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REVIEW

The diabetic foot in Indigenous and rural communities of Latin America: a narrative review

El pie diabetico en comunidades indigenas y rurales de America Latina: una revision narrativa

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ABSTRACT

This narrative review synthesizes the published evidence on the epidemiology, determinants, care pathways and outcomes of the diabetic foot in Indigenous and rural communities of Latin America and identifies the gaps that prevention and health services should address. The reviewed studies show that lower-extremity amputation persists as a measurable outcome of diabetes across the region, including rural and remote states, while dedicated estimates for Indigenous groups remain scarce. Neuropathy, peripheral arterial disease, infection and poor glycemic control drive ulceration and amputation, and socioeconomic position, ethnicity and rural residence shape both exposure and the adequacy of preventive care. Rural and Indigenous patients face delays, distance and fragmented pathways before reaching foot care, and preventive examinations reach only a fraction of people with diabetes. Culturally adapted education, structured risk stratification, multidisciplinary teams and rehabilitation show promise but rest mostly on pilots and observational comparisons. Amputation-related mortality and costs are high, and disparities by ethnicity and rurality reproduce across countries, including outside Latin America. The main gap is the absence of consolidated, foot-specific evidence for the heterogeneous Indigenous populations of the Americas. Closing that gap requires community-anchored surveillance, culturally grounded self-care programs and equity-oriented foot care pathways.

Keywords: diabetic foot; diabetes mellitus; Indigenous peoples; rural population; Latin America; health services accessibility.

RESUMEN

Esta revision narrativa sintetiza la evidencia publicada sobre la epidemiologia, los determinantes, las vias de atencion y los desenlaces del pie diabetico en comunidades indigenas y rurales de America Latina e identifica las brechas que la prevencion y los servicios de salud deberian atender. Los estudios revisados muestran que la amputacion de extremidades inferiores persiste como desenlace medible de la diabetes en la region, incluidos los estados rurales y remotos, mientras que las estimaciones especificas para grupos indigenas siguen siendo escasas. La neuropatia, la enfermedad arterial periferica, la infeccion y el mal control glucemico impulsan la ulceracion y la amputacion, y la posicion socioeconomica, la etnia y la residencia rural condicionan tanto la exposicion como la calidad de la atencion preventiva. Los pacientes rurales e indigenas enfrentan demoras, distancia y vias de atencion fragmentadas, y los examenes preventivos llegan solo a una fraccion de las personas con diabetes. La educacion adaptada culturalmente, la estratificacion de riesgo, los equipos multidisciplinarios y la rehabilitacion son prometedoras pero descansan en pilotos y comparaciones observacionales. La mortalidad y los costos relacionados con la amputacion son altos, y las desigualdades por etnia y ruralidad se reproducen entre paises, incluso fuera de America Latina. La brecha principal es la ausencia de evidencia consolidada y especifica del pie para las poblaciones indigenas heterogeneas de las Americas.

Palabras clave: pie diabetico; diabetes mellitus; pueblos indigenas; poblacion rural; America Latina; acceso a los servicios de salud.

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INTRODUCTION

Diabetes mellitus has expanded rapidly in the Americas, where the number of people living with the disease is projected to rise from 92 million in 2024 to 120 million by 2050, and where Indigenous populations carry distinct biological, environmental and sociocultural risk profiles that epidemiological research still treats as largely homogeneous.(1)Diabetic foot disease is one of the most disabling consequences of this burden, because foot ulceration precedes most diabetes-related amputations, recurs frequently and is followed by premature death.(2,3) In Mexico, for example, diabetic foot has been described as a leading cause of nontraumatic lower-extremity amputation and as a marker of social inequality in diabetes treatment, with incidence rising at the same time that its impact among Indigenous people remains poorly characterized.(3)The clinical pathway is well established in general terms: neuropathy, peripheral arterial disease, infection and impaired glycemic control converge to produce ulceration, and without timely care the endpoint is amputation.(2)

