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Review

A multidisciplinary expert consensus framework for diabetic foot disease management in the Gulf Cooperation Council: A modified Delphi study

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ABSTRACT

Background: The Gulf Cooperation Council (GCC) countries face an escalating epi-demic of diabetes, with prevalence rates substantially exceeding global averages and projections indicating a 96% increase by 2035. Diabetic Foot Disease (DFD) represents one of the most serious and costly complications of diabetes, yet regionally adapted clinical guidance is absent across all six GCC nations.

Methods: A modified Delphi study incorporating elements of the RAND/UCLA Appropriateness Method was conducted with an expert panel of 18 multidisciplinary clinicians from all six GCC countries (United Arab Emirates, Kingdom of Saudi Arabia, Qatar, Bahrain, Kuwait, and Oman). Panelists rated consensus statements using a 5-point Likert scale over two anonymous voting rounds, with an 80% agreement threshold defining consensus. Statements not achieving consensus were revised following structured group discussion.

Results: The panel generated consensus recommendations across seven domains: prevention and screening, risk assessment and classification, vascular assessment and management, wound management, infection and osteomyelitis, Charcot neuroarthropathy, and follow-up and recurrence prevention. Recommendations encompass GCC-specific adaptations addressing cultural practices, regional microbiology, climatic factors, healthcare system organization, and resource constraints.

Conclusions: This consensus provides the first evidence-informed, regionally adapted framework for DFD management in the GCC. Implementation requires coordinated investment in multidisciplinary care models,

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workforce development, patient education programmes tailored to regional contexts, and robust data systems to monitor outcomes and guide continuous quality improvement.

1. Introduction

Diabetic Foot Disease (DFD) represents one of the most serious and re-source-intensive complications of diabetes mellitus [1]. The global prevalence of diabetic foot ulcers (DFUs) among people with diabetes is estimated at 6.3%, with a lifetime risk of 19% to 34% [2–4]. Approximately 18.6 million people develop DFUs annually, and these ulcers precede 85% of all diabetes-related lower extremity amputations. The five-year mortality rate following DFU diagnosis approaches 40%, a figure comparable to outcomes for some malignancies, while survival following major amputation falls to 8.3% at five years [4]. Additionally, DFU causes substantial deterioration in health-related quality of life, affecting physical function, emotional wellbeing, and socioeconomic participation [5].

Within The Middle East and North Africa (MENA) region, the GCC countries demonstrate particularly concerning statistics, with a diabetes prevalence of 24% compared with 16% in non-GCC MENA nations [6]. Country-specific estimates reveal consistently elevated rates: Kuwait (25%), Kingdom of Saudi Arabia (23.7%), Qatar (19–23%), Bahrain (14.7%), Oman (15.7%), and the United Arab Emirates (12.3%), with six Arab countries ranking among the top ten globally for diabetes prevalence [7]. The diabetic foot prevalence in predominantly Muslim countries of the region ranges from 5% to 20%, and the projected increase in GCC diabetes prevalence of 96% by 2035 signals an impending escalation of foot-related complications unless preventive action is substantially strengthened [6,8]. Despite this magnitude of risk, the DFD burden in the GCC remains poorly quantified. Only Saudi Arabia has published incidence studies, and 17 of 22 Arab countries have not reported DFU prevalence rates. In the UAE, an estimated 72% of patients with diabetes lack access to dedicated foot care, illustrating systemic deficiencies that demand urgent, coordinated intervention [1,6,9,10]. Beyond the pathophysiology shared with DFD globally, the GCC region presents a set of sociocultural and contextual factors that must be incorporated into any regionally relevant framework. Religious practices, particularly ritual ablution performed five times daily, may serve as opportunities for regular foot inspection, as well as proper foot drying and hygiene [11–15].

International guidelines, principally those of the International Working Group on the Diabetic Foot (IWGDF), provide a comprehensive, evidence-based foundation for DFD prevention and management [16]. However, these guidelines are designed for a global audience and do not specifically address the epidemiological, sociocultural, or health system characteristics of the GCC [6,17,18]. Therefore, a GCC-specific consensus framework offers multiple strategic advantages. It establishes common definitions, classification systems, and clinical language to facilitate communication and benchmarking across countries. It provides a foundation for regionally adapted care pathways that address shared challenges while allowing country-specific flexibility. It supports harmonized training curricula and workforce development. It enables coordinated data collection and research collaboration, ad-dressing critical epidemiological gaps. It equips policymakers and funders with a framework for advocacy and resource allocation.

Similar to Delphi consensus publications [19], this study therefore aimed to develop a modified Delphi consensus framework, adapted to the clinical, cultural, and health system realities of the GCC, to guide the prevention, assessment, and multidisciplinary management of DFD across the region.

2. Methods

2.1. Study design

This study employed a modified Delphi methodology to achieve structured expert consensus on best practices for DFD management in the GCC. The Delphi technique is an iterative, multistage group decision-making process that systematically aggregates expert judgements through successive rounds of anonymous voting and controlled feedback, facilitating convergence towards consensus while preserving the benefits of diverse perspectives and mitigating the undue influence of dominant personalities [19–21]. Modified Delphi approaches are widely accepted for developing clinical consensus when robust, context-specific evidence is limited or when regional adaptation of international guidelines is required. The study adhered to the Conducting and REporting of DElphi Studies (CREDES) recommendations for rigour and transparent reporting [20].

The modified Delphi process employed in this study incorporated elements of the RAND/UCLA Appropriateness Method, combining anonymous individual voting with facilitated group discussion between rounds. This hybrid approach accelerates consensus development by allowing panelists to address ambiguity, explain divergent perspectives, and refine statements in light of collegial dialogue, whilst maintaining the anonymity essential to unbiased individual scoring. The Delphi process is illustrated in Fig. 1.

2.2. Expert panel selection and composition

The expert panel comprised 18 multidisciplinary healthcare professionals from all six GCC countries, selected to ensure broad representation of clinical specialties, geo-graphic settings, and healthcare sectors. The geographic distribution of expert panel members across GCC countries is shown in Fig. 2. Represented nations included the United Arab Emirates, Kingdom of Saudi Arabia, Qatar, Bahrain, Kuwait, and Oman, reflecting the commitment to a truly regional, rather than single-country, consensus [4,22].

Clinical disciplines represented on the panel included endocrinology and diabetology, podiatry, vascular surgery, plastic and reconstructive surgery, wound care nursing, orthopedic surgery, general surgery and infectious diseases. This composition reflects the multisystem nature of DFD and ensures that recommendations address all critical domains of prevention, assessment, and management from relevant specialist perspectives. International experts in diabetic foot care contributed to deliberations to ensure alignment with global best practice whilst maintaining regional relevance.

Panelists were selected according to pre-defined eligibility criteria: a minimum of five years of clinical experience in diabetic foot care or directly related specialties; active involvement in diabetic foot clinical practice, education, or research at the time of recruitment; a leadership or senior advisory role within their institution's diabetic foot service or diabetes programme; and demonstrated commitment to improving diabetic foot outcomes within the GCC. Several panelists held positions within the Gulf Diabetic Foot Working Group, ensuring continuity with existing regional collaborative efforts. All panelists agreed to participate voluntarily and without financial compensation [22].

