RSSDI Atlas of Diabetic Foot



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4
CHAPTER

Reduction of Lower Limb Amputations among People with Diabetes in India

Vijay Viswanathan

INTRODUCTION

Nontraumatic lower limb amputations are one of the most serious and devastating complications of diabetes mellitus in India. Apart from increasing the mortality rates and affecting the quality of life of patient, amputations can cause heavy economic burden for the healthcare system of the entire nation. A comprehensive healthcare system with a multipronged approach becomes essential to reduce the amputations of lower limb extremities in diabetic patients in India.

EPIDEMIOLOGY

The prevalence of diabetes has been alarmingly increasing and is also expected to increase by 69% to around 152 million by the year 2045 in the Southeast Asian region.[1] One of the most common complications of diabetes is diabetic foot infections, which is the most important reason for nontraumatic lower extremity amputation (LEA). The Global Burden of Diseases (GBD), Injuries, and Risk Factors Study done in 2016 states that around 131 million people had lower extremity complications related to diabetes, which accounts to nearly 6.8 million amputations.[2] It is also estimated that nearly 1 million people undergo amputations due to diabetes and every 20 seconds a limb is being lost in this world.[3] LEA can cause significant increase in mortality, poor quality of life, and high rates of hospitalization due to readmission. It is very clear that LEA is one of the most dreadful complications of diabetic foot ulcers (DFUs) because it is estimated that around 85% of amputations in diabetic patients were preceded by DFU.[4]

CAUSES OF AMPUTATION

There could be several reasons for lower limb extremities amputation among diabetic people, the most common one being vascular or peripheral artery disease (PAD). The global prevalence of PAD in diabetic patients increased from 2001 to 2012 by 24% and approximately 11% could be attributed to critical limb ischemia (CLI). CLI is a condition in which loss of blood supply to the limb can result in pain, ulceration, and gangrene of the feet.[5] The trends in amputations have increased steadily over the years, which is evident from the fact that amputations related to diabetes have increased leaps and bounds when compared to nondiabetes-related amputations. Apart from vascular changes, bone and joint infections as well as soft tissue infections and ulcerations are the other major reasons for diabetes-related amputations **(Fig. 1)**.[6]

Apart from this, there are several other reasons like neoplasm, sepsis, and other acute conditions, which were considered as rare or rather concomitant diseases and could not contemplated as a reason for amputation. The main reason for nondiabetes-related amputation could be associated with trauma. In a multicentric study in India by Vijay et al., the reasons for occurrence of LEAs were stated as infection, trauma, and frost bite.[7]

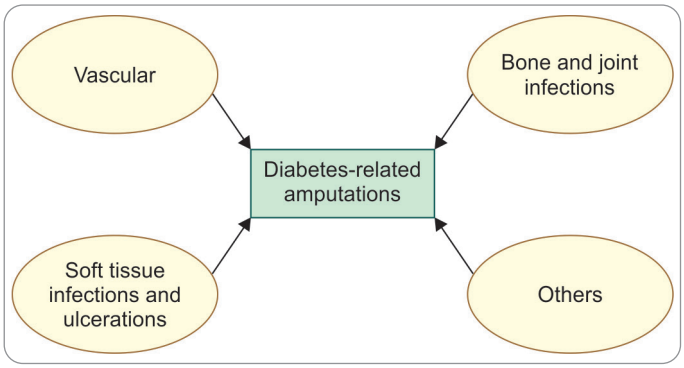

Fig. 1: The major reasons which can be attributed to the lower limb extremities-related amputation related to diabetes.[6]

PATHOPHYSIOLOGY AND RISK FACTORS

There are three factors namely, predisposing factors, triggering factors, and aggravating factors, which can contribute to the pathophysiology of DFUs, which in turn can lead to amputations that are best illustrated in **Figure 2**.[8] It becomes imperative to determine the various risk factors associated with DFUs ultimately leading to amputations, which is indispensable to appropriate management and prevention of amputations.

