



## Estimated costs of treating two standardised diabetes-related foot ulcers of different severity – A comparison of 7 global regions

Ketan Dhatariya<sup>a,b,\*</sup>, Zulfiqarali G. Abbas<sup>c,d,e</sup>, On behalf of the 7 Regions Foot Ulcer Costs Study Group<sup>1</sup>

<sup>a</sup> Elsie Bertram Diabetes Centre, Norfolk & Norwich University Hospitals NHS Foundation Trust, Norwich NR4 7UY, UK

<sup>b</sup> Norwich Medical School, University of East Anglia, Norwich NR4 7TJ, UK

<sup>c</sup> Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania

<sup>d</sup> Abbas Medical Centre, Dar es Salaam, Tanzania

<sup>e</sup> Staffordshire University, Stoke-on-Trent ST4 2DF, UK

### ARTICLE INFO

#### Keywords:

Costs and cost analysis  
Diabetes mellitus  
Foot, Diabetic  
Therapy, Soft tissue  
Foot ulcer, Diabetic

### ABSTRACT

**Aims:** To determine estimated costs to treat two hypothetical diabetes related foot ulcers of differing severity in different World Health Organization regions.

**Methods:** Descriptions of two standardised diabetes related foot ulcers of differing severity were sent to foot teams. Each centre was sent a picture and description of the ulcers, and a series of potential interventions. Respondents were asked to estimate how much each intervention would cost in their centre, and how many times each would be required before the ulcer would heal. These estimated costs were converted to US dollars.

**Results:** Responses were received from 51 centres. Estimated costs for treating each wound were highest in the North America and Caribbean region. The average estimated cost of treating the milder wound was \$2,942, (range \$79–\$17,758). Relative costs compared to those of North America and the Caribbean ranged from 0.36 to 0.75. The average time needed to cover the estimated costs of treating the wound was 8.6 (0.3–62.3) months' salary. The average estimated cost of treating the more severe wound was \$17,403, (\$546–\$67,178). Relative costs ranged from 0.06 to 0.69. The average time needed to cover the estimated costs of treating the wound was 22.7 (0.2–98.3) months' salary.

**Conclusions:** The estimated costs of treating ulcers vary widely across the world.

### 1. Introduction

Diabetes related foot ulcers (DFU) remain a significant cause of morbidity and mortality around the world, with an estimated prevalence of over 20 million people [1–3]. Just under half of those with DFU require hospitalisation for treatment of infection or the effects of peripheral arterial disease, with an estimated 2 million people per year requiring an amputation [2–4]. The annual incidence of DFU globally is estimated to be between 2.5% and 5%, with a lifetime risk of developing a DFU ranging between 15% and 34% in those with diabetes. This translates to hundreds of millions of individuals affected when considering the people with diabetes and their families [1–8]. Beyond the

immediate effect of the individuals' increased risk of complications and subsequent diminished quality of life, there is often also a significant financial burden accompanying DFU.

In 2015 diabetes mellitus (DM) is estimated to have cost the global economy about US\$1.3 trillion [9]. If past trends persist, the same authors estimated the global burden to increase to US\$2.5 trillion by 2030 [9]. In the USA, direct expenditure on DM was estimated at US\$237 billion 2017, with 30% of this being attributed to DFU management [10]. Similarly, it has been calculated that 0.9% of the entire UK National Health Service budget was attributed to DFU management [11]. In developing countries, data on the financial burden of DFU is scarce, despite the reported high prevalence [2,8,12,13]. It is reported that

**Abbreviations:** DM, Diabetes mellitus; DFU, Diabetes related foot ulcer; MENA, Middle East and North Africa; NAC, North America and the Caribbean; SACA, South and Central America; SEA, South-East Asia; WP, Western Pacific.

\* Corresponding author at: Elsie Bertram Diabetes Centre, Norfolk & Norwich University Hospitals NHS Foundation Trust, Norwich NR4 7UY, UK.

E-mail address: [Ketan.dhatariya@nnuh.nhs.uk](mailto:Ketan.dhatariya@nnuh.nhs.uk) (K. Dhatariya).

<sup>1</sup> The investigators and centres are listed at the end of the manuscript.

<https://doi.org/10.1016/j.diabres.2025.112036>

Received 10 September 2024; Received in revised form 29 January 2025; Accepted 3 February 2025

Available online 14 February 2025

0168-8227/© 2025 The Author(s). Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

approximately 6% of the National Health Budget for Barbados was allocated for DFU management [14]. A Brazilian study highlighted the shift for more outpatient care to reduce the financial burden of DFU on the individual and healthcare system [15]. The authors calculated that \$333.5million was spent on outpatient care of DFU compared to \$27.7million for inpatient care. However, these calculations did not represent the entirety of the expenses, because indirect costs were not accounted for [15].