2.3. Delphi process

Evidence synthesis and statement development. Prior to voting, the coordinating task force conducted a systematic review of international guidelines and peer-reviewed literature on DFD prevention, screening, classification, wound management, vascular intervention, infection, and Charcot neuroarthropathy. This review informed the drafting of a preliminary set of consensus statements, organized thematically to correspond with the major clinical domains of DFD care. Each statement was accompanied by a concise summary of supporting evidence and was assigned a certain-ty-of-evidence rating using the GRADE framework (Grading of Recommendations, Assessment, Development and Evaluations).

Round 1 voting. The preliminary statements were distributed electronically to all 18 panelists. Each panelist independently scored each statement on a 5-point Likert scale: 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree. Panelists were also invited to provide free-text comments explaining their ratings and suggesting modifications to statement wording. Responses were collected anonymously to prevent social influence on individual scoring.

Inter-round deliberation. Following Round 1, the coordinating task force collated and summarized the voting results, including the median score, percentage agreement (proportion voting 4 or 5), and a thematic summary of free-text comments for each statement. Results were shared with all panelists in aggregate, anonymized form. The panel then convened virtually for a structured discussion session, during which statements that had not achieved consensus were reviewed. Panelists whose ratings diverged substantially from the group median were invited to articulate their reasoning, ensuring that minority perspectives informed collective deliberation. Where disagreement reflected ambiguous wording rather than substantive clinical differences, statements were revised for clarity. Where disagreement reflected genuine uncertainty or legitimate contextual variability across GCC countries, statements were modified to acknowledge regional heterogeneity or flagged as requiring further research.

Round 2 voting. Revised statements were redistributed electronically for a second anonymous voting round using the same 5-point Likert scale. Results were collated and analyzed by the task force.

2.4. Consensus definition and statement Disposition

Consensus was pre-defined as 80% or more of panelists scoring a statement 4 (agree) or 5 (strongly agree) on the Likert scale. This threshold is commonly employed in healthcare consensus research and is considered sufficiently stringent to ensure that accepted recommendations reflect robust, broadly shared expert agreement across a diverse panel [6,20,22].

Statements achieving the 80% threshold in Round 1 were accepted into the final framework pending editorial review. Statements not achieving consensus after Round 1 were revised and re-submitted in Round 2. Statements achieving consensus in Round 2 were incorporated into the final document. Statements that did not achieve consensus after two rounds were subject to final task force review: those with substantive disagreement reflecting irreconcilable clinical differences were either substantially re-worded, disaggregated into component statements, or identified as areas requiring future research and deliberation, and were not presented as consensus recommendations in this document.

2.5. Data Analysis

Voting data for each statement were analyzed descriptively. For each

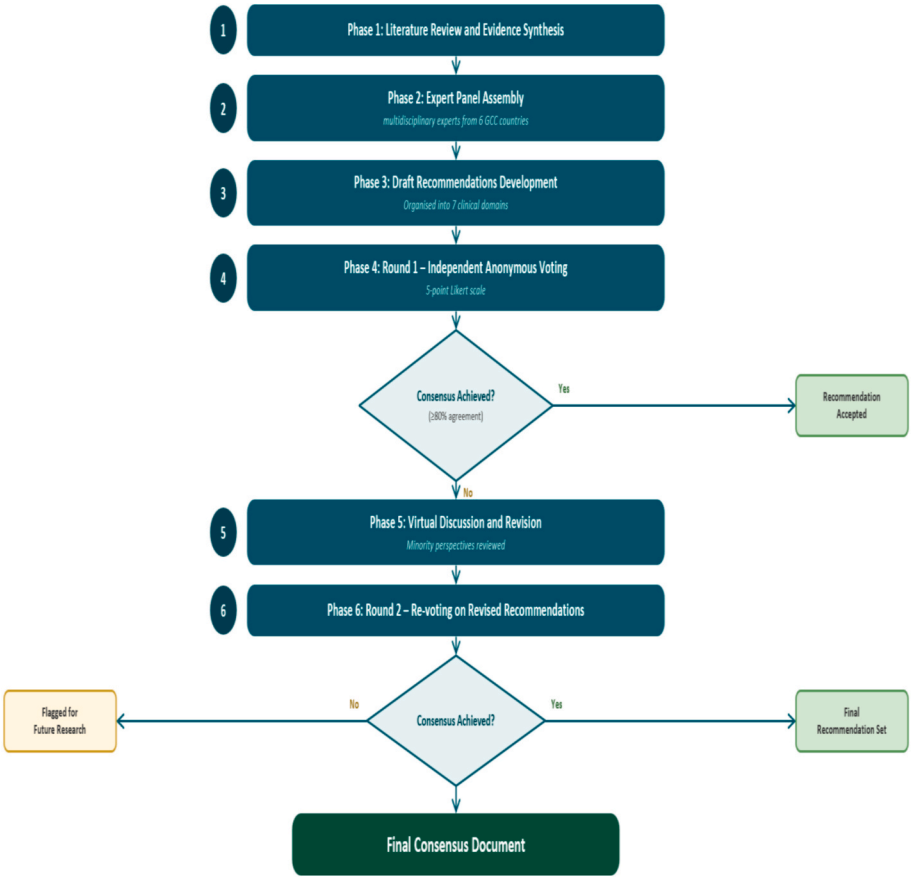

Fig. 1. Modified Delphi Consensus Development Process.

statement and each round, the following metrics were computed: mean and median Likert score; percentage of panelists scoring 4 or 5 (consensus metric); and percentage of panelists scoring 1 or 2 (explicit disagreement). Free-text comments were analyzed thematically to identify recurrent concerns, suggested modifications, and contextual factors war-ranting acknowledgement in statement wording. All analyses were conducted using standard spreadsheet software. No inferential statistics were applied, consistent with the descriptive nature of Delphi methodology.

3. Results

The panel developed and reviewed consensus statements across seven thematic domains of DFD care. The majority of statements achieved consensus in Round 1; remaining statements were revised following inter-round discussion and subjected to Round 2 voting, after which consensus was achieved for all statements incorporated into this framework. An integrated care pathway summarizing the recommended management approach is presented in Fig. 3.

3.1. Prevention of diabetic foot ulcers

3.1.1. Screening and risk identification

Recommendation 1. Annual foot screening should be offered to all adults with diabetes in the GCC. Screening frequency should be increased to every one to three months for individuals at high risk, including those with a previous ulcer or amputation, peripheral neuropathy, PAD, significant foot deformity, or advanced chronic kidney disease [16,23,24].

Recommendation 2. Structured foot screening must include assessment of peripheral neuropathy using a 10-g monofilament and vibration perception testing, palpation of pedal pulses, and inspection for foot deformity and pre-ulcerative lesions such as callus, fissures, and nail pathology [3,16].