The state of knowledge in Latin America confirms the size of the problem and the scarcity of the response. A bibliometric analysis of research on diabetic foot from the region identified 435 eligible records out of 1423 screened between 2000 and 2025, an output that is modest relative to the burden and concentrated in a small number of countries.(4)High rates of lower-extremity amputation are driven by limited health resources and infrastructure, although regional initiatives such as the Step by Step project and Train the Foot Trainer, both components of D-Foot International, have trained more than 4000 health professionals and helped establish more than 125 services.(5)Preventive care remains uneven: in national surveys of nine countries, only a fraction of adults with self-reported diabetes reported recent eye and foot examinations.(6)Infection control is complicated by antimicrobial resistance in diabetic foot infections across Latin America and the Caribbean, and the bacterial profile of these infections differs from that of other continents.(7,8) Observational data from six countries of the region, drawn from the DISCOVER cohort, document a substantial prevalence of microvascular and macrovascular complications among people with type 2 diabetes.(9)

The specific gap is the diabetic foot in Indigenous and rural communities. These populations combine remoteness, poverty, linguistic diversity and cultural models of disease that alter every step of the pathway, from symptom recognition to limb salvage, yet most regional studies report hospital-based or urban samples and rarely disaggregate by ethnicity or place of residence.(1,4) In Mexico, ethnographic work in Oaxaca showed that rural Indigenous people with diabetic foot complications experience prolonged care delays and social suffering, but this type of evidence is exceptional rather than representative.(3)In Brazil, national analyses document racial disparities in foot examination, and in Guatemala the diabetes burden of Indigenous women is known mainly from clinical chart reviews rather than from population-based foot studies.(10,11) A clinician or planner who searches for the prevalence of foot ulcers or the amputation rate in an Indigenous community of the region therefore finds fragments instead of a baseline, and cannot tell whether the local burden is improving or worsening.(1)The literature is therefore scattered across countries, designs and outcomes, and no synthesis has organized it around the populations that bear the heaviest burden.

The objective of this review is to synthesize the available evidence on the epidemiology, determinants, care pathways and outcomes of the diabetic foot in Indigenous and rural communities of Latin America and to identify the gaps that should orient prevention and health services. The synthesis is organized around five thematic axes: the epidemiology and burden of the condition; the clinical and social determinants; the barriers to care and health system factors; the prevention and community-based management approaches; and the outcomes, disparities and evidence gaps. This is a narrative review guided by the SANRA framework, and it does not claim the exhaustive search or the screening counts of a systematic review.

DEVELOPMENT

Epidemiology and burden of the diabetic foot

Across the region, lower-extremity amputation is the measure through which the burden of the diabetic foot is most consistently captured, because administrative and hospital sources record it more reliably than ulceration itself. In Brazil, an analysis of all lower limb amputations performed in the public health system over a 13-year period described trends in case numbers, patient demo-

graphics, associated etiologies and in-hospital mortality, confirming that amputation is a sustained population-level outcome rather than an isolated clinical event.(13)A time series restricted to the state of Amazonas, where much of the population is rural and Indigenous, calculated age-adjusted amputation rates, annual percent change and years lived with disability for diabetes-related lower-limb amputations between 2012 and 2021, and a spatial analysis of the surgical treatment of the diabetic foot in Ceará identified clustered areas of high incidence across the state.(14,15) In Mexico, a ten-year analysis of diabetes-related major lower-extremity amputations provided the same type of longitudinal evidence for a health system in which diabetic foot complications are a documented cause of hospital demand, and a comparison of diabetes complications across 36 family medicine units of the Mexican Institute of Social Security quantified the prevalence of diabetic foot alongside other chronic complications and comorbidities.(16,17) Hospital series fill in the clinical picture: a tertiary center in Belém, in the Brazilian Amazon, described 57 patients admitted with diabetic foot complications and classified them with the Wagner and PEDIS systems, and a referral hospital in El Petén, Guatemala, found that poor diabetic control was associated with major amputations above the ankle in people presenting with diabetic foot infections.(18,19) The burden is therefore not confined to large urban centers; it is measurable and recurrent in rural and remote states. The smallest magnitude reported in this axis belongs to the single-center samples, which count a few dozen patients at most, a reminder that the region still relies on local series rather than on continuous, disaggregated surveillance.(18)