In 2012, Cavanaugh *et al* published findings on the estimated costs of treating DFU in five countries – Chile, China, India, Tanzania, and the USA [16]. Using the 2010 Purchasing Power Parity (PPP) tool published by the world bank to account for the economic differences, the study showed substantial disparities in management strategies, and treatment costs for standardised (hypothetical) ulcers [17]. The World Bank and the *Economist* magazine define purchasing power parity as a way of comparing the price of specific goods in different countries using the absolute costs in that countries' currency. They are the rates of currency conversion that equalise the purchasing power of different currencies by eliminating the differences in price levels between countries. The PPP is the ratio of the cost of good in one economy compared to another economy [18]. The reference value for the current study and for the 2012 study was the costs of treating an ulcer in the USA. In 2012, the relative costs when compared to the USA ranged from markedly low (0.37 in India and Tanzania) to moderately low (0.53 in China) and low (0.71 in Chile) [16]. The objective of the current study was to expand this analysis to all seven World Health Organization (WHO) regions, namely Africa, Europe, Middle East and North Africa (MENA), North America and the Caribbean (NAC), South and Central America (SACA), South-East Asia (SEA), and the Western Pacific (WP). We aimed to evaluate the costs across the world of treating two hypothetical ulcers of different severity.

## 2. Materials and methods

In May of 2023 at the International Symposium for the Diabetic Foot meeting in the Hague, and other subsequent national and international foot meetings delegates were invited to register their interest in the study. Invitations were also sent out via the regular D-Foot International electronic newsletters. Interested centres were sent details on 2 hypothetical ulcers of highly different severity (Table 1, and Supplementary Figures). They were also sent out a list of multiple possible interventions (Table 2). Centres were asked to determine which interventions each wound would need, and how frequently each intervention would be needed at their centre before the wound would heal. Finally, they needed to find out the cost or reimbursement value of each intervention. The estimated costs of treating the wound were then calculated. A currency calculator was included (<https://www.xe.com>), to allow conversion to US dollars for each intervention. The Gross Domestic Product (US dollars per capita) was calculated using data from the International Monetary Fund website (<https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD>). Data were used for 2024 (except Pakistan, where 2023 data were used). The use of these standardised ulcers and interventions was to minimise the uncertainty and variations in analysis.

The data from each region were pooled for comparison. Using the United States as the reference value, we calculated the purchasing power parity of each region. This was the same analysis plan used by Cavanaugh *et al* [16]. We used the Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) guidance for health economic evaluations (given in the supplementary materials) [19]. Patients, or other service recipients, the general public, communities, or stakeholders (including payers) were not included in this exercise on the treatment of hypothetical ulcers.

Clinical Audit & Improvement, and Information Governance Departments of the Norfolk and Norwich University Hospitals NHS Foundation Trust deemed this to be a service improvement exercise and thus

**Table 1**  
The 2 hypothetical scenarios.

	Case 1	Case 2
<b>Age</b>	55 years old	75 years old
<b>BMI</b>	28 Kg/m <sup>2</sup>	40 Kg/m <sup>2</sup>
<b>Sex</b>	Female	Male
<b>Smoker</b>	No	Yes
<b>Site</b>	1st metatarsal head	Heel
<b>HbA<sub>1c</sub></b>	8.5 % (69 mmol/mol)	10 % (86 mmol/mol)
<b>Lesion size</b>	4 cm <sup>2</sup>	20 cm <sup>2</sup>
<b>SINBAD score</b>		
• Site	Forefoot	Midfoot and hindfoot
• Ischaemia	Pedal blood flow intact: at least one pulse palpable	Clinical evidence of reduced pedal blood flow
• Neuropathy	Protective sensation lost	Protective sensation lost
• Bacterial Infection	None	Present
• Area	Ulcer ≥ 1 cm <sup>2</sup>	Ulcer ≥ 1 cm <sup>2</sup>
• Depth	Ulcer confined to skin and subcutaneous tissue = 2/6	Ulcer reaching muscle, tendon or deeper = 6/6
<b>Duration of wound</b>	6 weeks	6 months
<b>Prior ipsilateral amputation</b>	No	Yes – loss of 1st ray
<b>Prior contralateral amputation</b>	No	Yes – previous <i>trans</i> -tibial (below knee) amputation
<b>Renal status</b>	Microalbuminuria – urinary albumin/creatinine ratio 54.7 mg/mmol/l (normal < 3.5)	Renal impairment – urinary albumin/creatinine ratio 354.7 mg/mmol/l (normal < 2.5), creatinine 220 µmol/L (2.49 mg/dL) (normal 45–84 µmol/L, 0.51–0.95 mg/dL)

**Table 2**  
The list of treatment options.

Treatment options	
Out-patient clinic visits	Out-patient debridement
Hospitalization	Operating room debridement
Offloading footwear	Plain x-ray
Total contact cast	MRI scan
Below knee removable walker	CT scan
Dermal replacement	External fixation
Renal consult	Soft tissue flap
Vascular consult	Hyperbaric oxygen
Orthopaedic consult	Trans-tibial amputation
Angioplasty	Prosthesis
Open bypass surgery	Rehabilitation
Oral antibiotics	GP visits / home nurse visits
IV antibiotics	Other (please specify)
Dressings	Other (Please specify)

did not need ethical approval.