Recommendation 3. Validated risk stratification tools, including IWGDF risk categories and the SINBAD or WIfI classification systems, should be incorporated into primary and secondary care diabetes workflows across the GCC, with clear, locally adapted triggers for referral to specialized foot services for patients classified as moderate or high risk [3,18]. Regional adaptation of risk thresholds should account for the earlier onset of diabetes, higher obesity prevalence, and specific comorbidity profiles characteristic of GCC populations.

Recommendation 4. Emerging technologies including infrared thermal imaging, smart insoles, and handheld Doppler devices may augment traditional assessment by ena-bling earlier detection of temperature asymmetry, plantar pressure hotspots, and per-fusion deficits [23]. The panel supports their adoption where available but emphasizes that these tools should complement, and not replace, systematic clinical examination.

3.1.2. Patient education and Self-Management

Recommendation 5. Structured patient education on foot self-care is a core preventive strategy and should be available at the time of diabetes diagnosis and reinforced at least annually thereafter, with intensified provision for those at moderate and high risk [9,16,25]. Education programmes should cover daily foot inspection, hygiene, nail care, moisturizing of dry skin (with explicit avoidance of inter-digital maceration), avoidance of barefoot walking including indoors, prompt reporting of any breaks in skin integrity, and appropriate footwear selection and inspection.

Recommendation 6. In the GCC, patient education programmes must be culturally tailored to address negative practices linked to implications for foot hygiene, traditional footwear, gender norms, the linguistic diversity of the population, and variable health literacy [11,12]. The panel recommends development of structured "foot education sessions" and community outreach initiatives delivered in Arabic and other prevalent languages, supported by visual materials accessible to those with limited literacy. Involvement of religious leaders and community health

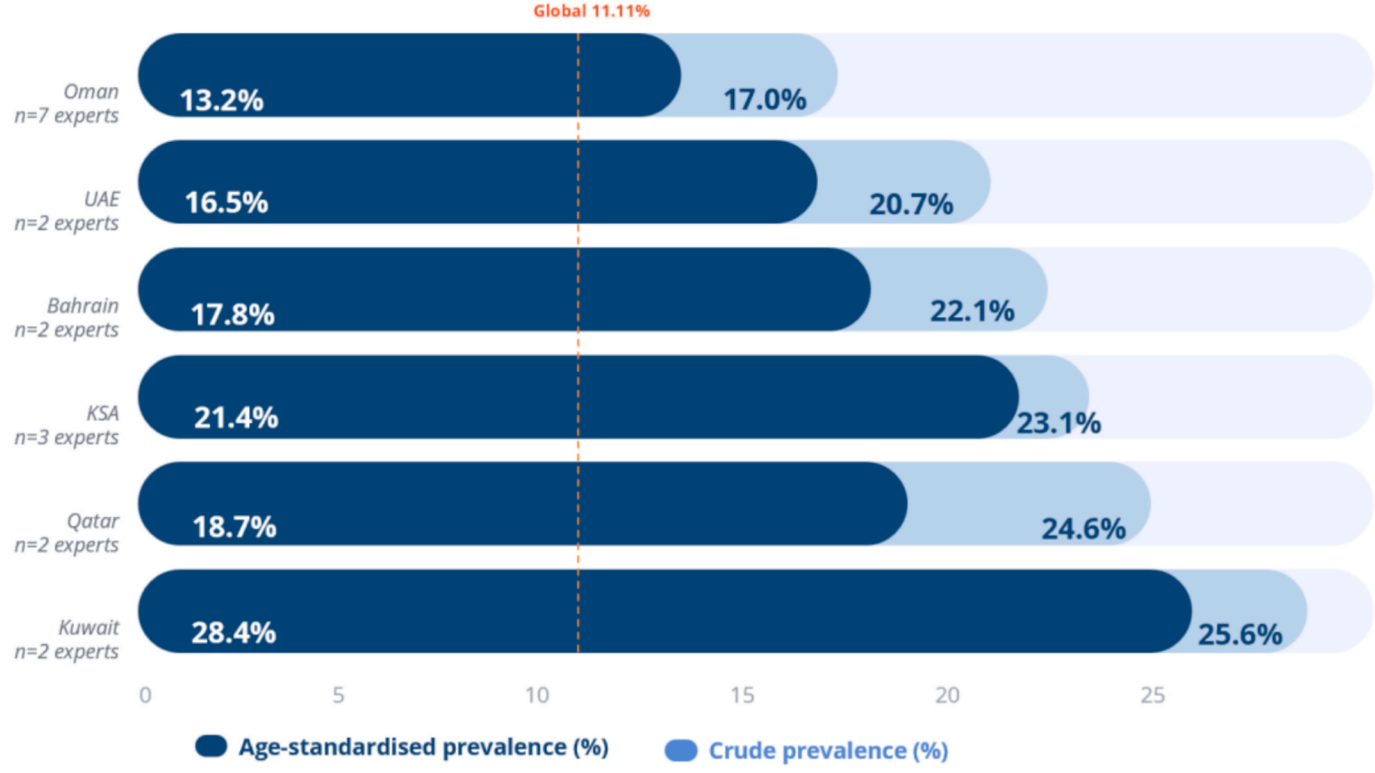

Fig. 2. Diabetes prevalence across GCC countries and expert panel distribution. All six GCC member states were represented on the 18-member expert panel. Diabetes prevalence data sourced from the International Diabetes Federation (IDF) Diabetes Atlas, 11th edition, 2025.

