

A report of 12 months' of data collected from a diabetic foot clinic at a public hospital in Phnom Penh, Cambodia

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Key words

- Demographic data
- Diabetic foot ulceration
- Resource-poor setting
- Review of services

Article points

1. The Kingdom of Cambodia is developing fast yet is struggling to meet healthcare and educational goals.
2. Data regarding the prevalence of diabetes and diabetic foot ulceration in Cambodia are lacking.
3. Data were gathered from the main diabetes hospital in Phnom Penh and analysed to measure services.
4. Concern is raised regarding the lack of pressure redistribution available and the number of patients lost to follow-up.
5. Recommendations for further development of diabetic foot services in Cambodia are given.

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This report interprets data gathered from a diabetic foot ulcer clinic in an outpatient department of a public hospital in Phnom Penh, Cambodia. The data were gathered between September 2019 and August 2020 and were entered into a Microsoft Excel™ spreadsheet. It gives basic demographic information of Cambodian patients with diabetic foot ulceration and provides data that can be used to measure any future research or audit. The data collection timeframe included the COVID-19 pandemic and the uncertainty of the period between April and May 2020 (Figure 1). The key data are discussed and recommendations are made for the further development of diabetic foot services in this resource-poor setting.

The Kingdom of Cambodia has made significant economic improvements over the past two decades and was recently classified as a lower middle-income country (LMIC) by the World Bank; however, Cambodia continues to struggle to meet its health and education goals (The World Bank, 2020). Government spending on diabetes was \$2.7million (USD) in 2016 and the out-of-pocket expenditure as a percentage of common health expenditure is 60.4%, the highest in the region (World Health Organization, 2018).

The true extent of diabetes is unknown, however, the International Diabetes Federation (IDF) estimate the age-adjusted prevalence at 6.3% of the population (IDF, 2019). Given that the adult population of Cambodia is estimated at 11.8 million (Central Intelligence Agency, 2020); the potential prevalence of diabetes can be calculated at 743,400 of the population. The first ever Global Disability Burdens of Diabetes-Related Lower-Extremity Complications were recently published, analysing data from 1990 and 2016 (Zhang et al, 2020). This study estimates that in 2016 there was an incidence of 22,825 diabetes-related foot ulcers in Cambodia (with a 95% confidence that the actual figure is between 18,022 and 28,617) a significant increase

from an estimated 7,637 diabetes-related foot ulcers in 1990. The study also highlights an estimated amputation rate in 2016 of 4,241; suggesting that 18.6% of diabetes-related foot ulcers result in amputation at some level (Zhang et al, 2020).

Audit of services is an important tool to measure and improve standards of care (Leese and Stang, 2016; Jeffcoate et al, 2018); up until this point, there has been no known published data regarding diabetic foot ulceration in Cambodia.

Overview

Between September 2019 and August 2020 clinicians treated 79 patients (68 of whom were new patients) with a total of 95 diabetic foot ulcers (DFUs) in the outpatient clinic resulting in 322 DFU treatments in 12 months. These figures are broadly similar to data collected between 2018 and 2019 (Table 1). Patients are referred from the doctor's routine diabetes clinic if they have a DFU or display any other evidence of diabetic foot disease. If they have an ongoing DFU, they are advised to return to the diabetic foot clinic every week (or as often as required) until the DFU is healed.

If the estimated data of 22,825 DFU in Cambodia in 2016 are applied, then only 0.4% of potential

Table 1. Comparison of 2 years pertinent data.

	2018-2019	2019-2020
Number of patients	94	79
Total number of DFU treated	99	95
Total number of dressing appointments provided in 12 months	328	322
Average patient age	61.1 (31-86)	59.6 (35-78)
Gender (female)	52 (55%)	37 (47%)
Diabetes Type 2 (%)	97.3	98.6
Number of patients who only attend one appointment	62 (58.3%)	47 (69.1%)
Percentage of DFU with pressure redistribution (%)	3.1	4.2
Number of DFU infected at presentation	37 (37.3%)	29 (30.5%)
Average time from DFU developing until presentation (weeks)	7.4	5.6
Percentage of DFU healed (in remission) (%)	9.1	20.2

Table 2. SINBAD classification (From August 2020 — the last month of data collection).