## 3. Results

Data were returned from 51 centres: 4 from NAC, 9 from Africa, 11 from Europe, 9 from the MENA, 4 from SACA, 6 from SEA (all from India), and 8 from the WP region.

The estimated costs of treating hypothetical wound 1 and 2, and estimated costs relative to the NAC are shown and Tables 3 and 4.

The average estimated cost of treating wound 1 was \$2,942, ranging from \$79 in Vellore, India to \$17,758 in Greece, with the relative costs compared to those of NAC ranging from 0.36 in SACA to 0.75 in Europe. The average time in months of salary needed to cover the estimated costs of treating the wound was 8.6 months ranging from 0.3 months in Romania to 62.3 months in Egypt.

The average estimated cost of treating wound 2 was \$17,403,

**Table 3**

The estimated costs of treating hypothetical wound 1, and costs relative to the North America and the Caribbean (NAC). Data on average salary from the International Monetary Fund: (<https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD>).

Region	Mean estimated cost of treating wound 1 (\$) (range)	Cost relative to NAC	Average annual salary (\$) (range)*	Average time in months to cover estimated cost (range)
North America and Caribbean	4,606 (640–9,922)	–	55,400 (23,600–85,370)	1.0 (0.3–1.4)
Africa	2,381 (1,125–4,082)	0.52	1,113 (952–1,730)	30.0 (11.1–53.8)
Europe	3,462 (379–17,758)	0.75	25,176 (7,240–52,430)	1.6 (0.3–8.9)
Middle East and North Africa	2,514 (175–16,720)	0.55	3,503 (526–6,360)	10.6 (0.7–62.3)
South and Central America	1,663 (606–3,707)	0.36	13,025 (7,750–17,250)	1.7 (0.5–3.8)
SE Asia	2,763 (79–8,988)	0.60	2,850 (2,850)	12.1 (0.3–39.5)
Western Pacific	3,202 (259–12,690)	0.70	20,466 (4,640–91,730)	2.9 (0.4–11.4)

**Table 4**

The estimated costs of treating hypothetical wound 2, and costs relative to the North America and the Caribbean (NAC). Data on average salary from the International Monetary Fund: (<https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD>).

Region	Mean estimated cost of treating wound 2 (\$) (range)	Cost relative to US	Average annual salary (\$) (range)*	Average time in months to estimated cover cost (range)
North America and Caribbean	41,062 (9,225–38,717)	–	55,400 (23,600–85,370)	7.7 (2.5–13.2)
Africa	2,394 (1,125–4,082)	0.06	1,113 (952–1,730)	30.1 (11.1–53.8)
Europe	16,919 (4,215–50,201)	0.43	25,176 (7,240–52,430)	7.5 (2.7–12.2)
Middle East and North Africa	6,512 (546–18,635)	0.16	3,503 (526–6,360)	23.6 (2.0–56.9)
South and Central America	28,484 (8,604–67,178)	0.69	13,025 (7,750–17,250)	26.9 (6.8–68.5)
SE Asia	7,726 (813–22,367)	0.19	2,850 (2,850)	34.0 (3.6–98.3)
Western Pacific	18,725 (178–56,399)	0.46	20,466 (4,640–91,730)	31.9 (0.2–86.7)

ranging from \$546 in Sudan to \$67,178 in the Dominican Republic, with the relative costs compared to those of NAC ranging from 0.06 in Africa to 0.69 in SACA. The average time in months of salary need to cover the estimated costs of treating the wound was 22.7 months, ranging from 0.2 months in Malaysia to 98.3 months in Chennai, India.

#### 4. Discussion

This worldwide study has shown very large variations in the estimated costs of treating two diabetes related foot ulcers at different end of the severity spectrum. In addition, the very large disparities in average income per head, meant that the time taken to cover the estimated costs of treating each wound (assuming the individual had to pay for their own treatment) varied vastly. North America and the Caribbean remained the most expensive region.

Previous work has look at the estimated costs of DFU, with many (but not all) having largely been from developed nations [20–24]. Data from the United States suggested that just under 50 % of the estimated \$306.6 billion dollars spent in 2022 on medical expenditure attributable to diabetes was related to peripheral arterial disease [10]. There no data comparing costs across the world.

The strengths of our study lie in the global nature of the data collection over a fixed time period. We provided descriptions and images of standardised ulcers. Together, these allowed direct comparisons of estimated costs. In addition, rather than use absolute costs, we used the purchasing power parity to be able to directly compare costs across different countries relative to costs in the United States. This can be likened to the 'Big Mac Index' first established by 'The Economist' magazine in 1986 [18].