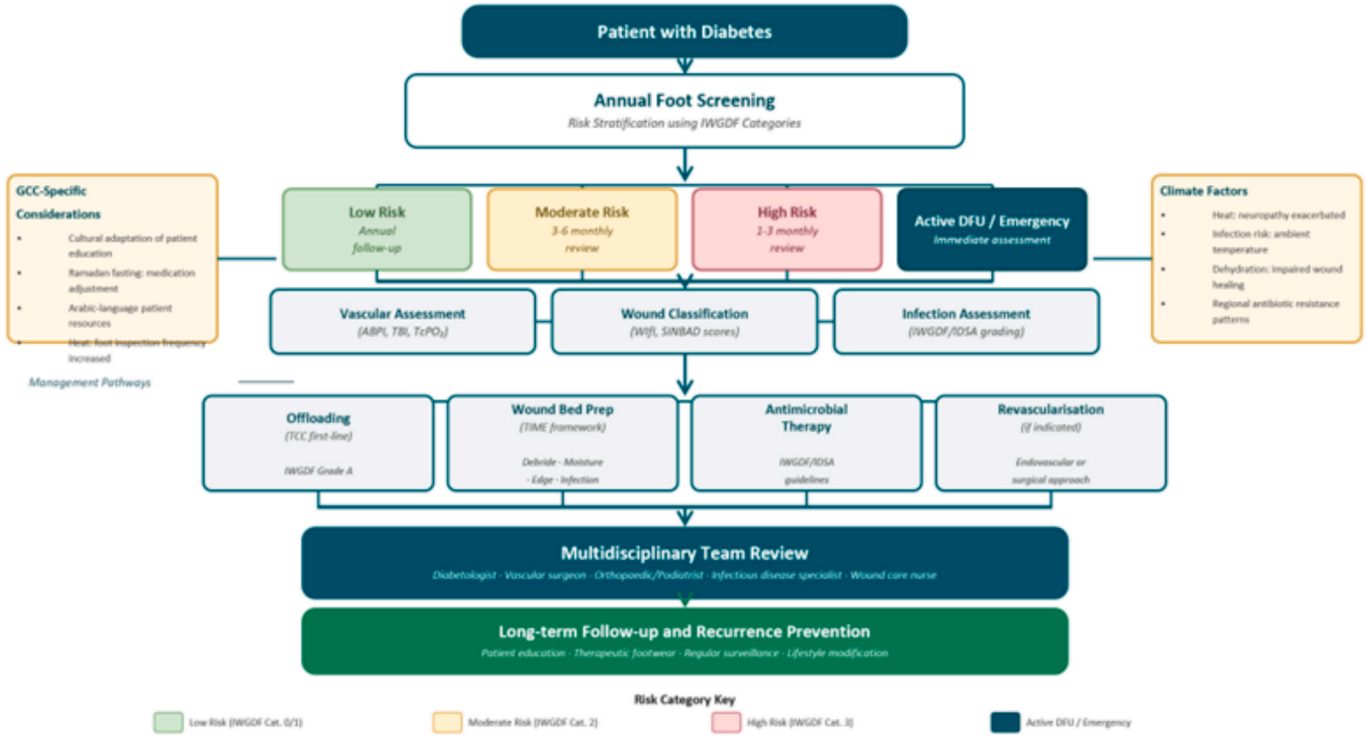

Fig. 3. Integrated diabetic foot care pathway for the GCC region. The pathway il-lustrates the recommended management approach from initial screening through risk stratification, assessment, management, multidisciplinary team review, and long-term follow-up, with GCC-specific considerations noted. ABPI = Ankle-Brachial Pressure Index; DFU = Diabetic Foot Ulcer; GCC = Gulf Coop-eration Council; IDSA = Infectious Diseases Society of America; IWGDF = International Working Group on the Diabetic Foot; MDT = Multidisciplinary Team;SINBAD = Site, Ischaemia, Neuropathy, Bacterial Infection, Area, Depth; TBI = Toe-Brachial Index; TCC = Total Contact Cast; $TcPO_2$ = Transcutaneous Oxygen Pressure; TIME = Tissue, Infection/Inflammation, Moisture, Edge; WIfI = Wound, Ischaemia, foot Infection.

workers in education delivery may enhance acceptability and engagement.

Recommendation 7. Lifestyle interventions encompassing smoking cessation, opti-mized glycaemic control, weight management, and increased physical activity should be integrated into foot education programmes, with explicit communication to patients that these measures independently reduce ulcer and amputation risk in addition to their broader metabolic benefits [14,25,26].

3.1.3. Health system organization for prevention

Recommendation 8. Prevention must be anchored in primary care, with clear referral pathways from primary to secondary and tertiary services based on risk category. GCC Ministries of Health and health authorities should embed a minimum diabetic foot assessment dataset within electronic primary care diabetes templates, designate and train dedicated diabetes foot champions or educators in primary care clinics, and ensure the availability of core prevention tools including 10-g monofilaments, culturally appropriate educational materials, and access to appropriate diabetic footwear.

Recommendation 9. Quality improvement programmes focusing on foot screening coverage, risk documentation completeness, and timeliness of specialist referrals are recommended across GCC primary care systems, with regular audit and feedback to clinical teams and linkage of diabetic foot performance indicators to institutional quality metrics [27].

3.2. Risk Assessment, Definitions, and classification

Recommendation 10. The panel endorses adoption of the IWGDF definition of a DFU as a full-thickness wound below or at the ankle in a person with current or previous diabetes, including plantar and dorsal surfaces, *peri*-malleolar regions, and post-amputation sites [16].

Recommendation 11. Neuropathy assessment should employ validated, standardized tools including monofilament testing, vibration perception testing with a 128-Hz tuning fork, and, where available, nerve conduction studies. Results should be recorded using IWGDF risk categories and linked to appropriate follow-up intervals. In the GCC context, clinical algorithms and visual aids should be developed to facilitate consistent application of these tools by non-specialist clinicians in primary and secondary care.

Recommendation 12. DFUs should be classified using one or more recognized classification systems, including WIfI (wound, ischaemia, foot infection) for overall risk stratification, SINBAD (site, ischaemia, neuropathy, bacterial infection, area, depth) for wound characterization, and the IWGDF/IDSA four-grade system for infection severity. Consistent use of these tools enables treatment planning proportional to ulcer complexity and facilitates benchmarking and quality improvement across GCC centers [4,16,28].

Recommendation 13. Practical implementation of classification systems in GCC set-tings requires structured training programmes for nurses, podiatrists, general practitioners, and trainees, using case-based teaching methods. A pragmatic minimum assessment set for all GCC facilities should include: focused clinical history; inspection of both feet; monofilament and vibration testing; pedal pulse palpation; ankle-brachial pressure index (ABPI) measurement where available; and documentation of a simple classification such as SINBAD in the medical record. Clinical services should ensure that both male and female assessors are available to respect cultural preferences and maximize uptake of assessment, particularly among female patients.

3.3. Vascular assessment and management

3.3.1. Screening for peripheral arterial disease

Recommendation 14. All patients with diabetes should undergo at

least one vascular assessment, with repeat evaluation every one to two years for those with asymptomatic PAD and more frequently where ulcers are present, symptoms develop, or risk factors change. Early detection of PAD is critical given its strong association with impaired ulcer healing, amputation risk, and mortality [14,26,27].

Recommendation 15. Minimum vascular assessment should include palpation of pos-terior tibial and dorsalis pedis pulses, together with evaluation of skin temperature, colour, capillary refill time, and hair distribution. Where pulses are absent or diminished, non-invasive investigations including ABPI with consideration of its limitations due to medial arterial calcification, toe-brachial index (TBI), and transcutaneous oxy-gen pressure ($TcPO_2$) should be performed to better characterize tissue perfusion [14,16,29].

3.3.2. Indications for referral and revascularization

Recommendation 16. Any patient with diabetes, PAD, and a foot ulcer should be ur-gently evaluated by an MDT that includes a vascular specialist. The WIfI classification and Rutherford staging should be used to stratify limb threat and guide the decision to revascularize, estimating the likely benefit in terms of limb salvage relative to procedural risk [28,30].

Recommendation 17. Direct angiosome-targeted revascularization (DAR) should be preferred where technically feasible, as it is associated with superior wound healing and limb salvage rates compared with indirect revascularization [14,31]. Endovascular techniques are preferred for focal lesions or patients with high surgical risk. Open or hybrid procedures are indicated for long-segment disease, repeated failed endovascular interventions, or complex multi-level involvement requiring durable reconstruction.