The risk factors and indicators for LEA are mentioned in **Table 1**.[9]

In a study from a South Indian tertiary hospital, the risk factors associated with amputation in diabetic foot disease patients were recognized to be neuropathy (36%), male predisposition, and associated with smoking and alcoholism as well as trauma, especially due to walking barefoot and inappropriate use of footwear.[10] This is in accordance with another multicentric study from South India in which 82% of them had neuropathy, 35% had peripheral vascular disease (PVD), and prevalence of claw deformities were seen in 64% of patients.[7] Some of the most common barriers for the management of foot infections and amputations in India are inappropriate usage of footwear or walking barefoot, accessibility to healthcare resources, and inadvertent use of antimicrobials to treat infections without obtaining the specific microbiological culture report.[11]

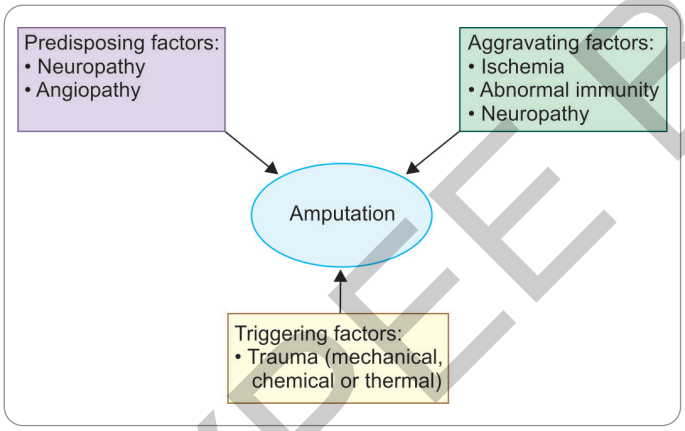

Fig. 2: Various factors associated with the pathophysiology of developing diabetic foot ulcers which in turn can lead to amputation.[8]

TABLE 1: Risk factors and indicators for lower extremity amputation (LEA).

Risk factors for diabetic feet amputation	Indicators for LEA amputation
Lower extremity ischemia	Peripheral arterial occlusion
History of foot ulcer	Septic gangrene nonhealing ulcer
Neuropathy	Severe soft tissue infection
Elevated HbA1c	Osteomyelitis
Retinopathy	Substantial necrosis of muscles and wet gangrene

LEVELS AND TYPES OF AMPUTATION

Any partial amputation up to the level of the transverse tarsal joint (Chopart's joint) is considered as successful limb salvage and also defined as minor amputation. Amputations that involve the sacrifice of ankle joints are considered as major amputations.[12] If the amputations are done at the level of hip, hind quarter, above/through/below the knee, through tarus or ankle, they were considered as major amputation. Similarly, if the amputations are done through metatarsal bones, through tarsometatarsal joints, rays or toes, they were called minor amputations.[7]

In a multicentric study by Vijay et al., it was estimated that around 30% had undergone major amputations and the remaining 70% underwent minor amputations. Among the major amputations, more than 50% had encountered below knee amputations and around 12% had experienced above knee amputations.[7]

STRATEGIES TO REDUCE AMPUTATION

The American Heart Association (AHA) has developed key recommendations and policies to reduce the rate of nontraumatic lower limb amputations by 20% by the year 2030. A collaborative and comprehensive approach of the key contributors **(Fig. 3)** will play a significant role to reduce the amputations.[5]