We acknowledge that our study has several limitations. We did not involve a health economist. One of the authors (KD) is the co-chair of the EASD Health Services Research and Health Economics Study Group. The analysis presented was done according to their recommendations. Furthermore, our methodology followed the same process as outlined in the 2012 paper by Cavanaugh et al [16]. We relied on centres that

returned data, and thus may not be representative their countries or regions. The rate of reply varied between region, from 4 in NAC, to 11 from Europe. Only Indian centres replied from the SEA region. In addition, these centres are likely to be from those with an interest in diabetes related foot disease. The data presented do not account for the subjectivity of the interventions, or their cost-effectiveness. In addition, our results may have influenced by misunderstandings by those who returned data. To try and minimise this, our initial invitations to take part in this study were sent to all centres / individuals on several mailing lists from the IWGDF and D-Foot International. We worked on the assumption that those who replied had, by the fact they were on a diabetes foot related mailing list, at least a basic knowledge of foot disease. However, we also gave them images, and detailed descriptions of the wounds. Despite their being several evidence-based guidelines on the management of DFU (<https://iwgdfguidelines.org/guidelines-2023/>), we do not know how many of the centres follow them and thus, where practices differ from those recommended, estimated costs may vary. In addition, these data are reliant on the subjective opinions of the investigators who returned data and is thus open to bias. Another factor we have not been able to account for is the level of income of those presenting with DFU. With data suggesting that the development of DFU is dependent to some extent on socio-economic factors this may have had an impact of the likelihood of someone presenting to a specialist clinic, and to decide what treatment they could have or afford. We appreciate that reimbursement varies across countries, with some countries, e.g., the UK, having a health service that is free to all users, being paid for by a general tax (National Insurance). In the United States, some people under the age of 65 years may or may not have some form of health insurance. Those that do, may require a percentage co-pay, but those over 65 years of age have Medicare, where the co-pay contribution may also be different. In other countries, e.g., India, healthcare costs are almost always fully borne by the individual with diabetes, with very few having health insurance. A myriad of other reimbursement methods exists across the world and thus costs may also vary as a result.

Similarly, medical expenses are not only related to the level of medical services, but also related to the national economic development and to the price of drugs and equipment and other factors. We have not taken these into account. Because we did not carry out any further modelling, an estimate of cost effectiveness was not possible.

In summary we have found that the estimated costs of treating diabetes related foot ulcers vary vastly across the world. More work needs to be done to help reduce these variations.

#### **CRedit authorship contribution statement**

**Ketan Dhatriya:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Zulfiqarali G. Abbas:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization.

#### **Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### **Acknowledgements**

We would like to acknowledge all other investigators who participated from different centres in this study as follows according to regions and countries: San Antonio, Texas, USA, Dr. Sunny Sajjad DPM UTHSCSA. San Antonio, Texas, USA. South Dakota, U.S.A. (1). Shahad Murad, NP, Sioux Falls, South Dakota, U.S.A. (2). Anthony Thomas Drazick, BS. Sioux Falls, South Dakota, U.S.A. Teheran, Iran, (1). Prof. Neda Mehrdad, MD. Elderly Health Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. (2). Prof. Mohammad Reza Amini, PhD. Diabetes Research Center-EMRI, Manager of DFRG. Tehran University of Medical Sciences. Atbara, Sudan, Dr. Abdualaziz Abdualmoneim Alsyed Naeim, MBBS. Shendi University, Sudan. Mansoura, Egypt, (1). Prof Omnia State, PhD. Diabetes & Endocrinology Unit, Mansoura University, Mansoura, Egypt. (2). Prof Samer Regal, PhD, Vascular Surgery Department, Mansoura University, Mansoura, Egypt. Vellore, India, Mrs Bharathi Saravanan, Christian Medical college, Vellore, India, Mr Anand Samuel, Christian Medical college, Vellore, India. Mr Arul Thomas, Christian Medical college, Vellore, India. Ahmedabad, India, Dr. Vishal Shah, E-MBA. All India Institute of Diabetes and Research, Ahmedabad, India.

We would like to thank the entire executive board members of D-Foot International (2023-25) Zulfiqarali G. Abbas, Harikrishna K.R. Nair, Vijay Viswanathan, Hermelinda Pedrosa, Mariam Botros, Roberto Anichini, Beata Mrozikiewicz-Rakowska. Executive board members of EASD Economic group and various other experts in the field of diabetes related foot complications for their continued support. We should also like to thank William Jeffcoat, Kristen Van Acker. Finally, we are most grateful to Dr Efstratios Stratos for his help and also the staff at D-Foot International and Abbas Medical Centre in Dar es Salaam for their excellent secretarial assistance.

#### **Availability of data and materials**

The datasets generated and/or analysed during the current study will be made available from the corresponding author on reasonable request, provided appropriate credit is attributed to the original authors and the data source.

#### **Author's contributions**

KD and ZA developed the initial idea for the manuscript. Both authors critically reviewed and revised the manuscript for important

intellectual content. Both authors read, amended, and approved final manuscript. No AI was used in the writing of this manuscript. The authors named in [Appendix 1](#) contributed their costs data from each centre.

#### **Appendix 1**

##### **Co-Authors, Highest Degree, and Affiliations:**

List of contributing authors and centres of 7 Regions Foot Ulcer Costs Study Group.

