies, the management of DFU should be done immediately with a multidisciplinary team that consists of a general practitioner, a nurse, an educator, an orthotic specialist, a podiatrist, and consultations with other specialists such as vascular surgeons, infectious disease specialists, dermatologists, endocrinologists,

dieticians, and orthopedic specialists. Today, numerous studies have shown that a multi-disciplinary team can reduce amputation rates, lower costs, and leads to better quality of life for patients with DFU. It has been shown that up to 50% of DFU cases can be prevented by effective education. In fact, educating patients on foot self-management is considered the cornerstone to prevent DFU[12].

Patients with DFU should be educated about risk factors and the importance of foot care, including the need for self-inspection, monitoring foot temperature, appropriate daily foot hygiene, use of proper footwear, and blood sugar control. In patients with DFU, blood glucose control is the most important metabolic factor. In fact, it is reported that inadequate control of blood sugar is the primary cause of DFU[6]. Debridement is the removal of necrotic and senescent tissues as well as foreign and infected materials from a wound, which is considered as the first and the most important therapeutic step leading to wound closure and a decrease in the possibility of limb amputation in patients with DFU. The use of offloading techniques, commonly known as pressure modulation, is considered the most important component for the management of neuropathic ulcers in patients with diabetes. The most effective offloading technique for the treatment of neuropathic DFU is total contact casts (TCC). A major breakthrough for DFU management over the last decades was the demonstration of novel dressings[13]. Ideally, dressings should confer moisture balance, protease sequestration, growth factor stimulation, antimicrobial activity, oxygen permeability, and the capacity to promote autolytic debridement that facilitates the production of granulation tissues and the re-epithelialization process. In addition, it should have a prolonged time of action, high efficiency, and improved sustained drug release in the case of medicated therapies. Hence, no single dressing fulfills all the requirements of a diabetic patient with a foot ulcer. The choice of dressing is largely determined by the causes of DFU, wound location, depth, amount of scar or slough, exudates, condition of wound margins, presence of infection and pain, need for adhesiveness, and conformability of the dressing [13].

Diabetic foot surgery plays an essential role in the prevention and management of DFU, and has been on the increase over the past 2 decades.

In general, surgery for DFU healing includes non-vascular foot surgery, vascular foot surgery, and in some cases amputation. Nonvascular foot surgery is divided into elective, prophylactic, curative, and emergent surgeries that aim to correct deformities that increase plantar pressure.

While the primary goal of DFU management focuses on limb salvage, in some cases amputation may offer a better functional outcome, although this is often not clearly defined. This decision is individualized and multifactorial to match patient lifestyle, medical, physical, and psychological comorbidities. In general, amputation is considered as an urgent or curative surgery and should be the last resort after all other salvage techniques have been explored, and the patient must be in agreement. Indications for an amputation include the removal of infected or gangrenous tissues, control of infection, and creation of a functional foot or stump that can accommodate footwear or prosthesis.

Hyperbaric oxygen therapy (HBOT) has shown promise in the treatment of serious cases of non-healing DFU, which are resistant to other therapeutic methods. HBOT involves intermittent administration of 100% oxygen, usually in daily sessions.

The exact mechanism of HBOT remains poorly understood. Some studies have reported that HBOT improved wound tissue hypoxia, enhanced perfusion, reduced edema, down regulated inflammatory cytokines, and promoted fibroblast proliferation, collagen production, and angiogenesis.

Electrical stimulation (ES) has been reported as a perfect adjunctive therapy for DFU healing in recent literature. Based on the literature review, it is suggested that ES could improve common deficiencies that have been associated with faulty wound healing in DFU, such as poor blood flow, infection, and deficient cellular responses. This therapy is a safe, inexpensive, and a simple intervention to improve wound healings in patients with DFU.

Negative pressure wound therapy (NPWT) is a non-invasive wound closure system that uses controlled, localized negative pressure to help heal chronic and acute wounds.

It seems that NPWT removes edema and chronic exudate, reduces bacterial colonization, enhances formation of new blood vessels, increases cellular proliferation, and improves wound oxygenation as the result of applied mechanical force.

Bio-engineered skin (BES) has been used during the last decades as a new therapeutic method to treat DFU. This method replaces the degraded and destructive milieu of extra cellular matrix (ECM) with the introduction of a new ground substance matrix with cellular components to start a new healing trajectory. It seems that BES can provide the cellular substrate and molecular components necessary to accelerate wound healing and angiogenesis. They act as biologic dressings and as delivery systems for growth factors and ECM components through the activity of live human fibroblasts contained in the dermal elements.

In the present study, the prevalence of foot ulcers was 18%, which is higher than DFU prevalence reported in other countries including Egypt, Kenya, Jordan, and Saudi Arabia where the prevalence was found to be 1.2%, 4.6%, 2.05%, and 3.3%, respectively [24–27]. However, the finding of this study is comparable to

studies done in Ethiopia and Tanzania, where the prevalence was found to be 14.8% and 15%, respectively [28–30]. This wide variation in the prevalence of foot ulcers could be due to differences in subject characteristics and the methodology used.

## V. Conclusion

This study assessed the prevalence of DFU and DLLA among Type 2 diabetics attending Rajendra Institute of Medical Sciences, Ranchi, Jharkhand. The study showed that the prevalence of DFU is high among diabetes patients from tribal areas in Jharkhand.