3.3.3. Post-Revascularization surveillance and secondary prevention

Recommendation 18. Post-revascularization surveillance should include regular clinical review at one to three monthly intervals in the first year, with objective perfusion monitoring using ABPI, toe pressure, and $TcPO_2$, and duplex ultrasound at intervals defined by local vascular protocols, typically every three to four months for two years then annually. Secondary prevention measures, including antiplatelet therapy, statin therapy, blood pressure control, glycaemic optimization, and smoking cessation sup-port, are mandatory to reduce major adverse cardiovascular and limb events [14,32,33].

Recommendation 19. GCC-specific multicentre research on PAD prevalence among people with diabetes and on outcomes of different revascularization strategies, including limb salvage and mortality, is urgently needed to strengthen the regional evidence base.

3.4. Wound management

3.4.1. Core Components of standard of care

Recommendation 20. Standard of care for DFUs in the GCC should encompass: opti-mization of systemic glycaemic control and cardiovascular risk factors; prompt as-sessment and management of infection; adequate pressure offloading; structured wound bed preparation using the TIME framework (tissue, infection/inflammation, moisture balance, edge effect); and assessment and treatment of any underlying PAD [4,16,34].

Recommendation 21. Offloading is a central pillar of DFU management. Non-removable devices, specifically total contact casts (TCC) or irremovable walkers, are recommended as first-line treatment for neuropathic plantar forefoot and midfoot ulcers, given their demonstrated superiority in healing rates and time to closure com-pared with removable devices [16]. Where TCC is unavailable or contraindicated by infection, ischaemia, or patient factors, removable cast walkers with structured adherence support, customized insoles, and appropriate therapeutic footwear should be employed. Ensuring access to TCC materials and training in their application should be a priority for GCC health systems.

Recommendation 22. Wound bed management should follow the TIME framework, employing sharp or surgical debridement of non-viable tissue, appropriate wound cleansers, exudate control with suitable dressings, protection of the *peri*-wound skin, and, where clinical signs of biofilm or local infection are present, antimicrobial dressings. Debridement should be performed by clinicians with appropriate training and competence [3,9].

3.4.2. Advanced wound therapies

Recommendation 23. Advanced wound therapies, including negative pressure wound therapy (NPWT), bioengineered skin substitutes, amniotic membrane grafts, topical oxygen therapy, and hyperbaric oxygen therapy, may improve healing rates and re-duce amputation risk in selected complex ulcers where standard of care has been optimized and healing trajectory remains inadequate [13,32]. Evidence indicates that NPWT can accelerate granulation tissue formation and increase rates of complete wound closure compared with standard moist wound therapy, although results vary across settings and patient selection is critical [17].

Recommendation 24. GCC Ministries of Health and health insurers should work to improve access to advanced wound therapies within tertiary diabetic foot centers, guided by clinical evidence, regional cost-effectiveness evaluations, and structured MDT decision-making. Health economic analyses specific to GCC health systems are needed to inform rational procurement and reimbursement policies.

3.5. Infection and osteomyelitis

3.5.1. Diagnosis and classification

Recommendation 25. The panel endorses the IWGDF/IDSA definition of diabetic foot infection (DFI) as the invasion and multiplication of microorganisms in host tissue, causing local or systemic inflammatory response and tissue damage [27]. Clinical signs including localized erythema, warmth, swelling, pain, and purulent discharge remain the primary diagnostic criteria. Systemic signs including fever, tachycardia, leucocytosis, and haemodynamic instability indicate severe infection requiring urgent intervention.

Recommendation 26. The IWGDF/IDSA four-grade infection classification (uninfected, mild, moderate, and severe, with an “O” modifier for concurrent osteomyelitis) is recommended as the regional standard for GCC facilities, as it is evidence-based, prognostically validated, and internationally recognized [27,32]. Implementation re-quires development of simplified, user-friendly algorithms and visual aids suitable for non-specialist clinicians in primary care and emergency settings. In the GCC, chronic and recurrent infection phenotypes are increasingly recognized, and future guidance iterations should explicitly address these patterns.

Recommendation 27. Minimum investigations for DFI should include full blood count, C-reactive protein, erythrocyte sedimentation rate, and plain radiographs of the affected foot. Where osteomyelitis is suspected on clinical or plain film grounds, MRI is recommended as the investigation of choice where available [21]. Advanced imaging modalities such as PET-CT should not be incorporated into minimum standards for GCC facilities given limited regional availability, and their use should be reserved for diagnostically challenging cases in specialist centers.

3.5.2. Antimicrobial therapy and stewardship

Recommendation 28. Empirical antibiotic therapy should be initiated according to in-fection severity whilst awaiting microbiological results, with subsequent de-escalation or modification guided by culture sensitivities and local resistance patterns [29]. The panel notes that, unlike many Western cohorts where gram-positive organisms predominate, DFIs in GCC populations frequently involve gram-negative bacilli, including multidrug-resistant strains, necessitating the development of region-specific empirical antibiotic regimens [1,13].

Empirical regimens should therefore be informed by current regional antibiograms rather than extrapolated from non-GCC data.

Recommendation 29. Establishing regional DFI antibiogram surveillance, convening infectious disease and microbiology experts from across GCC countries to develop consensus empirical and targeted antibiotic protocols, and implementing antimicrobial stewardship programmes within all diabetic foot services are priorities that GCC healthcare systems should address collectively.

Recommendation 30. For osteomyelitis, both conservative management using pro-longed antibiotic courses guided by bone biopsy and culture, and surgical approaches involving debridement or bone resection, are acceptable depending on the extent of bone involvement, vascular status, soft tissue envelope quality, and patient comorbidities and preferences [21,28,29]. Decisions regarding osteomyelitis management should be made within an MDT setting, with explicit documentation of treatment goals ad-dressing the tension between limb salvage and the risk of prolonged or recurrent infection.

3.5.3. Organization of DFI care

Recommendation 31. All moderate to severe DFIs, and all cases of suspected osteomyelitis, should be managed by an MDT comprising at minimum: a diabetologist or endocrinologist; a surgeon with relevant expertise (vascular, orthopaedic, or podiatric surgery); a wound care specialist; a microbiologist or infectious diseases specialist; and a specialised wound care nurse. Emergency departments and primary care services should have clear, locally validated criteria for hospital admission and urgent specialist referral based on infection severity and evidence of systemic involvement.

Recommendation 32. Development of a regional DFI registry is strongly recommended to enable systematic tracking of presentations, microbiological profiles, treatment approaches, clinical outcomes, and resource utilization, and to support ongoing quality improvement initiatives across GCC diabetic foot services.

3.6. Charcot neuroarthropathy

3.6.1. Early recognition and differential diagnosis

Recommendation 33. Acute Charcot neuroarthropathy is frequently misdiagnosed in the GCC, leading to delayed immobilization and preventable progressive deformity [5,11]. Clinicians at all levels must maintain a high index of suspicion in any patient with peripheral neuropathy presenting with unilateral warmth, erythema, and swelling of the foot or ankle, even in the absence of significant pain, and irrespective of a history of recognized precipitating trauma.