We will proceed with the name of the regions, followed by the countries and name of the authors, in the following order:

##### **African Region:**

##### **(1). Dar es Salaam, Tanzania**

Raidah R. Gangji, MD

Hubert Kairuki Memorial University, Dar es Salaam, Tanzania,

Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania.

##### **(2). Kampala, Uganda**

(1). Deus Kabugo, FCP

Mengo Hospital, Kampala, Uganda

(2). William Lumu, PhD

Mengo Hospital, Uganda Diabetic Association

Kampala, Uganda

##### **(3). Abuja, Nigeria**

(1). Prof. Felicia O. Anumah, FRCP

University of Abuja, Abuja, Nigeria

(2). Dr. Amina I. Abubakar, FWACS

University of Abuja, Abuja, Nigeria

##### **(4). Koudougou, Burkina Faso**

Dr. Ella M. K. Saloukou, MD,

Regional Hospital of Koudougou, Burkina Faso.

##### **(5). Tenkodogo, Burkina Faso**

(1). Dr. Daniel Zemba, MD, Regional Hospital of Tenkodogo, Burkina Faso.

(2). Dr. Gael U. Zio, MD, Regional Hospital of Tenkodogo, Burkina Faso.

##### **(6). Ziniaré, Burkina Faso**

(1). Dr. Solo Traoré, MD, Regional Hospital of Ziniaré, Burkina Faso.

##### **(7). Ouagadougou, Burkina Faso**

(1). Dr. Lassina Sere, MD

Tengandogo University Hospital, Ouagadougou, Burkina Faso.

(2). Dr. Seydou Bengaly, MD

Tengandogo University Hospital, Ouagadougou, Burkina Faso.

##### **(8). Bobo-Dioulasso, Burkina Faso**

(1). Yempabou Sagna, MD, Higher Institute of Health Sciences, Nazi BONI University, Bobo-Dioulasso, Burkina Faso.

(2). Nab Somé, MD,

Sourou Sanou University Hospital, Bobo-Dioulasso, Burkina Faso.

##### **(9). Ouagadougou, Burkina Faso**

(1). Dr. Aline Patricia P. Yaméogo/Tondé, MD.

Yalgado Ouedraogo University Hospital, Ouagadougou, Burkina Faso.

(2). Dr. Brice A. Bandre, MD.

Yalgado Ouedraogo University Hospital, Ouagadougou, Burkina Faso.

#### South and Central America Region:

##### (10). Mexico City, Mexico:

(1). Sergio Hernandez-Jimenez, M.D.  
Centro de Atención Integral Del Paciente Con Diabetes (CAIPaDi),  
Instituto Nacional de Ciencias Medicas y Nutricion Salvador  
Zubiran, Mexico City, Mexico.

(2). Gabrriela Garza-Garcia, M.D.  
Instituto Nacional de Ciencias Medicas y Nutricion Salvador  
Zubiran, Mexico City, Mexico.

##### (11). Lima, Perú

(1). Marlon Yovera-Aldana, MSc  
Grupo de Investigación en Neurciencia, Metabolismo, Efectividad  
Clínica y Sanitaria, Universidad Científica del Sur, Lima, Perú

(2). Delia Cruz-Estacio, MD  
Maria Auxiliadora Hospital, Lima, Perú

##### (12). Santo Domingo, Dominican Republic

Nalini Campillo-Vilorio, MD  
Department of Diabetology, Diabetic Foot Unit, Endocrinology Ser-  
vice, Plaza de la Salud General Hospital, Santo Domingo, Dominican  
Republic

##### (13). San José, Costa Rica

(1). Gerardo Víquez-Molina, MD  
Hospital San Juan de Dios, San José, Costa Rica.

(2). Javier Aragón-Sánchez, PhD  
Hospital San Juan de Dios, San José, Costa Rica.

#### North America and Caribbean Region:

##### (14). St. Michael, Barbados, Caribbean

Simone McConnie, RCPS  
Comfeet Foot Care Clinic, St. Michael Barbados

##### (15). San Antonio, Texas, USA

(1). Cyaandi Dove, DPM  
UTHSCSA, San Antonio, Texas, USA.

(2). Lee Rogers, DPM  
UTHSCSA, San Antonio, TX, USA.