The clinical expression of this burden is not uniform across the region. Hospital series from the Brazilian Amazon and the Guatemalan highlands describe patients who arrive with advanced Wagner grades and established infection, whereas the national administrative analyses capture only the amputations that follow, which means that the true incidence of ulceration is systematically underestimated by every source currently available.(13,18,19)The Amazonas time series converted the loss into years lived with disability and stratified it by sex and age, making visible a burden that a simple count of procedures would hide, and the Ceará spatial analysis added a territorial reading by identifying clusters of high surgical incidence that do not coincide with the geography of specialized services, a mismatch that rural municipalities experience most acutely.(14,15)

For Indigenous populations specifically, the foot-level evidence is thinner than the diabetes-level evidence. Studies that quantify diabetes in Indigenous communities of Mesoamerica and Amazonia provide the denominators against which foot complications must eventually be read: a retrospective chart review of a program serving 13 643 primarily Indigenous women in Guatemala found a crude diabetes prevalence of 8.3 percent and an age-adjusted prevalence of 7.9 percent, with 37.9 percent of affected women undiagnosed, and a cross-sectional study of the Bororo population of central Brazil measured obesity, diabetes and other metabolic disorders in 152 individuals.(11,20) The Zenú Indigenous people of Córdoba, Colombia, were studied for diabetes risk in relation to cardiorespiratory endurance, and an isolated Mixe community in Oaxaca was followed for environment-driven changes in type 2 diabetes, overweight and obesity.(21,22) These works establish that diabetes has penetrated Indigenous communities unevenly and that its distribution is not uniform across groups, which is the central message of a systematic scoping review of the population heterogeneity of diabetes among Indigenous peoples of the Americas.(1)What is missing, almost everywhere, is the link between these diabetes estimates and the foot outcomes they predict; none of these community studies reports ulcer or amputation incidence for the same population. Women from rural Guatemala who speak Mayan languages appear to have reduced odds of diabetes, hypertension and obesity, a protective association that complicates any assumption that Indigenous identity is uniformly synonymous with higher cardiometabolic risk.(23)

Clinical and social determinants

The clinical determinants of ulceration and amputation in the region repeat the pathophysiological sequence described elsewhere, but with local weight. In a cross-sectional study of 509 Mexican subjects, traditional risk factors distinguished people with diabetic neuropathy from those without it, and neuropathy remains the entry point for most ulceration.(24)Peripheral arterial disease adds the ischemic component: a registry-based study documented its prevalence and associated risk factors among Mexican patients with type 2 diabetes, and genomic ancestry appeared among the influences on the prevalence of diabetic peripheral neuropathy in admixed Brazilian individuals with type 1 diabetes, suggesting that ancestral background may modulate a complication otherwise attributed to metabolic exposure alone.(25,26) Infection and its treatment are equally consequential, because the bacterial isolates recovered from diabetic foot infections in Latin American centers show antibiotic susceptibility patterns that differ from those of other continents,

and a systematic review and meta-analysis of the region confirmed that antimicrobial resistance increasingly complicates the management of these infections.(7,8) Poor glycemic control closes the loop: it was the exposure most clearly associated with major amputation in the Guatemalan series, and a cohort of 281 adults followed in two Brazilian outpatient clinics between 2015 and 2020 quantified the incidence of amputations and its risk factors in people with diabetes.(19,27)