SINBAD Score (0-6)	0	1	2	3	4	5	6
Number of patients	1 (9%)	0	2 (18%)	4 (36%)	4 (36%)	0	0

Total patients 11

Table 3. University of Texas classification.

Stage	Grade 0 Pre- or post-ulcerative lesion	Grade 1 Pre- or post-ulcerative lesion	Grade 2 Ulcer penetration to tendon or capsule	Grade 3 Ulcer penetrating to bone or joint
A No infection or ischaemia	6 (6.3%)	50 (52.6%)	2 (2.1%)	0
B Infection	0	9 (9.5%)	9 (9.5%)	7 (7.4%)
C Ischaemia	0	2 (2.1%)	0	0
D Infection and ischaemia	0	2 (2.1%)	0	2 (2.1%)

DFUs are being treated at the diabetic foot clinic. Realistically, the total number of DFUs in Cambodia would have increased since 2016; therefore, the percentage of DFUs treated would be significantly less. As the diabetic centre is one of a handful of specialist diabetes clinics in Cambodia, the data are concerning.

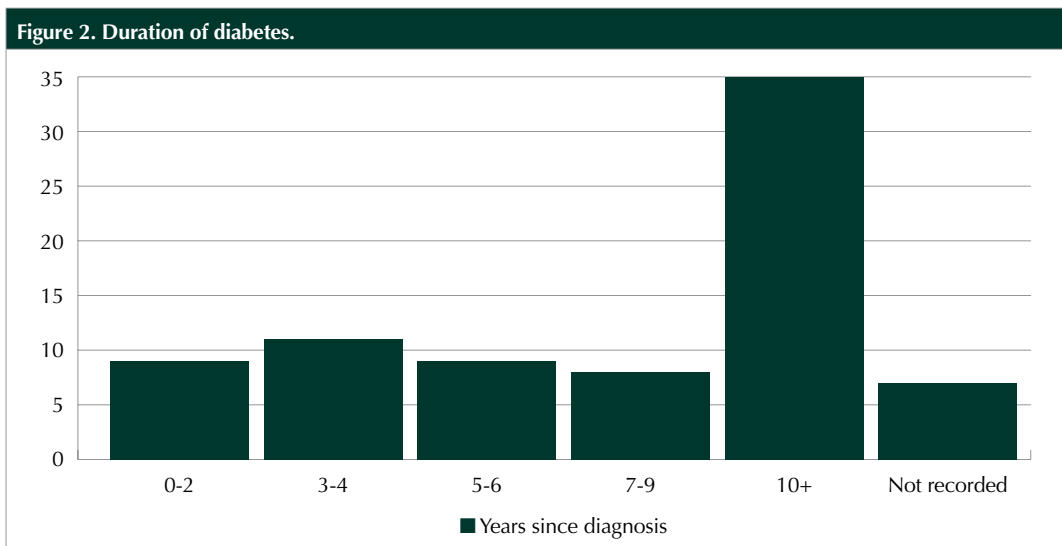
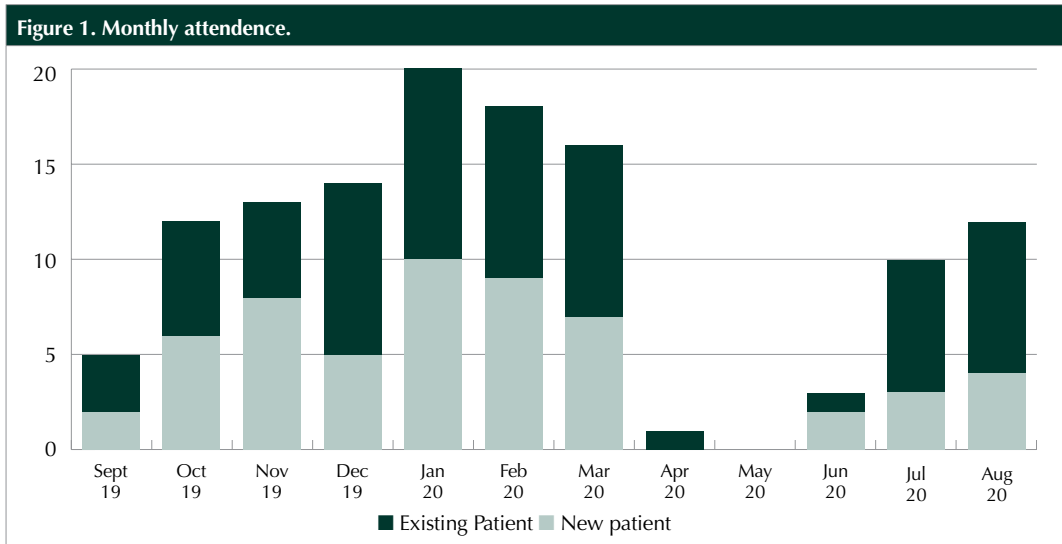
The number of patients who only attend for one appointment at the diabetes clinic has risen from 58.3% in 2018–2019 to 69.1% in 2019–2020 (Table 1). This is a concern as it is unknown where these patients receive treatment for their complex DFU. This highlights the importance of structured high-quality patient information and education so that patients with a DFU will consider their DFU a priority and not a problem that can be ignored.