##### (16). South Dakota, USA

(1). Alan Yong Yan, MD,  
Sioux Falls, South Dakota, USA

(2). Adam Nichols, DPM,  
Sioux Falls, South Dakota, USA

##### (17). The Bahamas

Dr. Monique K. Mitchell, MPH  
Ministry of Health & Wellness/Family Foot Centre  
Nassau, New Providence, The Bahamas

#### Middle East and North Africa Region

##### (18). Mansoura, Egypt:

(1). Prof. Hanan Gawish, PhD  
Diabetes and Endocrinology Unit, Mansoura University  
Mansoura, Egypt

(2). Prof. Manal Tarshoby, PhD  
Diabetes and Endocrinology Unit, Mansoura University  
Mansoura, Egypt

##### (19). Karachi, Pakistan:

(1). Prof. Zahid Miyan, MD  
Baqai Institute of Diabetology and Endocrinology (BIDE)  
Karachi, Pakistan

(2). Dr. Riaz Memon, MD  
Baqai Institute of Diabetology and Endocrinology (BIDE)  
Karachi, Pakistan

##### (20). Tehran, Iran:

(1). Dr. Mohammad Reza Amini, PhD  
Diabetes Research Centre, Endocrinology and Metabolism Clinical  
Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran

(2). Dr. Mohammad Reza Mohajeri Tehrani, MD,  
Endocrinology and Metabolism Research Centre, Endocrinology and  
Metabolism Clinical Sciences Institute, Tehran University of Medical  
Sciences, Tehran, Iran

##### (21). Mahdia, Tunisia:

(1). Prof. Baha Zantour, MD  
Department of endocrinology and internal medicine. Tahar Sfar  
Hospital. Mahdia, Tunisia

(2). Prof. Fatma Larbi Ammari, MD  
Department of endocrinology and internal medicine. Tahar Sfar  
Hospital. Mahdia, Tunisia

##### (22). Atbara, Sudan:

(1). Prof. Mohamed Elmakki Ahmed, FRCSI  
University of Khartoum and Karamala Diabetic Centre, Atbara,  
Sudan(2). Dr. Ahmed Awadelkareem Omer Mahmoud, MBBS  
Karamala Diabetic Centre, Atbara, Sudan

##### (23). Cairo, Egypt:

(1). Prof. Mohamed Ibrahim Sharkawy, MD  
Cairo University, Cairo, Egypt.

(2). Dr. Ihab Nabil Amin Hanna, MD  
National Institute of Diabetes and Endocrinology, Cairo, Egypt.

##### (24). Tripoli, Libiya:

Dr. Adel Khalifa Salama, LBMS  
Abuslim Trauma Hospital, Tripoli, Libya

#### Europe Region

##### (25). Norwich, UK

Dr Efstratios Stratos  
Norfolk and Norwich University Hospitals, Norwich, UK

##### (26). Alexandroupolis, Greece

Prof. Nikolaos Papanas, PhD  
Diabetes Centre-Diabetic Foot Clinic, Second Department of Internal  
Medicine, Democritus University of Thrace, University Hospital of  
Alexandroupolis, Greece.

##### (27). Prague, Czech Republic

(1). Vladimíra Fejfarová, PhD  
Diabetes Centre, Institute for Clinical and Experimental Medicine,  
Prague, and Department of Internal Medicine, Second Faculty of Medi-  
cine, Charles University, Prague, Czech Republic

(2). Miroslav Koliba, PhD,

Department of Internal Medicine and Cardiology, University Hospi-  
tal Ostrava and Ostrava University Faculty of Medicine, 17. listopadu  
1790, 708 52 Ostrava, Czech Republic

##### (28). Sofia, Bulgaria

(1). Prof. Tsvetalina Tankova, PhD  
Department of Endocrinology, Medical University, Sofia, Bulgaria.

(2). Ani Todorova, PhD  
Department of Endocrinology, Medical University, Sofia, Bulgaria.

##### (29). Minsk Belarus

(1). Hanna Bliznets, MD  
Minsk City Clinical Endocrinology Centre, Minsk, Belarus

(2). Inesa Pukita, MD  
Minsk City Clinical Endocrinology Centre, Minsk, Belarus

##### (30). Moscow, Russia

Prof. Irina V. Gurieva, PhD  
Head of the Department of Endocrinology, Federal Bureau of Medical  
and Social Expertise, Department of Endocrinology, Russian Medical  
Academy of Continuous Professional Education, Moscow, Russia

##### (31). St. Petersburg, Russia

(1). Vadim Bregovsky, PhD  
St. Petersburg Regional Centre of Endocrinology  
Out-patient Diabetic foot department, endocrinologist, St. Peters-  
burg, Russia

(2). Anastasia Demina, PhD  
St. Petersburg Regional Centre of Endocrinology



Out-patient Diabetic foot department, endocrinologist, St. Petersburg, Russia

**(32). Cluj-Napoca, Romania**

(1). Norina Alinta Gavan, PhD

Worwag Pharma Romania, Cluj-Napoca, Romania.

(2). Prof. Cornelia Gabriela Bala

Iuliu Hatieganu University of Medicine and Pharmacy, Department of Diabetes and Nutrition; Emergency County Hospital Cluj Napoca, Romania.

**(33). Bucharest, Romania**

Dr. Eduard Lucian Catrina, PhD

Carol Davila University of Medicine and Pharmacy, I. Cantacuzino Hospital

Bucharest, Romania.

**(34). Cluj-Napoca, Romania**

(1). Dr. Paula Pavel, PhD

Clinical Military Emergency Hospital, Cluj-Napoca, Romania.