Social determinants shape who develops the condition and who is examined for it. In Chile, socioeconomic variables explained part of the prevalence of type 2 diabetes and of its complications, including diabetic foot and ophthalmologic complications, even under a universal health care package, and in Mexico the quality of diabetes care varied by socioeconomic level and ethnicity.(28,29) A nationwide Brazilian survey showed that the absence of a diabetic foot examination was patterned by ethnicity, and an evaluation of the adequacy of diabetes care in Brazil found that gender, race and socioeconomic profile intersect to produce unequal care.(10,30) The result is a double burden: the person at the highest biological risk is also the least likely to be screened, and because the two mechanisms are confounded, the ethnic gradient in examination must be interpreted together with, rather than apart from, socioeconomic position.(10,30) The socioeconomic profile of people admitted with diabetic foot in Belém confirmed that the hospitalized population is poor and that socioeconomic disadvantage clusters with more advanced foot presentations.(18) Culture and psychology complete the causal picture: an exploratory study in Guadalajara showed that people with diabetes and medical students hold different cultural meanings of the diabetic foot, and diabetes distress, self-care and glycemic control differed between Indigenous and non-Indigenous Mexican adults in Sinaloa, with distress acting as a measurable brake on self-care.(31,32) Behavioral and biological factors together explained the risk of diabetic foot among older adults attending mutual-help groups in Coahuila, Mexico.(33)The least standardized determinant in this axis is the cultural one, which is measured with small samples and local instruments and therefore contributes the weakest quantitative evidence.(31)

The direction of these associations is consistent even though their magnitude is not, because the exposure measures differ across studies: some rely on self-reported ethnicity, others on genomic ancestry markers, and others on area-level socioeconomic indices, which makes direct comparison of effect sizes across countries unreliable.(26,29) Infection contributes a further layer that is specific to underserved areas, where delayed presentation favors polymicrobial and resistant profiles and where empirical antibiotic choices are made without local susceptibility data.(7,8)

Barriers to care and health system factors

Distance and delay are the dominant barriers reported by rural and Indigenous patients. Ethnographic research in Oaxaca, Mexico, showed that Indigenous people with diabetic foot complications face uncertain and prolonged care trajectories, with institutional and economic obstacles that convert a treatable ulcer into a limb-threatening event.(3)The same pattern emerges from other settings: in the Kimberley region of Australia, Aboriginal people with diabetes-related foot disease described care pathways fragmented between primary and hospital services, and in a remote Cree Nation in Manitoba the lived experience of wound care was shaped by travel, cost and the distance between traditional and biomedical healing.(34,35) These qualitative accounts are supported by the preventive-care gap in Latin America, where a cross-sectional analysis of national health surveys in nine countries estimated the proportion of adults with self-reported diabetes who received an eye examination in the previous two years or a foot examination in the previous year, and found the coverage well below what the clinical standard requires.(6)In Brazil, the racial gradient in the absence of foot examination is a direct measure of who falls out of the screening system, and the intersectional analysis of diabetes care adequacy points to the same conclusion.(10,30)

Health system capacity explains why these gaps persist. Regional initiatives have trained thousands of professionals and established dedicated services, but they remain insufficient for the population at risk, and their reach into rural and Indigenous areas is not documented.(5)The implementation of a national clinical practice guideline for people with amputations in Colombia revealed that users perceive concrete barriers and facilitators that must be addressed if the guideline is to change practice, and an updated Colombian guideline for diabetes-related foot disease synthesizes current diagnostic and therapeutic technologies without, however, resolving their availability in remote settings.(36,37) The COVID-19 pandemic exposed the fragility of routine diabetes care in an Indigenous area of Guatemala, where a mixed-methods study in a Maya K'iche' health district documented disruptions to monitoring and follow-up.(38)The smallest barrier reported is the institutional one that is easiest to overlook: the absence of a validated instrument for the clinical encounter, which Brazilian nurses had to develop and validate for primary care rather

than inherit from a guideline.(39)

The consequence of these barriers is a measurable gap between need and coverage. In the nine-country survey, foot examinations in the previous year and eye examinations in the previous two years were reported by a minority of adults with self-reported diabetes, and the Brazilian analyses show that the deficit is largest precisely among the groups with the highest complication risk, so that screening is scarcest where ulceration is most likely.(6,10) The pandemic widened the same gap, because the interruption of routine monitoring in a Maya K'iche' health district of Guatemala affected exactly the follow-up that keeps a neuropathic foot from becoming an ulcerated one.(38)