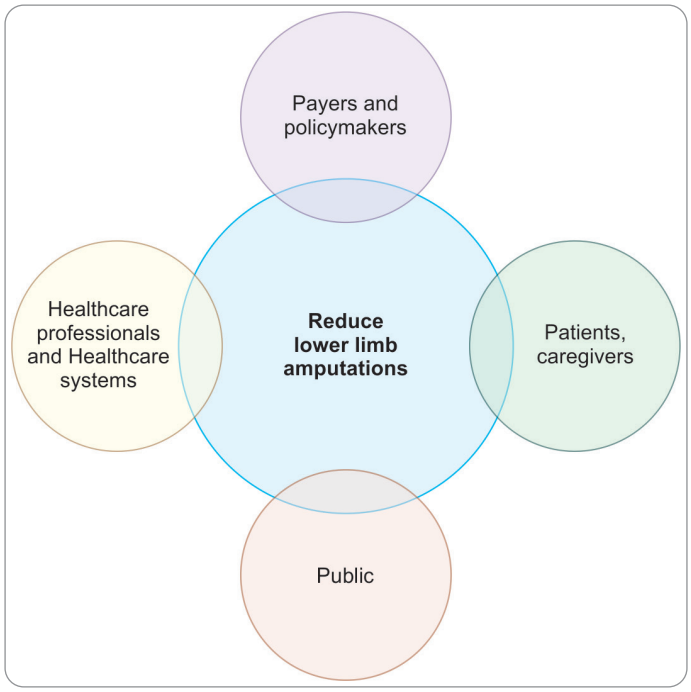

Fig. 3: The most significant contributors who can play a key role in reducing lower limb amputations.

The role of each of the key stakeholders must be established to improve the quality of treatment as well as to reduce the rate of amputations, which have been steadily increasing over the years.

The patients and caregivers must be adequately motivated and educated about adherence to the treatment and self-examination of feet, which is quintessential for prevention or reduction of amputations. Healthcare professionals must be given appropriate awareness about the evidence-based practical guidelines for comprehensive and imperative treatment. The payers can provide affordable risk-modifying measures for cessation of smoking and for treatment of PAD. The policy makers should provide preventive services to the patients at affordable costs and can also increase the funding toward research, which in turn will help us to treat patients in an efficient and effective manner. General awareness or education campaigns among the public and various lifestyle modifications to ensure and promote healthy life also play a very important role in reducing the levels of amputation in diabetes in India.[5] In a study on the amputation preventive initiative in South India by Vijay et al., it was concluded that strategies like intensive management and foot care education created a positive impact on the reduction of amputations.[11] The step-by-step project in developing countries like India, Nepal, Tanzania, Bangladesh, and Tanzania was a remarkable training program aimed at creating awareness among people to improve the diabetic foot care and sustainable training to the healthcare professionals to manage diabetic foot infections and reduce the lower limb amputations with the available human and financial constraints efficiently.[13]

A multidisciplinary approach is required for management of foot infections and prevention of amputations, which includes revascularization and appropriate surgeries, treatment of pain and infections, management of comorbidities, cautious wound control as well as biomechanical off-loading.[14]

CONCLUSION

Diabetes-related amputations are preventable to a great extent provided some simple effective strategies are followed to improve the quality of life of patients who are affected both economically as well as psychologically due to the loss of limbs. An integrated approach is thus recommended to reduce the lower limb amputations of diabetes in India.

TAKE-HOME MESSAGES

- Stratification of patients based on risk
- Identification of high-risk group
- Intensive education, motivation, and significant modification of lifestyle and behavior
- Appropriate treatment (wound care and off-loading)

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RSSDI Atlas of
Diabetic Foot

Salient Features

- Covers the various aspects regarding the management of diabetic foot
- High-resolution colored photographs are included to justify the title
- Contributed by many physicians who are stalwarts in their field
- These photographs have been contributed as a part of Save the Feet and Keep Walking Campaign 2022
- Includes concise and lucid text for better understanding of each photograph
- Serves as a ready reckoner in most clinical situations

Vijay Viswanathan MD PhD FRCP (London, Glasgow) has completed 32 years as a diabetologist. He is the Head and Chief Diabetologist of the M V Hospital for Diabetes, Chennai, India, and Prof. M Viswanathan Diabetes Research Centre, Chennai, India. He was the immediate past Vice President of National RSSDI and is the Honorary President of D Foot International, an organization based in Belgium consisting of members working in the field of diabetic foot from across the world.

Dr Viswanathan is also the honorary faculty in the Department of Podiatry Medicine in the Royal College of Physicians and Surgeons of Glasgow. He has set up a multidisciplinary team for Diabetic Foot Care in Chennai and has published over 200 original research papers in diabetic foot.

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