## References

- [1]. International Diabetes Federation, *IDF Diabetes Atlas*, International Diabetes Federation, Brussels, Belgium, 7th edition, 2015, <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas/13-diabetes-atlas-seventh-edition.html>.
- [2]. J. L. Richard and S. Schuldiner. "Epidemiology of diabetic foot problems," *Internal Medicine Journal*, vol. 29, pp. S222–S230, 2008.
- [3]. Centers for Disease Control and Prevention, "Geographic disparities in diabetes-related amputations," *National Institutes of Health*, vol. 55, no. 46, pp. 1251–1253, 2008.
- [4]. World Health Organisation/International Diabetes Federation, *Screening for Type 2 Diabetes*, World Health Organisation, Geneva, Switzerland, 2003.
- [5]. J. C. Mbanya and E. Sobngwi, "Diabetes microvascular and macrovascular disease in Africa," *European Journal of Cardiovascular Prevention & Rehabilitation*, vol. 10, no. 2, pp. 97–102, 2003.
- [6]. C. Harrington, M. J. Zagari, J. Corea, and J. Klitenic, "A cost analysis of diabetic lower-extremity ulcers," *Diabetes Care*, vol. 23, no. 9, pp. 1333–1338, 2000.
- [7]. International Diabetes Federation, *Complications. IDF Diabetes Atlas I*, International Diabetes Federation, 6th edition, 2013, <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas/13-diabetes-atlas-seventh-edition.html>.
- [8]. F. K. Bijan Iraj, E. Alireza, and A. Gholamreza, "Prevention of diabetic foot ulcer," *International Journal of Preventive Medicine*, vol. 4, no. 3, pp. 373–376, 2013.
- [9]. P. K. Mouluk, R. Mtonga, and G. V. Gill, "Amputation and mortality in new-onset diabetic foot ulcers stratified by etiology," *Diabetes Care*, vol. 26, no. 2, pp. 491–494, 2003.
- [10]. Turns M. The diabetic foot: an overview of assessment and complications. *Br J Nurs*. 20(15):S19-25.
- [11]. B. Aulivola, C. N. Hile, A. D. Hamdan et al., "Major lower extremity amputation: outcome of a modern series," *Archives of Surgery*, vol. 139, no. 4, pp. 395–399, 2004.
- [12]. C. P. Cruz, J. F. Eidt, C. Capps, L. Kirtley, and M. M. Moursi, "Major lower extremity amputations at a Veterans Affairs hospital," *The American Journal of Surgery*, vol. 186, no. 5, pp. 449–454, 2003.
- [13]. L. V. Fortington, J. H. B. Geertzen, J. J. van Netten, K. Postema, G. M. Rommers, and P. U. Dijkstra, "Short and long term mortality rates after a lower limb amputation," *European Journal of Vascular and Endovascular Surgery*, vol. 46, no. 1, pp. 124–131, 2013.
- [14]. R. Shobhana, P. R. Rao, A. Lavanya, V. Vijay, and A. Ramachandran, "Cost burden to diabetic patients with foot complications-a study from southern India," *Journal of the Association of Physicians of India*, vol. 481, no. 2, pp. 1147–1150, 2000.
- [15]. Z. G. Abbas and L. K. Archibald, "Epidemiology of the diabetic foot in Africa," *Medical Science Monitor*, vol. 11, no. 8, pp. RA262–RA270, 2005.
- [16]. IDF. Diabetes Atlas. International Diabetes Federation, Brussels. 2015. <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas.html>. Accessed 10 Sept 2017.
- [17]. WHO. Top 10 causes of death. World health Organization 2017 <http://www.who.int/mediacentre/factsheets/fs310/en/>.
- [18]. Alexiadou K, Doupis J. Management of Diabetic Foot Ulcers. *Diabetes Ther*. 2012;3:4. doi: 10.1007/s13300-012-0004-9.
- [19]. Forlee M. What is the diabetic foot? The rising prevalence of diabetes worldwide will mean an increasing prevalence of complications such as those of the extremities. *Continuing Medical Education*. 2010;28:152–156.
- [20]. Jain AKC, Vishwanath S. Studying major amputations in a developing country using Amit Jain's typing and scoring system for diabetic foot complications - time for standardization of diabetic foot practice. *Int Surg J*. 2015;2:26–30.
- [21]. The International Working Group on the Diabetic Foot 2017. <http://iwgdf.org/> Accessed 10 Sept 2017.
- [22]. Katsilambros N, Dounis E, Makrilakis K, Tentolouris N, Tsapogas P. Atlas of the diabetic foot. John Wiley & Sons. 2010.
- [23]. Bakkar K, Foster A, Houtum WV, Riley P. Diabetes and Foot Care: Time to act. 4<sup>th</sup> edition. Netherlands. 2005.
- [24]. Apelqvist J, Bakker K, Van Houtum WH, et al. The international consensus on the diabetic foot. In: *International consensus on the diabetic foot*. 1999 Amsterdam International Diabetes Federation.
- [25]. McIntosh A, Peters J, Young R, et al. *Prevention and management of foot problems in type 2 diabetes: clinical guidelines and evidence* 2003 Sheffield University Sheffield (NICE guideline).
- [26]. Scottish Intercollegiate Guideline Network, Management of diabetic foot disease, in Management of Diabetes, 2001.
- [27]. Diabetic foot ulcers. Data point #1. Prevalence of diabetes, diabetic foot ulcer, and lower extremity amputation among medicare beneficiaries 2006 to 2008.
- [28]. IDF. Diabetes Atlas. International Diabetes Federation, Brussels. 2015. <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas.html>. Accessed 10 Sept 2017.
- [29]. WHO. Top 10 causes of death. World health Organization 2017 <http://www.who.int/mediacentre/factsheets/fs310/en/>. Accessed 10 Sept 2017.
- [30]. Alexiadou K, Doupis J. Management of Diabetic Foot Ulcers. *Diabetes Ther*. 2012;3:4.

Dr Sandeep Marcus Horo, et. al. "A Study on the Prevalence of Foot Ulcer in Type 2 Diabetes Mellitus in Tribals of Jharkhand." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(09), 2021, pp. 01-04.