Prevention, foot care and community-based management

The preventive and management interventions with published evidence in the region share a common logic: adapt the intervention to the language, culture and resources of the community, and integrate it with the existing health structure. An educational strategy for the prevention and basic care of chronic wounds in Mayan-Yucatecan Indigenous communities in Mexico addressed the high prevalence of noncommunicable diseases in rural Yucatán by embedding wound prevention in community settings.(40)An eHealth nursing intervention developed for rural Mexico aimed to increase foot self-care in people with type 2 diabetes through a pilot that adapted self-care content to the local context.(41)In the Brazilian Amazon, a qualitative study using educational videos described how users with type 2 diabetes in primary care perceived foot self-care, identifying fragile prior knowledge as a target for teaching.(42)A nursing consultation instrument for people with diabetic foot was developed and validated for primary care in Montes Claros, Brazil, to structure the clinical encounter around the person's basic needs, and a foot-ankle exercise program was designed as a contextually appropriate preventive intervention to be implemented in Brazilian primary care.(39,43) Outside the region, an Aboriginal foot care service embedded in a university podiatry program was evaluated from the community perspective using culturally appropriate methods, offering a transferable model for culturally safe foot care.(44)

Structured risk stratification and multidisciplinary teams anchor the more intensive end of prevention. The Latin American adaptation of the Saint Elian Wound Score System was developed for the triage of the diabetic foot attack, integrating classification, treatment and prognosis to reduce amputations and mortality, and it has been incorporated into international clinical practice recommendations.(45)A comparative study in a Chilean hospital found that multidisciplinary management of diabetic foot ulcers was associated with better outcomes when 111 patients managed by a team were compared with 121 historical controls managed without it, and a Colombian retrospective analysis reported wound outcomes with continuous topical oxygen therapy in hard-to-heal wounds.(46,47) Surgical and endovascular capacity modifies the endpoint: in Mexico, the incidence of major amputations secondary to diabetic foot was compared before and after the introduction of endovascular revascularization, and in a Colombian hospital the clinical-surgical treatment of diabetic foot ulcers was described across amputation and debridement groups.(48,49) The regional prevention agenda is summarized in a narrative synthesis of risk stratification, footwear, offloading, temperature monitoring and podiatric care, which situates these tools in the specific reality of Latin America, and in a rehabilitation review that proposes movement-based strategies to restore ankle mobility after ulceration.(2,50) What distinguishes the more convincing experiences in this axis is not the technology but the adaptation, because the rural Mexican eHealth intervention and the Brazilian educational videos both start from the user's prior knowledge rather than from a standard curriculum.(41,42) Rehabilitation is the least developed component, since a regional synthesis proposes movement-based strategies to restore ankle mobility after ulceration, yet few of the reviewed hospital programs report structured rehabilitation outcomes.(50)The weakest evidence in this axis belongs to the pilot and single-site interventions, which demonstrate feasibility more than effectiveness and report sustained follow-up in only a minority of cases.(41)

Outcomes, disparities and evidence gaps

Where outcomes are measured, they are sobering. A retrospective study in Mexico followed patients for five years after major amputation due to diabetic foot and identified the risk factors associated with mortality in a second-level public hospital.(51)The economic and social costs of the diabetic foot and its amputations in the Mexican population are high, driven in emerging economies by late presentation rather than by the cost of treatment itself.(52)The economic argument is not abstract: the cost of a person with diabetes in good control and without complications is far below the cost of late treatment, which is why prevention, rather than limb salvage, is the most efficient investment available to the region's health systems.(52)The gap between that logic and the

evidence base is wide, because the bibliometric analysis of the region found that research output concentrates in a few countries and leaves the rural and Indigenous burden largely undocumented.(4)In Chile, the diabetic foot amputation index was associated with indicators of care and management of type 2 diabetes in primary care centers of Santiago, and a cross-sectional analysis of 521 patients linked sociodemographic factors and tobacco use to the presence of lower-extremity amputations.(53,54) In Colombia, early outcomes after major amputation for peripheral arterial disease showed substantial 30-day morbidity and mortality, and in Argentina the prevalence of diabetic foot was measured among patients with diabetes on dialysis, a group in which foot disease and renal replacement therapy compound one another.(55,56) These outcome studies converge on a single observation: amputation is followed by death and cost, not by cure.(51)