Recommendation 34. Differentiating acute Charcot neuroarthropathy from osteomyelitis is clinically challenging and has significant management implications. Normal or mildly elevated white cell counts and C-reactive protein, combined with erythrocyte sedimentation rate below 70 mm/h, favour Charcot, whilst markedly elevated inflammatory markers and focal bony destruction favour infection, although substantial diagnostic overlap exists [5]. MRI is recommended when plain radiographs are normal but clinical suspicion persists; diffuse marrow oedema without focal abscess or cortical breach is more consistent with Charcot neuroarthropathy than with osteomyelitis.

3.6.2. Management and Indications for surgery

Recommendation 35. Once acute Charcot neuroarthropathy is clinically suspected, immediate non-removable offloading, preferably with TCC, is the recommended intervention to prevent further joint collapse and deformity, except where significant ischaemia or active ulcer infection are present [5]. An initial immobilization period of approximately three months is recommended, followed by clinical and radiographic reassessment. Where remission criteria are met, specifically normalized foot temperature, resolution of swelling, and radiographic evidence of consolidation, transition to protective walking devices such as Charcot restraint orthotic walker (CROW) boots, high-neck diabetic boots, or bespoke therapeutic footwear is appropriate.

Recommendation 36. Surgical intervention should be considered for patients with in-stability, non-braceable deformities, recurrent or impending ulcers attributable to bony prominences, or rearfoot and ankle Charcot where conservative management has failed [28]. Surgical planning requires careful assessment of vascular status, bone quality, soft tissue envelope, and the patient's social support network, as the intensive postoperative care required places additional demands on patients who live alone or lack family support.

3.6.3. Service provision in the GCC

Recommendation 37. There is a critical shortage of surgeons with limb-salvage expertise in Charcot reconstruction across GCC countries, contributing to late diagnoses and high rates of major amputation for a condition that is frequently constructible. The panel calls for: the identification and networking of existing regional experts as accessible referral hubs; the development of formal training pathways, fellowships, and competency frameworks in limb-salvage surgery; and the creation of simple clinical algorithms for primary care and emergency clinicians to guide early identification and referral.

Recommendation 38. Where TCC is not immediately available, locally adapted im-mobilization solutions using accessible materials should be considered as a bridge, whilst regional policies work towards ensuring broader access to standard devices and competence in their application.

3.7. Follow-up and recurrence prevention

Recommendation 39. Patients with a history of DFU, DFI, osteomyelitis, Charcot neu-roarthropathy, or lower extremity amputation are at very high risk of recurrence and require structured long-term follow-up. The panel recommends regular review by a podiatrist or specialist foot clinic at one to three monthly intervals based on individual risk level, ongoing prescription of therapeutic footwear and orthotics, repeated reinforcement of foot self-care education at each visit, and systematic screening for new lesions, footwear wear, and gait changes at every contact [9,16].

Recommendation 40. Transition periods represent particular vulnerability for recur-rence. Discharge from hospital, completion of immobilization for Charcot foot, change of residence or healthcare provider, and loss of specialist follow-up are all critical junctures that should trigger proactive patient contact, education reinforcement, and scheduled review. Electronic recall systems and patient registries are valuable tools for maintaining structured follow-up and monitoring long-term outcomes across GCC diabetic foot services.

4. Discussion

This GCC consensus framework synthesizes international evidence with multi-disciplinary regional expert opinion to propose a pragmatic, adaptable approach to improving diabetic foot care across the diverse health systems of the Gulf. The recommendations affirm the central importance of prevention, risk stratification, MDT organization, evidence-based offloading, and aggressive management of PAD and infection, whilst explicitly addressing GCC-specific challenges including climatic and cultural factors, healthcare system heterogeneity, regional microbiology, and the critical scarcity of outcome data.

The central message of this framework, namely that most DFU-related amputations are preventable, is supported by robust international evidence demonstrating that 49–85% of amputations can be avoided through systematic screening, timely intervention, and MDT management [5,9]. MDT models have demonstrated consistent reductions in major amputation rates and improvements in healing across diverse healthcare settings [2,5]. However, MDT implementation requires institutional commitment, clear role delineation, and sustainable funding. In the GCC context, embedding diabetic foot performance

metrics within national non-communicable disease strategies and linking them to explicit accountability mechanisms may help secure the organizational support necessary for sustained MDT function.

The alignment of GCC recommendations with IWGDF 2023 guidelines is deliberate and important for maintaining international credibility and comparability. Key areas of direct alignment include the endorsement of TCC as the gold standard for offloading neuropathic plantar ulcers, systematic vascular assessment and prompt revascularization for neuroischaemic wounds, the IWGDF/IDSA infection classification, and structured long-term follow-up for high-risk patients [16,29,35]. Where GCC-specific adaptations have been introduced, they reflect genuine contextual differences rather than departures from evidence: the emphasis on culturally adapted patient education, the need for regional antibiograms given divergent microbiological profiles, the heightened clinical attention to thermal and cultural footwear risks, and the call for expanded limb-salvage surgery capacity reflect the practical realities of delivering DFD care in this region.

The emphasis on culturally tailored education merits further discussion. Evidence from Muslim-majority populations demonstrates that religious practices, gender norms, family structures, and health beliefs significantly shape self-care behaviours and healthcare-seeking patterns [7,36]. Generic educational materials developed for Western populations are unlikely to be optimally effective in GCC contexts without adaptation. The panel's recommendation to co-design education programmes with patients, community representatives, and religious leaders is consistent with participatory health promotion principles and may substantially enhance uptake and sustained behaviour change.

The microbiological profile of DFIs in the GCC warrants specific attention. Unlike the predominantly gram-positive bacteriology of DFIs in many Western cohorts, GCC studies have documented a higher prevalence of gram-negative bacilli, including ex-tended-spectrum beta-lactamase-producing and carbapenem-resistant organisms [1,14]. This divergence has direct implications for empirical antibiotic prescribing and underscores the importance of the panel's recommendation to establish regional DFI antibiograms and harmonized antibiotic stewardship protocols. Without such data, clinicians risk either undertreating severe infections or contributing to further resistance selection through unnecessarily broad empirical regimens.

The economic case for investment in DFD prevention and MDT management is compelling in the GCC context. The cost of DFU management substantially exceeds that of diabetes care without foot complications, and the catastrophic expenditures associated with prolonged hospitalization, surgical intervention, and rehabilitation disproportionately affect expatriate and lower-income households [13,15,37]. Prevention-focused investment, including enhanced screening programmes, patient education, and early intervention for pre-ulcerative lesions, offers a cost-effective strategy for reducing long-term expenditure. Gulf-specific cost-effectiveness analyses comparing preventive programmes, MDT clinics, NPWT, and advanced biological therapies against current fragmented care are urgently needed to support rational resource al-location and procurement decisions by GCC health authorities and payers.