Diabetes type

The majority of patients recorded (98.6%, $n=79$) have type 2 diabetes. This is similar to previous data from Cambodia (Raguenaud et al, 2009) and is higher than the estimated worldwide demographic data, which suggests 90% of patients with diabetes are type 2 (IDF, 2019). Global estimations of type 2 patients with DFU are 94.3% (Zhang et al, 2017).

Duration of diabetes

A total of 48.6% of patients recorded have had diabetes 10 years or longer, which significantly increases their risk of neuropathy alongside other associated complications that delay wound healing, such as peripheral vascular disease and nephropathy (Young et al, 1993) (Figure 2). It is also important



to note that many patients in Cambodia are slow to present with symptoms of diabetes and may have had undiagnosed diabetes for several years. In one study, two-thirds of patients were undiagnosed at presentation (King et al, 2005). Undiagnosed diabetes will still result in the development of complications as many patients will have developed macro- and microvascular complications at an earlier stage.

Area of wound on presentation

Fifty-nine (60.8%) of recorded wounds are less than 300mm² in area on presentation at the first appointment; this again is comparable to results from the previous 2018–2019 report (58.4%) (Table 1). It is known that ulcer size, duration and severity is a

predictor of outcomes (Oyibo et al, 2001; Margolis et al, 2002); therefore, the smaller nature of the majority of DFUs should heal quickly.

A total of 20.2% of all DFUs treated achieved full-thickness healing (remission) within the data collection timeframe. This is an improvement on 9.1% from the previous 2018–2019 report (Table 1).

Location of wound

The vast majority (42.6%) of recorded wounds are on the hallux and lesser digits; this is similar to other published data (Haji Zane et al, 2014; Ambegoda et al, 2015). An explanation may be due to the ‘unshod’ habitual nature of patients with diabetes in Cambodia leading to trauma of the distal extremities of the foot (Jayasinghe et al, 2007).

Figure 3. Area of Wound (mm²).