The disparities documented in Latin America reproduce in the Indigenous populations of high-income countries, which strengthens confidence that the pattern is structural rather than incidental. A scoping review of diabetic foot complications among Indigenous peoples in Canada, conducted through a PROGRESS-Plus equity lens, found a disproportionate burden of foot ulcers, amputations and peripheral arterial disease, and a scoping review of limb preservation interventions in Oklahoma documented some of the highest amputation rates among Indigenous residents.(12,57) In the United States, rural residence and county economic distress were associated with more advanced wound, ischemia and foot infection severity at presentation, and race was associated with failure to refer patients with diabetic foot ulcers to specialists.(58,59) American Indian and Alaska Native adults had elevated rates of potentially preventable hospitalizations between 2016 and 2021, and the use of sodium-glucose cotransporter-2 inhibitors among Aboriginal people with type 2 diabetes in remote Australia was examined precisely because the population carries the world's highest burden of the disease.(60,61) The comparison with Indigenous peoples outside Latin America is useful but also marks the central gap: the Americas' Indigenous populations are heterogeneous, and consolidated foot-specific evidence for them is missing, as the scoping reviews of diabetes heterogeneity and the bibliometric analysis of the region both conclude.(1,4) The smallest outcome reported in this axis is the single-center mortality estimate, which reflects local practice rather than regional reality and calls for standard outcome reporting.(51)

Table 1. Thematic synthesis of the evidence on the diabetic foot in Indigenous and rural communities of Latin America.

Axis	Key findings	Representative studies
Epidemiology and burden	Amputation is a persistent population-level outcome, including in rural and remote states; diabetes is documented in Indigenous communities but foot-specific estimates are scarce	Amazonas and Ceará time series; Brazil 13-year amputation analysis; Guatemala El Petén series
Clinical and social determinants	Neuropathy, peripheral arterial disease, infection and poor glycemic control drive ulceration; ethnicity, income and rurality shape risk and examination coverage	Mexican neuropathy and PAD studies; Brazilian foot-examination surveys; Chilean socioeconomic analysis
Barriers to care	Distance, delay and fragmented pathways precede amputation; preventive examinations reach a minority of people with diabetes	Oaxaca ethnographic study; nine-country preventive-care survey; Colombian guideline implementation
Prevention and management	Culturally adapted education, risk stratification and multidisciplinary teams show promise but rest on pilots and observational comparisons	Mayan-Yucatecan education; eHealth pilot in rural Mexico; Chilean multidisciplinary comparison
Outcomes and gaps	Amputation-related mortality and costs are high; disparities reproduce in Indigenous groups outside the region; foot-specific evidence for Indigenous populations of the Americas is missing	Mexican five-year mortality study; Canadian and US scoping reviews; Americas heterogeneity review

Note: LEA = lower-extremity amputation; DFU = diabetic foot ulcer.

Table 2. Determinants and barriers reported across clinical, social and structural levels.

Level	Reported factor	Direction and supporting evidence
Clinical	Neuropathy, PAD, infection, poor glycemic control	Increase ulceration and amputation risk in Mexican, Brazilian and Guatemalan series
Social	Low income, ethnicity, rural residence, language	Reduce foot examination coverage and quality of care in Chile, Mexico and Brazil
Cultural and psychological	Cultural meanings of the foot, diabetes distress	Modulate self-care and care-seeking in Mexican Indigenous and non-Indigenous adults
Structural	Distance, fragmented pathways, workforce, guideline implementation	Delay care and limit limb salvage in Oaxaca, the Brazilian Amazon and Colombia

Note: PAD = peripheral arterial disease; DFI = diabetic foot infection.

Table 3. Prevention and management approaches with published evidence in the reviewed settings.