Several important limitations of this consensus must be acknowledged. The evidence base underpinning many recommendations remains predominantly derived from non-GCC populations, and extrapolation to the regional context relies on expert judgement rather than local data. This is itself a primary justification for the Delphi approach, which is designed precisely for settings where direct evidence is limited, but it means that recommendations will require refinement as regional research evidence accumulates. The panel of 18 experts, whilst broadly multidisciplinary and geographically representative, represents a relatively small group, and different panels with different compositions might have generated somewhat different recommendations. Patient and caregiver representatives, primary care providers, and policymakers were not included as panel members, meaning that perspectives critical to implementation were not directly incorporated into the voting process. Future guideline iterations should actively seek to broaden stakeholder participation. Certain recommendations, particularly those relating to widespread access to TCC, NPWT, advanced wound therapies, and limb-salvage surgery, may not be immediately implementable in all GCC facilities, especially those in more remote or resource-constrained settings. The framework describes aspirational best practice rather than minimum care, and phased implementation with prioritization according to local context will be necessary.

Looking ahead, several priorities are identified for the next phase of work to translate this consensus into operational impact. The development of detailed stepwise clinical algorithms, suitable for primary, secondary, and tertiary care levels and incorporating into national diabetes strategies, is essential for converting these high-level recommendations into actionable clinical guidance [38]. Multi-centre epidemiological and health services research to quantify DFU incidence, amputation rates, microbiological profiles, outcomes of revascularization and advanced therapies, and the cost-effectiveness of different care models is needed to generate the regional evidence currently lacking. Establishment of accredited regional training curricula in diabetic foot care for physicians, nurses, and allied health professionals, and the expansion of specialized limb-salvage surgery services, are key workforce development priorities. Implementation of GCC-wide diabetic foot registries linked to quality improvement programmes and benchmarking will be critical for monitoring progress and driving continuous improvement. Finally, engagement with policymakers and insurers to re-view coverage frameworks for preventive services, specialist footwear, offloading de-vices, and advanced wound therapies, guided by regional cost-effectiveness data, represents an important advocacy priority for the clinical community [15,36].

5. Conclusions

Diabetic foot disease is a major but largely preventable cause of disability, amputation, and early death in the GCC, driven by rising diabetes rates and gaps in standardized care. This Delphi consensus offers the first region-specific, evidence-based framework covering prevention, risk assessment, wound and infection management, vascular care, and Charcot neuroarthropathy. Effective implementation requires coordinated, multidisciplinary efforts and investment in workforce training, research, and data systems. With adequate resources and commitment, the GCC has strong potential to lead in diabetic foot care using this framework.

6. Institutional review Board Statement

Not applicable. This study employed a consensus methodology and did not involve experiments on human subjects or collection of personal data.

7. Informed Consent Statement

Not applicable.

8. Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the authors used ChatGPT in order to improve language and Grammer. After using this tool/service, the authors reviewed and edited the content as needed and takes full

responsibility for the content of the published article.

CRediT authorship contribution statement

Thamra Al Ghafri: Writing – original draft, Resources, Formal analysis, Data curation, Conceptualization. **Saud Al Harthi:** Writing – review & editing, Resources, Methodology, Data curation, Conceptualization. **Aisha Al Mahrizi:** Writing – original draft, Resources, Data curation, Conceptualization. **Fatima Hussain Ali:** Writing – review & editing, Supervision, Formal analysis. **Haidar Saeed Jalil:** Writing – review & editing, Supervision, Methodology, Formal analysis. **Khalifa Al Wahaibi:** Writing – review & editing, Supervision, Data curation. **Maram Taha Alkhatieb:** Methodology, Formal analysis, Data curation. **Muneera Ben Nakhi:** Writing – original draft, Supervision, Methodology, Funding acquisition, Data curation. **Nashat Ali Ghandoura:** Methodology, Data curation, Conceptualization. **Noor Janahi:** Writing – review & editing, Validation, Software, Methodology, Formal analysis. **Samiah Mushara:** Writing – original draft, Visualization, Software, Resources, Project administration, Data curation. **Samira Jumah Abdulla:** Resources, Investigation, Data curation. **Talal Elenzi:** Writing – original draft, Validation, Project administration, Investigation, Formal analysis. **Mustafa Al Shaaibi:** Visualization, Software, Project administration, Funding acquisition. **Ali Alamoudi:** Writing – review & editing, Investigation, Data curation.

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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.

References

[1] A.J.M. Boulton, R.W. Whitehouse, The Diabetic Foot, in: K.R. Feingold, S.F. Ahmed, B. Anawalt, M.R. Blackman, A. Boyce, G. Chrousos, E. Corpas, W.W. de Herder, K. Dhatariya, K. Dungan, J. Hofland, S. Kalra, G. Kaltsas, N. Kapoor, C. Koch, P. Kopp, M. Korbonits, C.S. Kovacs, W. Kuohung, B. Laferrère, M. Levy, E.A. McGee, R. McLachlan, R. Muzumdar, J. Purnell, R. Rey, R. Sahay, A.S. Shah, F. Singer, M.A. Sperling, C.A. Stratakis, D.L. Trence, D.P. Wilson (Eds.), Endotext, MDText.com, Inc., South Dartmouth (MA), 2000. http://www.ncbi.nlm.nih.gov/books/NBK409609/ (accessed August 14, 2025).

[2] Zhang P, Lu J, Jing Y, Tang S, Zhu D, Bi Y. Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis. Ann Med 2017;49:106–16. https://doi.org/10.1080/07853890.2016.1231932.

[3] Edmonds M, Manu C, Vas P. The current burden of diabetic foot disease. J Clinical Orthopaedics Trauma 2021;17:88–93. https://doi.org/10.1016/j.jcot.2021.01.017.

[4] Bandyk DF. The diabetic foot: pathophysiology, evaluation, and treatment. Semin Vasc Surg 2018;31:43–8. https://doi.org/10.1053/j.semvascsurg.2019.02.001.

[5] Musuuza J, Sutherland BL, Kurter S, Balasubramanian P, Bartels CM, Brennan MB. A systematic review of multidisciplinary teams to reduce major amputations for patients with diabetic foot ulcers. J Vasc Surg 2020;71:1433–1446.e3. https://doi.org/10.1016/j.jvs.2019.08.244.

[6] International Working Group on Diabetic Foot, IWGDF Guidelines on the prevention and management of diabetes-related foot disease, (2023). https://iwgdfguidelines.org/wp-content/uploads/2023/07/IWGDF-Guidelines-2023.pdf (accessed August 12, 2025).

[7] Grant-McDonald L, Grant W. Bone Metabolism in Charcot. Clin Podiatr Med Surg 2022;39:543–57. https://doi.org/10.1016/j.cpm.2022.05.002.

[8] Jouhar L, Jaafar RF, Nasreddine R, Itani O, Haddad F, Rizk N, et al. Microbiological profile and antimicrobial resistance among diabetic foot infections in Lebanon. Int Wound J 2020;17:1764–73. https://doi.org/10.1111/iwj.13465.

[9] 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. https://doi.org/10.1016/j.diabres.2021.109119.

[10] Mairghani M, Elmusharaf K, Patton D, Burns J, Eltahir O, Jassim G, et al. The prevalence and incidence of diabetic foot ulcers among five countries in the Arab world: a systematic review. J Wound Care 2017;26:S27–34. https://doi.org/10.12968/jowc.2017.26.Sup9.S27.

[11] Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of Type 2 Diabetes Mellitus. IJMS 2020;21:6275. https://doi.org/10.3390/ijms21176275.