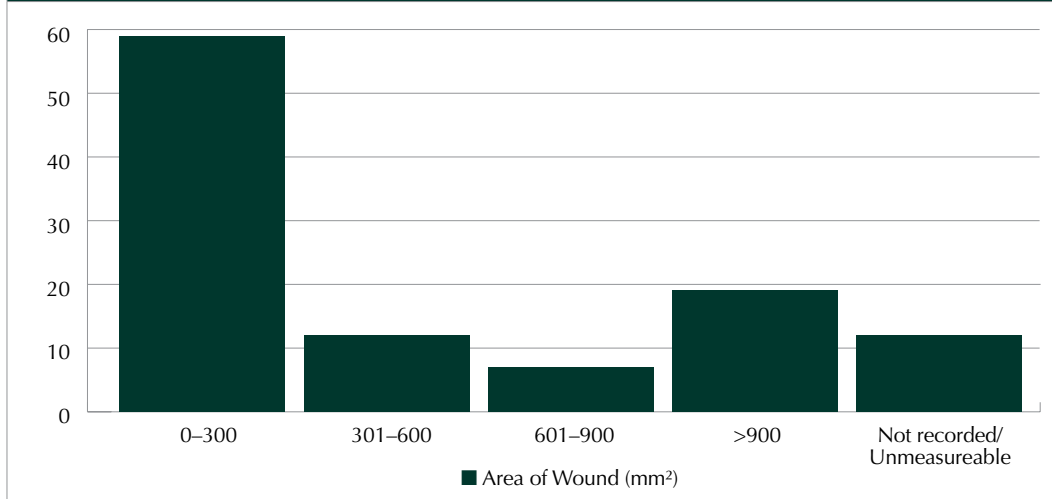
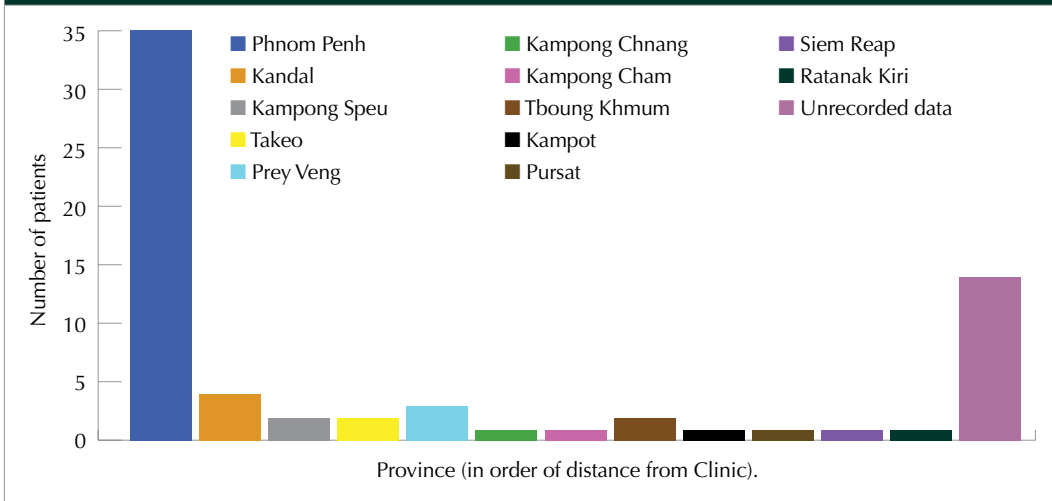


Figure 4. Current Location of patients.



The challenges of protecting the foot within a full shoe are mostly cultural due to the practice of removing footwear in the home and in many social situations. Footwear choice is often in unsupportive 'flip flop' or 'thong' style sandals, which are beneficial in the tropical climate of Cambodia, but offer no protection for the insensate foot. Therefore, patients with one or more risk factors of ulceration should be advised to wear a supportive 'running shoe' with laces, which will provide adequate protection and cushioning as identified in the Scottish National Diabetes Management Guidelines in point 11.4 (SIGN, 2010).

Monthly attendance rates

The drop in patient attendance in April-June can

be explained by the uncertainty of the Covid-19 Pandemic (*Figure 1*). At this time; the Royal Government of Cambodia closed the borders to ensure low infection rates of COVID-19 in Cambodia. The diabetic foot clinic was still open, but many patients were reluctant to attend due to fear of gathering in large groups. The principal clinician was also advised by his NGO not to attend the hospital for the period of April and May. The detected numbers of COVID-19 were relatively low at this point with only 274 cases and 1 fatality up to the end of August 2020 (WHO, 2020).

The worldwide response to providing care for vulnerable patients with DFUs during this global pandemic has been reported widely with many countries using 'telemedicine' to provide advice for

stable DFUs (D-Foot International, 2020a; Diabetes Feet Australia, 2020). Unfortunately, at present this is not an option here in Cambodia; however, a new computerised record system has recently been introduced to the diabetes department, this could be adapted to include DFU treatment and methods to consult patients via telemedicine in the future.