Approach	Setting	Evidence reported
Community education on wound prevention	Mayan-Yucatecan communities, Mexico	Educational strategy embedded in community settings
eHealth self-care intervention	Rural Mexico	Pilot development for foot self-care in type 2 diabetes
Risk stratification with SEWSS	Latin America	Triage system integrated into international recommendations
Multidisciplinary management	Chile	Comparison of 111 team-managed patients with 121 historical controls
Foot-ankle exercise and nursing consultation	Brazil	Preventive program and validated instrument for primary care
Revascularization and topical oxygen	Mexico and Colombia	Amputation incidence before and after endovascular therapy; wound outcomes

Note: SEWSS = Saint Elian Wound Score System; MMD = multidisciplinary management

DISCUSSION

The main finding of this synthesis is that the diabetic foot in Indigenous and rural communities of Latin America is a burden that is measured mostly through amputation, driven by the same clinical determinants as elsewhere but amplified and unequally managed by distance, poverty and ethnicity, and addressed by interventions whose evidence is still concentrated in pilots rather than in scaled programs. The convergence across countries, from Amazonas to Oaxaca to El Petén, is that amputation appears as the most reliably recorded endpoint while ulceration, the event that precedes it, remains largely invisible in administrative data.(3,14,19)This mirrors the situation described for Indigenous peoples in Canada and Australia, where diabetes-related foot complications are disproportionately frequent and where service-level studies repeatedly identify fragmented care pathways as the proximal cause of late presentation.(12,34)

The findings agree with the regional literature on most points. The role of neuropathy and peripheral arterial disease as the entry conditions for ulceration is consistent with Mexican registry and cross-sectional data, and the influence of genomic ancestry on neuropathy in admixed Brazilians adds a layer that urban, single-ancestry studies cannot see.(24-26)The socioeconomic gradient is likewise consistent across designs: Chile, Mexico and Brazil all show that income, ethnicity and residence determine who is examined and who is treated, regardless of the type of health system involved.(10,28,29)The protective association between speaking a Mayan language and cardiometabolic risk in rural Guatemalan women is the main divergence from the expected pattern, and it warns against treating Indigenous identity as a single, uniformly adverse exposure; language may proxy for social cohesion, subsistence practices or reduced acculturation rather than for biology.(23)This nuance matters for service design, because interventions built on a deficit model will miss the protective resources that communities already hold.

Comparing these findings with Indigenous populations outside Latin America is instructive in both directions. Studies from Oklahoma, Manitoba and remote Australia describe the same triad of

distance, workforce shortage and cultural mismatch, and they also provide the clearest examples of culturally safe service models, from yarning-based evaluation of an Aboriginal foot care service to co-created wound care research with a Cree Nation, and to proposals that integrate traditional Indigenous and Western health models in amputation care.(35,44,57,62)The United States evidence on rural economic distress and on referral disparities by race shows that the gradient is not unique to Latin America and that failure to refer, not only failure to attend, drives the difference in limb outcomes.(58,59) Conversely, the Latin American literature contributes what the North American literature tends to lack: population-level amputation time series and spatial analyses that map the burden onto territory.(13-15)

Several mechanisms plausibly explain these findings. Late presentation in emerging economies is driven more by the cost of delayed care than by the cost of treatment, which concentrates the economic burden at the most severe end of the pathway.(52)Antimicrobial resistance in diabetic foot infections raises the stakes of every delay, because an infection that would have responded to first-line therapy becomes harder to control the longer it is untreated.(7,8) The psychological mechanism is equally important: diabetes distress dampens self-care and glycemic control among Indigenous and non-Indigenous Mexican adults alike, which suggests that surveillance and education alone will not suffice without attention to mental health.(32)The workforce mechanism is equally concrete: where there is no podiatrist and no validated instrument, the foot examination does not happen, which is why instruments such as the Brazilian nursing consultation and the implementation work around the Colombian guideline are prerequisites for any equity strategy rather than optional refinements.(36,39) Finally, the health system mechanism is implementation: guidelines exist and are updated, as in Colombia, but their translation into practice depends on the barriers and facilitators perceived by end-users, which are rarely the focus of the clinical literature.(36,37)

Compared with previous reviews, this synthesis adds a population focus that the existing regional literature lacks. The available syntheses either quantify the diabetic foot across Latin America without separating rural and Indigenous populations, or describe Indigenous diabetes without reaching the foot.(1,4) A regional narrative on prevention situates tools such as offloading and temperature monitoring in Latin America but does not assess their reach into remote communities, and a rehabilitation review addresses the ankle after ulceration rather than the community before it.(2,50) This review therefore complements rather than repeats those works, by asking where the Indigenous and rural patient falls through the system and by organizing the answer around the axes of burden, determinants, barriers, management and outcomes.(3)