(2). Dr. Adrian Pavel,

Clinical Military Emergency Hospital, Cluj-Napoca, Romania

**(35). Pordenone, Italy**

Dr. Cesare Miranda. Coordinator of the Italian Diabetic Foot Study Group

Department of Internal Medicine, Clinic of Endocrinology and Metabolism Diseases,

Pordenone, Italy

**(36). Monfalcone, Italy**

Roberto da Ros, MD

Director of Diabetes and Centre for Diabetic Foot Treatment, Asugi, Monfalcone, Italy

**South East Asia Region**

**(37). Vellore, India:**

(1). Prof. Felix K. Jebasingh, MD

Department of Endocrinology, Diabetes, and Metabolism, Christian Medical College.

Vellore, India

(2). Prof. Niall Thomas, PhD

Department of Endocrinology, Diabetes, and Metabolism, Christian Medical College, Vellore, India

**(38). Bengaluru, India**

Dr. Aravinda Jagadeesha, FRCP

Dr. Aravind's Diabetes Centre, Basaveshwaranagar, Bengaluru, India

**(39). Ahmedabad, India**

(1). Dr. Yash Patel, PhD

Swasthya Diabetes Care, Ahmedabad, India

(2). Dr. Mayur Patel, PhD

All India Institute of Diabetes and Research (AIIDR), Ahmedabad, India

**(40). Chennai, India**

Dr. Rajesh Kesavan, M.S.

Dr.RK Diabetic Foot and Podiatry Institute, Chennai, India

**(41). Mumbai, India**

(1). Dr. Milind Ruke, MS

Advance Diabetic Foot & Wound Clinic, Mumbai, India

(2). Dr. Iffat Siddiqui, BUMS

Advance Diabetic Foot & Wound Clinic, Mumbai, India

**(42). Mumbai, India**

Dr. Arun Bal, PhD

Director, Diabetic Foot Services, Raheja Fortis Hospital,

Mumbai, India

**Western Pacific Region**

**(43). Kuala Lumpur, Malaysia**

Prof. Harikrishna K.R.Nair, PHD

Wound Care Unit, Kuala Lumpur Hospital

Kuala Lumpur, Malaysia

**(44). Perak, Malaysia**

Dr. Khairina Binti Kamaruddin, MD

Wound Care Unit Klinik Kesihatan Kampar,

Perak, Malaysia.

**(45). Johor, Malaysia**

(1). Jeremiah Joseph John Henry, M.D.,

Hospital Sultanah Aminah, Ministry of Health Malaysia

Johor Bahru, Johor, and Malaysia

(2). Vimal Nambiar Viswanathan, MBBS

Hospital Sultanah Aminah, Ministry of Health Malaysia

Johor Bahru, Johor, and Malaysia

**(46). Ulaanbaatar, Mongolian**

(1). Prof. Sainbileg Sonomtseren, MD

Department of Endocrinology, School of Medicine, Health Sciences University of Mongolia, Ulaanbaatar, Mongolia

(2). Dr. Telmen Boldbaatar, MD

Diabetic Foot Clinic, Endomed Hospital, Ulaanbaatar, Mongolia

**(47). Hanoi, Vietnam**

(1). Prof. Dinh Tung Do, PhD

Hanoi Saint Paul General Hospital, Hanoi, Vietnam

(2). Prof. Do Dinh Tung, Ph.D.

Hanoi Saint Paul General Hospital, Hanoi, Vietnam

**(48). Singapore**

(1). Dr. Loh Zhi Wen, MRCP (UK)

Department of Endocrinology, Tan Tock Seng Hospital, Singapore

(2). Yong Enming, MMed

Vascular Surgery Unit, Department of General Surgery, Tan Tock Seng Hospital

Singapore

**(49). Beijing, China**

(1). Prof. Lei Gao, MD

Beijing Shijitan Hospital, Affiliated Capital Medical University, Orthopaedics Department

(2). Prof. Jiangning Wang, MD

Beijing Shijitan Hospital, Affiliated Capital Medical University, Orthopaedics Department

**(50). Beijing, China**

(1). Prof. Aihong Wang, PhD

Department of Endocrinology, Ninth Medical Centre of Chinese PLA General, No. 9 Anxiang North Road, Chaoyang District, Beijing, 100101, China.

(2). Prof. Zhangrong Xu, MD

Department of Endocrinology, Ninth Medical Centre of Chinese PLA General, No.9 Anxiang North Road, Chaoyang District, Beijing, 100101, China.

**(51). Bangkok, Thailand**

(1). Assoc. Prof. Gulapar Srisawasdi, M.D.

Sirindhorn School of Prosthetics and Orthotics, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand

(2). Mrs. Rattana Pianchareonsin, MON

Department of Nursing, Siriraj Hospital, Mahidol University, Bangkok, Thailand

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.diabres.2025.112036>.

**References**

- [1] Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF diabetes Atlas: global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract* 2022;183:109119.