Distance from diabetic foot clinic

Unsurprisingly, the majority of patients recorded live in Phnom Penh (64.8%) followed by Kandal, the adjacent province to Phnom Penh (7.4%) (*Figure 4*). This fits with data shown by Nang et al (2019) emphasising that distance from the specialist centre is a contributing factor in patients not attending. This further highlights the need for provincial healthcare providers to be upskilled in their care of DFU so that patients can receive quality wound care without the need to travel long distances.

Pressure redistribution

Pressure redistribution devices have been used on only 4.2% DFUs at the diabetic foot clinic. Given the wealth of data that advocates the proven use of pressure redistribution devices in aiding DFUs to heal (Bus et al, 2020), this is disappointing. For patients with a plantar DFU that would benefit from a pressure redistribution device, information is given on where patients can purchase suitable pressure redistribution devices. However, these devices are often prohibitively expensive and need to be brought to the diabetic foot clinic for instruction on how to fit and only two (2.5%) patients have followed this clinical advice.

A recent case report highlighted an unusual patient-led pressure redistribution device that was used in Cambodia; however, unfortunately the patient stopped attending and the effectiveness of the device has not been further evaluated (Hunt, 2020).

Efforts have been made to build a working relationship between the diabetic foot clinic and the Department of Prosthetics and Orthotics, but unfortunately this has not yet been established.

Ulcer classification

University of Texas grading at first presentation

The University of Texas (UOT) grading tool is used for grading the severity of diabetic foot disease

and can be used to predict the likelihood of DFUs achieving remission (Armstrong et al, 1998). The majority of wounds are superficial or pre/post ulcerative, 69 (72.6%); this would suggest that, similar to surface area data (where 60.8% are less than 300mm²) the wounds should be simple and quick to heal. However, only 20.2% of DFUs did result in full-thickness healing (remission; *Table 3*). Although this is an improvement on the previous year, significant improvements can still be made (*Table 1*).

Twenty-nine (30.5%) of the wounds are infected at presentation and nine (9.5%) penetrate to tendon/capsule or bone/joint. This is an improvement on the previous year's data (*Table 1*), which is surprising as the uncertainty of the COVID-19 pandemic and the potential fear of attending a hospital appointment appears to have increased the time from DFU starting until presentation (mean 5.6 weeks/mode 4 weeks/minimum 1 week/maximum 180 weeks). Further barriers to attending for diabetes care in Cambodia have shown to be financial, geographical and a lack of knowledge and skills (Nang et al, 2019).

SINBAD ulcer classification system

In line with the International Working Group on the Diabetic Foot (IWGDF) 2019 guidelines on the prevention and management of diabetic foot disease, in August 2020 the SINBAD ulcer classification system was recorded; this is the preferred international method of communicating DFU characteristics between clinical staff due to its ease of use, reliability and no need for specialist clinical equipment (Ince et al, 2008; Monteiro-Soares et al, 2020).

As this change occurred towards the end of the data collection time period, only 11 patients were recorded. The classification system considers site, ischaemia, neuropathy, bacterial load, area and depth and gives each category a value. The higher the score, the more severe the DFU and resulting in a reduced likelihood of healing (*Table 2*).

Comparing current data with previous year's report

As shown in *Table 1*, the data from the previous 2 years is broadly similar despite the effects of the COVID-19 pandemic. For true accuracy, the data

collection should have been gathered from the same time period (i.e., April–March), but the principal clinician was not resident in Cambodia for part of this time.

There are five changes in the data of interest. Firstly, the increase in the number of male-gender attending for treatment of their DFU. This is inline with data that states that male-gender is a risk factor for DFU (Banik et al, 2020), but the change cannot be explained. Secondly, patients only attending for one appointment has increased; this can be explained by the effects of the COVID-19 pandemic and patients not wanting to attend hospital waiting areas. Two factors that cannot be explained by the effects of the COVID-19 pandemic are the reduction in the numbers of DFU infected at presentation and the reduction in the average waiting time from DFU developing to presentation. Finally, it is encouraging to see that the number of healed DFUs (or DFUs in remission) has increased from the previous years' data collection.

Issues that continue to be of concern are the low number of patients that are treated with a pressure redistribution device and the high number of patients that will only attend for one appointment at the diabetic foot clinic.

