

Financial burden of diabetic foot ulcers to world: a progressive topic to discuss always

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Abstract: Diabetic foot complications are the most common occurring problems throughout the globe, resulting in devastating economic crises for the patients, families and society. Diabetic foot ulcers (DFUs) have a neuropathic origin with a progressive prevalence rate in developing countries compared with developed countries among diabetes mellitus patients. Diabetic patients that are of greatest risk of ulcers may easily be diagnosed with foot examination. Economic burden may be carefully examined. The budget costing must include both the clinical and social impact of the patients.

Keywords: Diabetic foot ulcers, diabetes mellitus, global health, hyperglycemia

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Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder imparting loss in health and economic burden on patients and healthcare machinery around the globe. As the present world is facing an epidemic of both type 1 and type 2 DM, the International Diabetes Federation (IDF) has focused on the micro and macrovascular complications associated with DM. In 2005, the IDF committed to execute the management approach for diabetic foot diseases.^{1,2} The risk for developing foot ulcers is 25% high in patients with diabetes³ and it is also reported that every 30 seconds, one lower limb amputation in diabetes patients occurred around the world.⁴ The IDF has now become proactive and declared in its mandate that now is the time to increase awareness about the foot complications associated with DM in scenarios of social, personal, clinical and economic costs.⁵

Diabetic foot is a severe complication associated with DM that shows the presentation of deep lesions of tissues intermingled with neurological disorders and peripheral vascular disease of lower limbs.⁶ A previously published study showed that the average annual expenditure of diabetic foot care is US\$8659 per patient.⁷ The total medical cost for the management of diabetic foot disease in the United States (US) ranges from US\$9 to

US\$13 billion in addition to the cost for management of DM alone.⁸ It is estimated in diabetic patients that of all amputations, 85% are contributed by foot ulceration which further deteriorates to chronic infection and severe forms of gangrene.⁹ Ongoing research of prevalence of diabetic foot ulcers (DFUs) around the world does not tell the exact figure, thus a contemporary and comprehensive evaluation along with upgradation of DFU epidemiology is needed in order to provide up-to-date information about the management of diabetes care and the economic burden.

Epidemiology of diabetic foot complication

It is evident that foot care service reduces the amputations in diabetic patients.¹⁰ In the report published on amputations it has been shown that native Americans have higher rate of amputation compared to Madrid population suffering from diabetes.¹¹ Another study conducted prevalence rate of DFUs between developed and developing countries along with European countries.¹² A meta-analysis study published recently showed that the worldwide prevalence rate of DFU was 6.3%.¹³ North America showed the highest prevalence rate of 13.0%¹³ compared with Oceania with prevalence rate of 3.0%.¹³ Africa showed a prevalence rate of 7.2% which is higher than Asia

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(5.5 %).¹³ Europe showed a prevalence rate of 5.1%,¹³ Australia has prevalence rate of 1.5% (130) and Belgium with 16.6%¹³ followed by Canada (14.8%) and USA at 13.0%.¹³ India showed a prevalence rate of 11.6%.¹³

Economic Burden of diabetic foot complications

In addition to the mortality and morbidity associated with DM, foot lesions have adverse consequences on healthcare system and health economics. The cost of DFUs may vary with the interventions used to treat foot ulcers and management approaches. In 2001, the US healthcare system recorded a US\$10.9 billion expenditure towards diabetic foot care management and treatment.¹⁴ In parallel with this, the United Kingdom (UK) estimated expenditure at £3 billion.¹⁴ Moreover, the total annual cost of DFUs was estimated to be £252 million.¹⁵ It is evident that lower limb amputations are preceded by foot ulcers in around 75–85% of cases, commonly in association with chronic infection and severe gangrene. In addition to the direct expenditure towards foot ulcers, there is also indirect expenditure that possibly contributes to loss of productivity, family costs, family status, and loss of quality of life.

In a previously published study related to cost expenditure of DFUs between 1994 and 2000, it has been demonstrated that cost of DFUs devoid of lower limb amputations ranged from US\$993 to US\$17,519.¹⁶ In another study, however, the expenditure of a DFU occurrence in the initial 2 years post diagnosis was US\$30,724.¹⁷ Only the lowest cost in these studies is only evident due to insurance premiums and younger aged patients compared with the highest cost among the deep foot ulcers patients. Moreover, the comparisons of data from different health economics studies are complex due to differences in study design (primary care *versus* secondary care data, prospective *versus* retrospective), patient selection, grade of DFU, healthcare machinery and operation, treatment approaches, analysis time, reimbursement strategies, perspective of the studies and countries involved. In a prospective study performed on Swedish patients with DFUs without amputations until healing of ulcers completely, the most expenses incurred during patient care (37% of total health care costs) and treatment of topical wounds cost 45% of the total budget.¹⁸

In a review related to the costs of lower limb amputations, the range lies between US\$16,488 and US\$66,215 (1998 currency).¹⁸ The cost was found higher in the amputation procedure and its associated nursing and institutional care compared with costs included in the surgical procedure. It showed that for minor lower limb amputation (only at foot level), the cost was US\$43,800, while the major lower limb amputations (above ankle) was US\$66,215.¹⁸ In these studies it was observed that a substantial part of the expenditure was not incurred in the surgeries, but included rehabilitation medicine, nursing homes and internal medicine.¹⁸ The conclusions derived from these studies clearly state that prevention of DFUs and lower limb amputations may be the most effective way to reduce the high cost.

Studies performed in European countries estimated that the direct and indirect expenditure in care for patients suffering from DFUs incurred US\$13,561 annually.¹⁹ Patients in France showed a monthly expenditure of US\$1265 in the healthcare of DFUs.²⁰ Moreover several other studies related to the expenditure system of DFUs held in UK estimated \$7539/patient that results in a total expense of 514 million US dollars annually.²¹ Belgium showed an indirect and direct expenditure of US\$10,572 per ulcer.²² In Sweden, the expenses incurred as a total cost for healing DFUs was estimated around US\$24,965/patient without amputation while they were US\$47,518 and US\$42,858 with amputation with minor and major surgeries respectively.²³ Recently in 2017, the economic burden of DFUs in India showed expenses of US\$1960 for the treatment of DFUs. In the previously published literature of costs of DFU treatment and management, it was demonstrated that DFU patients spent four times (~US\$296) to that of non-DFU patients with DM (~US\$69.91). It is estimated that treatment expenses of neuropathic ulcers (ambulatory care), chronic infected neuropathic foot (ambulatory care), advanced DFUs (care, limb amputation) and neuroischemic foot (bypass) was around US\$56, US\$165, US\$1080, US\$960, US\$2650 and US\$1960, respectively.²⁴

Conclusions

DFUs are commonly occurring complications associated with DM worldwide and their economic consequences are important for the patient, society, families and also for the countries. When assessing the burden of DFUs it is essential to

take into consideration several factors including primary care, nursing, social care, lower limb amputations and healthcare management. These factors precisely give the expenditure incurred in DFU complications. The key questions remain still unsolved; how these expenditures may be reduced along with the morbidity and mortality associated with DFUs. The developing countries should consider this economic burden seriously so that it may not become a national crisis.

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Conflict of interest statement

The authors declare that there is no conflict of interest.

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