- [2] Abbas ZG, Boulton AJ. Diabetic foot ulcer disease in African Continent: 'From clinical care to implementation' - review of diabetic foot in last 60 years - 1960 to 2020. *Diabetes Res Clin Pract* 2022;183:109155.
- [3] Zhang Y, Lazzarini PA, McPhail SM, van Netten JJ, Armstrong DG, Pacella RE. Global disability burdens of diabetes-related lower-extremity complications in 1990 and 2016. *Diabetes Care* 2020;43:964–74.
- [4] Lazzarini PA, Pacella RE, Armstrong DG, van Netten JJ. Diabetes-related lower-extremity complications are a leading cause of the global burden of disability. *Diabet Med* 2018;35:1297–9.
- [5] Armstrong DG, Boulton AJ, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med* 2017;376:2367–75.
- [6] Lu Q, Wang J, Wei X, Wang G, Xu Y, Lu Z, et al. Cost of diabetic foot ulcer management in China: a 7-year single-center retrospective review. *Diabet Metabol Syndrom Obes* 2020;13:4249–60.
- [7] Waibel FW, Uçkay I, Soldevila-Boixader L, Sydler C, Gariani K. Current knowledge of morbidities and direct costs related to diabetic foot disorders: a literature review. *Front Endocrinol (Lausanne)* 2023;14:1323315.
- [8] Salad AM, Duale HA, Sheikh IM, Hassan GD, Farah AA, Gele A. Prevalence of diabetes foot ulcers and associated factors among adult diabetic patients in three referral hospitals in Mogadishu, Somalia. *Front Public Health* 2023;11:1195483.
- [9] Bommer C, Sagalova V, Heesemann E, Manne-Goehler J, Atun R, Barnighausen T, et al. Global economic burden of diabetes in adults: projections from 2015 to 2030. *Diabetes Care* 2018;41:963–70.
- [10] Armstrong DG, Swerdlow MA, Armstrong AA, Conte MS, Padula WV, Bus SA. Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer. *J Foot Ankle Res* 2020;13:16.
- [11] Kerr M, Barron E, Chadwick P, Evans T, Kong WM, Rayman G, et al. The cost of diabetic foot ulcers and amputations to the National Health Service in England. *Diabet Med* 2019;36:995–1002.
- [12] Khan MI, Azhar U, Zubair F, Khan ZA. Can we link foot ulcer with risk factors in diabetics? A study in a tertiary care hospital. *Pak J Med Sci* 2018;34:1375–80.
- [13] Abbas ZG. Managing the diabetic foot in resource-poor settings: challenges and solutions. *Chronic Wound Care Manage Res* 2017;4:135–42.
- [14] Greenidge AR, Quimby KR, Rose AM, Speede A, Hambleton IR, Anderson SG, et al. Direct healthcare services cost of non-healing diabetic foot wounds in an African origin population in Barbados. *Diabet Med* 2022;39:e14773.
- [15] Toscano CM, Sugita TH, Rosa MQ, Pedrosa HC, Rosa RD, Bahia LR. Annual direct medical costs of diabetic foot disease in Brazil: a cost of illness study. *Int J Environ Res Public Health* 2018;15:89.
- [16] Cavanagh P, Attinger C, Abbas Z, Bal A, Rojas N, Xu ZR. Cost of treating diabetic foot ulcers in five different countries. *Diabetes Metab Res Rev* 2012;28:107–11.
- [17] PPP conversion factor, GDP (LCU per international \$) [article online], 2024. Available from <https://data.worldbank.org/indicator/PA.NUS.PPP>.
- [18] Anonymous. On the hamburger standard. *The Economist* 1986;300:119.
- [19] Huserreau D, Drummond M, Augustovski F, de Bekker-Grob E, Briggs AH, Carswell C, et al. Consolidated health economic evaluation reporting standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. *BMJ* 2022;376:e067975.
- [20] Hunt NA, Liu GT, Lavery LA. The economics of limb salvage in diabetes. *Plast Reconstr Surg* 2011;127:289S–S295.
- [21] van Houtum WH, Lavery LA, Harkless LB. The costs of diabetes-related lower extremity amputations in the Netherlands. *Diabet Med* 1995;12:777–81.
- [22] Apelqvist J, Ragnarson-Tennvall G, Larsson J, Persson U. Long-term costs for foot ulcers in diabetic patients in a multidisciplinary setting. *Foot Ankle Int* 1995;16:388–94.
- [23] Driver VR, Fabbi M, Lavery LA, Gibbons G. The costs of diabetic foot: the economic case for the limb salvage team. *J Am Podiatr Med Assoc* 2010;100:335–41.
- [24] Prompers L, Huijberts M, Schaper N, Apelqvist J, Bakker K, Edmonds M, Holstein P, Jude EB, Jirkovska A, Mauricio D, Piaggese A, Reike H, Spraul M, Van Acker K, Van Baal S, Van merode F, Ucciolo L, Urbancic V, Tennvall GR. Resource utilisation and costs associated with the treatment of diabetic foot ulcers. Prospective data from the Eurodiale Study. *Diabetologia* 2008;51:1826–1834.