Conclusion and recommendations

This report is the first known to give demographic details of patients with diabetic foot ulceration in the Kingdom of Cambodia. The data collected are only a small fraction (>0.4%) of the potential number of DFUs in Cambodia; however, it does allow for some analysis, which can be helpful in the future planning of services here.

Although published clinical guidelines for the treatment of diabetes covering treating diabetic foot disease are available, they lack detail and only cover basic aspects of DFU management (Ministry of Health, 2015). Work is ongoing on specific Cambodian National Diabetes Footcare Guidelines and it is hoped that these will mirror the IWGDF 2019 Guidelines on the prevention and management of diabetic foot disease as closely as possible (Van Netten et al, 2020). In partnership with the IWGDF, D-Foot International have produced Diabetic Foot Info Cards, which have been translated into Khmer

(the national language) and are free to download and print. These give easy-to-follow evidence-based advice and clinicians should be encouraged to use them until more detailed guidelines are available (D-Foot International, 2020b).

The biggest concern is the lack of provision of pressure redistribution devices. It is unreasonable to expect a LMIC to provide expensive imported pressure redistribution devices for all patients who would benefit from them, however, often cheaper options are available (Hunt, 2020). A stock of pressure redistribution devices (e.g. removable cast walkers, cast shoes) could be purchased and offered for patients to buy at a reduced cost from the diabetic foot clinic instead of the medical device retailers. For more complex DFUs or custom manufactured devices, a partnership with the Prosthetics and Orthotics department would be beneficial.

In order to reduce the time until presentation of DFU at the specialist clinic, ongoing patient education should be emphasised at every patient contact. The upskilling of provincial healthcare staff is also important to facilitate the vast need for high quality diabetic footcare at a location more convenient for the patient. This should also increase the concordance of patients returning for ongoing treatment.

Diabetic footcare services in Cambodia require significant investment and development in order to satisfactorily treat and manage DFUs effectively. It is hoped that the production of the Cambodian National Diabetic Footcare Guidelines will enable ongoing improvements in this LMIC and reduce the burden of diabetic foot disease in this population. ■

- Ambegoda ALAMC, Wijesekera JR, Panditharathne KI et al (2015) Analysis of severity and anatomical distribution of diabetic foot ulcers; a single unit experience. *Int J Multidisciplinary Stud* 2(1): 12–21
- Armstrong DG, Lavery LA, Harkless LB (1998) Validation of a Diabetic Wound Classification System: The contribution of depth, infection, and ischemia to risk of amputation. *Diabetes Care* 21(5): 855–9
- Banik PC, Barua L, Moniruzzaman M et al (2020) Risk of diabetic foot ulcer and its associated factors among Bangladeshi subjects: a multicentric cross-sectional study. *BMJ Open* 10(2): e034058
- Bus SA, Armstrong DG, Gooday C et al (2020) Guidelines on offloading foot ulcers in persons with diabetes (IWGDF 2019 update). *Diabetes Metab Res Rev* 36(Suppl 1): e3274
- Central Intelligence Agency (2020) *The World Factbook: Cambodia*. Available at: <https://bit.ly/3xsgnKN> (accessed 29.04.2021).
- D-Foot International (2020a) *Fast Track Pathway for Diabetic*