[12] Maity S, Leton N, Nayak N, Jha A, Anand N, Thompson K, et al. A systematic review of diabetic foot infections: pathogenesis, diagnosis, and management strategies. Front Clin Diabetes Healthc 2024;5:1393309. https://doi.org/10.3389/fcdhc.2024.1393309.

[13] Thirunavukkarasu A, Alsaidan AA. Self-management behaviours in type 2 diabetes across gulf cooperation council countries: an updated narrative review to enhance patient care. Healthcare 2025;13:2247. https://doi.org/10.3390/healthcare13172247.

[14] Akça Doğan D, Efil S, Kalkan Uğurlu Y, Camci GB. Knowledge and behaviors of foot care in muslims with diabetes mellitus: does islamic ritual ablution make a difference? J Transcult Nurs 2024;35:21–9. https://doi.org/10.1177/10436596231209046.

[15] Hinchliffe RJ, Forsythe RO, Apelqvist J, Boyko EJ, Fitridge R, Hong JP, et al. on behalf of the International Working Group on the Diabetic Foot (IWGDF), guidelines on diagnosis, prognosis, and management of peripheral artery disease in patients with foot ulcers and diabetes (IWGDF 2019 update). Diabetes Metabolism Res 2020;36:e3276.

[16] Driver VR, Blume PA. Evaluation of wound care and health-care use costs in patients with diabetic foot ulcers treated with negative pressure wound therapy versus advanced moist wound therapy. J Am Podiatr Med Assoc 2014;104:147–53. https://doi.org/10.7547/0003-0538-104.2.147.

[17] 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. https://doi.org/10.1111/dme.13973.

[18] Schaper NC, Van Netten JJ, Apelqvist J, Bus SA, Fitridge R, Game F, et al. the IWGDF Editorial Board, Practical guidelines on the prevention and management of diabetes-related foot disease (IWGDF 2023 update). Diabetes Metabolism Res 2024;40:e3657.

[19] Salutini E, Brocco E, Da Ros R, Monge L, Uccioli L, Anichini R. The complexity of diabetic foot management: from common care to best practice the italian expert opinion by delphi survey. Int J Lower Extremity Wounds 2020;19:34–43. https://doi.org/10.1177/1534734619890814.

[20] Diamond IR, Grant RC, Feldman BM, Pencharz PB, Ling SC, Moore AM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. J Clin Epidemiol 2014;67:401–9. https://doi.org/10.1016/j.jclinepi.2013.12.002.

[21] Nasa P, Jain R, Juneja D. Delphi methodology in healthcare research: how to decide its appropriateness. WJM 2021;11:116–29. https://doi.org/10.5662/wjm.v11.i4.116.

[22] International Diabetes Federation, IDF Diabetes Atlas, (2025). https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/ (accessed April 8, 2025).

[23] Quak GSW, Lin JHX, Liew H, Tan E, Tan D, Yeo LS, et al. Diabetic foot screening: a systematic review of global guidelines and questionnaire-based tools. Int J Low Extrem Wounds 2025:15347346251381091. https://doi.org/10.1177/15347346251381091.

[24] Rossboth S, Lechleitner M, Oberaigner W. Risk factors for diabetic foot complications in type 2 diabetes—a systematic review. Endocrino Diabet & Metabol 2021;4:e00175. https://doi.org/10.1002/edm2.175.

[25] Monteiro-Soares M, Boyko EJ, Ribeiro J, Ribeiro I, Dinis-Ribeiro M. Predictive factors for diabetic foot ulceration: a systematic review. Diabetes Metabolism Res 2012;28:574–600. https://doi.org/10.1002/dmrr.2319.

[26] 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. https://doi.org/10.1186/s13047-020-00383-2.

[27] Rümenapf G, Abilmona N, Morbach S, Sigl M. Peripheral arterial disease and the diabetic foot syndrome: neuropathy makes the difference! A Narrative Review, JCM 2024;13:2141. https://doi.org/10.3390/jcm13072141.

[28] Yachmaneni A, Jajoo S, Mahakalkar C, Kshirsagar S, Dhole S. A comprehensive review of the vascular consequences of diabetes in the lower extremities: current approaches to management and evaluation of clinical outcomes. Cureus 2023. https://doi.org/10.7759/cureus.47525.

[29] Lazzarini PA, Jarl G, Gooday C, Viswanathan V, Caravaggi CF, Armstrong DG, et al. Effectiveness of offloading interventions to heal foot ulcers in persons with diabetes: a systematic review. Diabetes Metabolism Res 2020;36:e3275.

[30] Widigdo DAM, Muttaqien Sofro Z, Suseani Pangastuti H, Dachlan I. The efficacy of negative pressure wound therapy (NPWT) on healing of diabetic foot ulcers. A Literature Review, CDR 2024;20:e111023222109. https://doi.org/10.2174/0115733998229877230926073555.

[31] Liu S, He C, Cai Y, Xing Q, Guo Y, Chen Z, et al. Evaluation of negative-pressure wound therapy for patients with diabetic foot ulcers: systematic review and meta-analysis. TCRM 2017;13:533–44. https://doi.org/10.2147/TCRM.S131193.

[32] Senneville É, Albalawi Z, Van Asten SA, Abbas ZG, Allison G, Aragón-Sánchez J, et al. IWGDF/IDSA guidelines on the diagnosis and treatment of diabetes-related foot infections (IWGDF/IDSA 2023). Diabetes Metabolism Res 2024;40:e3687.

[33] Boulton AJM. The diabetic foot: grand overview, epidemiology and pathogenesis. Diabetes Metab Res Rev 2008;24:S3–6. https://doi.org/10.1002/dmrr.833.

[34] Murphy-Lavoie HM, Ramsey A, Nguyen M, et al., Diabetic Foot Infections, Updated 2025 Apr 11, StatPearls, Treasure Island (FL): StatPearls, n.d. https://www.ncbi.nlm.nih.gov/books/NBK441914/.

[35] Benwan KA, Mulla AA, Rotimi VO. A study of the microbiology of diabetic foot infections in a teaching hospital in Kuwait. J Infect Public Health 2012;5:1–8. https://doi.org/10.1016/j.jiph.2011.07.004.

[36] A.C. Collins, R. Bergman, Charcot Neuropathic Osteoarthropathy, in: StatPearls, StatPearls Publishing, Treasure Island (FL), 2026. http://www.ncbi.nlm.nih.gov/books/NBK470164/ (accessed May 23, 2026).
[37] Albright RH, Manohar NB, Murillo JF, Kengne LAM, Delgado-Hurtado JJ, Diamond ML, et al. Effectiveness of multidisciplinary care teams in reducing major amputation rate in adults with diabetes: a systematic review & meta-analysis. Diabetes Res Clin Pract 2020;161:107996. https://doi.org/10.1016/j.diabres.2019.107996.
[38] Halabi J, Tarshoby M. Current situation and progress of diabetic foot care in the Middle East and North Africa region. Diabetes Res Clin Pract 2025;226:112318. https://doi.org/10.1016/j.diabres.2025.112318.