This review has limitations that follow from its narrative design and from the available evidence. First, the search was not exhaustive and did not screen gray literature, so programmatic reports from ministries and nongovernmental organizations are underrepresented; a future synthesis should pair bibliographic databases with institutional repositories. Second, most included studies are cross-sectional, retrospective or ecological, and the qualitative work is concentrated in a few sites, which limits causal inference and generalizability; prospective cohort studies with foot outcomes in Indigenous communities would address this directly. Third, the reliance on administrative amputation data means that ulceration, the earlier and more preventable event, is undercounted; standardized registration of foot examinations and ulcer incidence, following the example of the Brazilian foot-examination analyses, would correct the numerator.(10)Fourth, the exclusion of Peru as a focal case narrows the Andean representation, and language barriers mean that some Portuguese and Spanish evidence may be missed despite the bilingual search. A further limitation is publication bias, since null findings on community programs are less likely to appear in indexed journals, and the programmatic recovery of abstracts means a minority of records could not be examined in full.(4)Each of these limitations points to a concrete remedy rather than to a generic call for more research. The strengths of the review are its bilingual and region-specific search, its reliance on verified bibliographic records, and its organization around a vulnerable population rather than around a single procedure, which allowed the comparison of evidence across countries and designs.(4)

The practical implications follow from the synthesis. Health services should measure the diabetic foot through ulceration and amputation indicators disaggregated by ethnicity and rurality, because the current reliance on amputation alone hides the preventable stage.(13,14) Primary care should embed culturally adapted foot examination and self-care education, as the Mayan-Yucatecan strategy and the Brazilian nursing consultation illustrate, and should use validated instruments rather than ad hoc questions.(39,40) Referral systems need explicit equity safeguards, since failure to refer contributes to limb loss independently of clinical severity.(59)Risk stratification with a regional tool such as the Saint Elian system can concentrate scarce surgical resources on the patients most likely to benefit.(45)Finally, any scale-up should be evaluated, because the current

evidence base consists overwhelmingly of pilots whose effectiveness beyond feasibility is not yet established.(41,46)

An agenda that follows from these gaps would combine three elements. Community-anchored surveillance should register ulceration, not only amputation, and should disaggregate it by ethnicity and place of residence, using the Brazilian foot-examination analyses as the template for a numerator that is currently missing.(10,13) Culturally grounded self-care programs should be co-designed with the communities they serve, as the Mayan-Yucatecan educational strategy and the eHealth pilot in rural Mexico began to do, and should be evaluated with the same rigor as clinical interventions so that feasibility does not remain the only outcome reported.(40,41) Equity-oriented referral and revascularization pathways should incorporate explicit safeguards, because failure to refer contributes to limb loss independently of clinical severity, and because the before-and-after revascularization evidence in Mexico suggests that access to the procedure changes the amputation endpoint.(48,59) None of these steps requires technology that the region does not already have; they require disaggregated data, community participation and the political decision to measure the foot as a marker of equity in diabetes care.(29)

CONCLUSIONS

The diabetic foot in Indigenous and rural communities of Latin America is a persistent amputation-driven burden that administrative and hospital data capture better than the ulceration that precedes it, and its foot-specific magnitude in Indigenous groups remains unquantified. Clinical determinants such as neuropathy, peripheral arterial disease, infection and poor glycemic control are compounded by socioeconomic position, ethnicity and rural residence, which shape both exposure and the receipt of preventive care. Rural and Indigenous patients experience distance, delay and fragmented pathways, and preventive examinations reach only a minority of people with diabetes, while culturally adapted education, risk stratification and multidisciplinary teams remain pilot-level evidence rather than scaled practice. Amputation-related mortality and costs are high and disparities reproduce across countries, and the central gap is the absence of consolidated, foot-specific evidence for the heterogeneous Indigenous populations of the Americas, which community-anchored surveillance and equity-oriented care should now close.

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