- Foot Ulceration During Covid-19 and Beyond*. Available at: <https://bit.ly/3eDLbPX> (accessed 29.04.2021).
- D-Foot International (2020b) *Diabetic Foot Info Cards: At-a-glance Info Cards of the IWGDF Guidance Documents on Diabetic Foot*. Available from: <https://www.d-foot.org/resources/resources/diabetic-foot-info-cards> (accessed 29.04.2021).
- Diabetes Feet Australia (2020) *Australian Clinical Triage Guide: For people with Diabetes-related Foot Disease During the Covid-19 Pandemic*. Available at: <https://bit.ly/3u5eYHJ> (accessed 29.04.2021).
- Haji Zaine N, Burns J, Vicaretti M et al (2014) Characteristics of diabetic foot ulcers in Western Sydney, Australia. *Journal of Foot and Ankle Research* 7: 39
- Hunt A (2020) A surprising patient-led pressure redistribution modality in the treatment of diabetic foot ulceration in Cambodia. *Wounds Asia* 3(2): 32–7
- Ince P, Abbas ZG, Lutale JK, et al (2008) Use of the SINBAD Classification System and Score in Comparing Outcome of Foot Ulcer Management on Three Continents. *Diabetes Care* 31(5): 964–7
- International Diabetes Federation (2019) *Diabetes Atlas*. Ninth Edition 2019. Available at: <https://diabetesatlas.org/resources/> (accessed 29.04.2021)
- Jayasinghe SA, et al. (2007) Is walking barefoot a risk factor for diabetic foot disease in developing countries? *Rural Remote Health* 7(2): 692
- Jeffcoate WJ, Vileikyte L, Boyoko EJ et al (2018) Current Challenges and Opportunities in the Prevention and Management of Diabetic Foot Ulcers. *Diabetes Care* 41(4): 645–52
- Leese GP, Stang D (2016) When and how to audit a diabetic foot service. *Diabetes Metab Res Rev* 32(Suppl 1): 311–7
- Margolis DJ, Allen-Taylor L, Hoffstad O, Berlin JA (2002) Diabetic neuropathic foot ulcers: the association of wound size, wound duration, and wound grade on healing. *Diabetes Care* 25(10): 1835–9
- Ministry of Health (2015) *Clinical Practice Guidelines Type 2 Diabetes. A Continuum of Care for Diabetes Patients Both With and Without Complications at NCD Clinics/RHs*. Available at: <https://bit.ly/3nuy3V9> (accessed 29.04.2021)
- Monteiro-Soares M, Russell D, Boyko EJ et al (2020) Guidelines on the classification of diabetic foot ulcers (IWGDF 2019). *Diabetes Metab Res Rev* 36(Suppl 1): e3273
- Nang EEK, Dary C, Hsu LY et al (2019) Patients' and healthcare providers' perspectives of diabetes management in Cambodia: a qualitative study. *BMJ Open* 9(11): e032578
- Oyibo SO, Jude EB, Tarawneh I et al (2001) The effects of ulcer size and site, patient's age, sex and type and duration of diabetes on the outcome of diabetic foot ulcers. *Diabet Med* 18(2): 133–8
- Raguenaud M-E, Isaakidis P, Reid T et al (2009) Treating 4000 diabetic patients in Cambodia, a high-prevalence but resource-limited setting: a 5-year study. *BMC Med* 7: 33
- Scottish Intercollegiate Guidelines Network (2010) *116. Management of Diabetes*. Edinburgh: SIGN. Available at: <https://bit.ly/3h11KZd> (accessed 29.04.2021)
- The World Bank (2020) *The World Bank in Cambodia: Overview*. Available at: <https://bit.ly/3gN9cGZ> (accessed 29.04.2021)
- Van Netten JJ, Apelqvist J, Bus SA et al (2020) New IWGDF Guidelines on Prevention and Management of Diabetic Foot Disease released. *The Diabetic Foot Journal* 23(1): 6–9
- World Health Organization (2018) *Cambodia National Health Accounts (2012–2016): Health Expenditure Report*. Manila, Philippines: World Health Organization. Available at: <https://bit.ly/3sXgtG1> (accessed 29.04.2021).
- World Health Organization (2020) *COVID-19 Joint WHO-MOH Situation Report 09*. Available at: <https://www.who.int/cambodia/internal-publications-detail/covid-19-joint-who-moh-situation-report-09#> (accessed 25.05.21)
- Young MJ, Boulton AJ, MacLeod AF et al (1993) A multi-centre study of the prevalence of diabetic peripheral neuropathy in the United Kingdom hospital clinic population. *Diabetologia* 36(2): 150–4
- Zhang P, Lu J, Jing Y et al (2017) Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. *Ann Med* 49(2): 106–16
- Zhang Y, Lazzarini PA, McPhail SM et al (2020) Global disease burdens of diabetes-related lower-extremity complications in 1990 and 2016. *Diabetes Care* 43(5): 964–74