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ORIGINAL

Mortality from diabetes with peripheral circulatory complications in Mexico, Colombia and Chile

Mortalidad por diabetes con complicaciones circulatorias periféricas en México, Colombia y Chile

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ABSTRACT

Introduction: Diabetes mellitus is a leading cause of death in Latin America, yet mortality specifically attributed to diabetes with peripheral circulatory complications has not been compared across countries of the region. Methods: Ecological time-series study of deaths recorded between 2000 and 2023 in Mexico, Colombia and Chile with underlying cause coded as diabetes with peripheral circulatory complications (ICD-10 E10.5, E11.5, E12.5, E13.5 and E14.5), using the WHO Mortality Database and World Bank population estimates. Results: The three countries recorded 55,871 deaths. Crude rates rose before 2018 in Mexico and Colombia and fell in Chile. Males predominated in Mexico and Chile, whereas females predominated in Colombia, and deaths concentrated at ages 65 and over. Conclusions: Mortality from diabetes with peripheral circulatory complications followed divergent trends and distinct age and sex profiles across the three countries, which should guide risk stratification and foot care planning.

Keywords: diabetes mellitus; peripheral vascular diseases; mortality; diabetic foot; Latin America; cause of death.

RESUMEN

Introducción: La diabetes mellitus es una de las principales causas de muerte en América Latina, pero la mortalidad atribuida específicamente a la diabetes con complicaciones circulatorias periféricas no se ha comparado entre países de la región. Métodos: Estudio ecológico de series temporales de las defunciones registradas entre 2000 y 2023 en México, Colombia y Chile con causa básica codificada como diabetes con complicaciones circulatorias periféricas (CIE-10 E10.5, E11.5, E12.5, E13.5 y E14.5), con la base de mortalidad de la OMS y estimaciones de población del Banco Mundial. Resultados: Los tres países registraron 55 871 defunciones. Las tasas crudas aumentaron antes de 2018 en México y Colombia y descendieron en Chile. Predominaron los varones en México y Chile y las mujeres en Colombia, y las defunciones se concentraron en personas de 65 años o más. Conclusiones: La mortalidad por diabetes con complicaciones circulatorias periféricas siguió tendencias divergentes y perfiles de edad y sexo distintos entre los tres países, lo que debería orientar la estratificación del riesgo y la planificación de la atención del pie.

Palabras clave: diabetes mellitus; enfermedades vasculares periféricas; mortalidad; pie diabético; América Latina; causa de muerte.

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INTRODUCTION

Diabetes mellitus imposes a heavy and still rising burden of disease in Latin America, where age-standardized prevalence now exceeds the global average and where the cascade of diabetes care remains incomplete in most countries.(1,2) A large share of that burden falls on the lower limb. Chronic hyperglycemia drives peripheral arterial disease, sensory neuropathy and foot ulceration, and these complications in turn precede soft tissue infection, gangrene and amputation, a sequence that converts a metabolic disease into a source of disability, limb loss and death.(3)The human and economic weight of nonhealing diabetic wounds is recognized worldwide, and the lower limb is its principal anatomical site.(4)Mortality analyses for the region show that diabetes ranks among the leading underlying causes of death and that its contribution to years of life lost remains substantial in Mexico, Colombia and Chile.(5,6) Systematic reviews likewise indicate that lower limb amputation remains a frequent and mortality-associated outcome among people with diabetes in low- and middle-income countries, including those of Latin America.(7,8) The three countries studied here illustrate the heterogeneity of the region: Mexico combines one of the highest diabetes prevalence levels with a large burden of lower-limb complications in working-age adults, Colombia shows marked regional and educational inequalities in diabetes mortality, and Chile has achieved sustained declines in diabetes death rates over three decades.(9-11)The tenth revision of the International Classification of Diseases has been in use in all three countries since the late 1990s, so the codes needed to track this complication are available for a quarter of a century, yet they have rarely been assembled into a dedicated mortality indicator for the region.

The tenth revision of the International Classification of Diseases distinguishes diabetes mellitus with peripheral circulatory complications as a specific group of four-character codes: E10.5, E11.5, E12.5, E13.5 and E14.5.(12)These codes identify deaths in which peripheral vascular disease of the lower limb, diabetic foot or gangrene is the complication recorded on the death certificate, and they therefore capture a clinically distinct and potentially preventable subset of diabetes mortality rather than all diabetes deaths. Because the fifth character .5 is shared across the diabetes types, the group can be assembled from routine vital statistics without ambiguity and compared across settings that use the tenth revision. National analyses of death certificates have described overall diabetes mortality trends in Colombia and Chile, and studies in Mexico have quantified premature mortality among adults with type 2 diabetes and the frequency of diabetes-related major amputations.(9,11,13,14)Work from the United States using the equivalent cause-of-death codes has documented socioeconomic and demographic disparities in mortality from peripheral circulatory complications of diabetes, which shows that this subset of deaths deserves attention in its own right and is measurable from routine vital statistics.(15)

What remains unknown is how this specific outcome has behaved across Latin American countries, where coding practices, health systems and the organization of diabetes and foot care differ substantially. No study has compared the temporal, age and sex patterns of mortality attributed to diabetes with peripheral circulatory complications across Mexico, Colombia and Chile using a single common data source and a consistent case definition. The objective of this study was to describe temporal trends and age, sex and cross-country patterns of mortality from diabetes with peripheral circulatory complications in Mexico, Colombia and Chile between 2000 and 2023. Establishing these patterns matters because the three countries are increasingly used as reference points for diabetes policy in the region, and because the specific codes for peripheral circulatory complications are directly relevant to podiatric and vascular services even though they remain underused in regional surveillance.

METHODS

This was an ecological time-series study of national mortality records, in which the unit of analysis was the country-year. The reporting followed the Strengthening the Reporting of Observational Studies in Epidemiology statement adapted to routine administrative data. The three countries were chosen because they are the largest Latin American countries with continuous, comparably coded vital registration data available in the international source used here, and because they span the range of diabetes burden and health system organization seen in the region. Mexico and Colombia represent high-burden, middle-income health systems with large public insurance populations, whereas Chile represents a higher-income system with near-universal coverage and a longer history of cardiovascular risk-factor control. The ecological design is appropriate because the exposure of interest is the country and its health system, and because individual-level follow-up

of an entire national population over two decades is not feasible for this outcome.

Deaths were obtained from the WHO Mortality Database, which compiles official national vital statistics transmitted to the World Health Organization by the competent authorities of each country and publishes them in a harmonized format.(16)The database distributes cause-of-death counts by country, year, sex and age group in comma-separated files named Morticd10, organized in six parts according to calendar year, and it is freely downloadable without registration. Each record carries the country code, the calendar year, the cause list, the cause code, the sex and the distribution of deaths across age groups.

The records use the underlying cause of death as coded by the national authority according to the International Classification of Diseases, tenth revision, where the underlying cause is defined as the disease or injury that initiated the chain of morbid events leading directly to death.(12) The detailed cause list of the database, list 104, includes third- and fourth-character codes, which permitted the identification of diabetes with peripheral circulatory complications.

The case definition comprised deaths whose underlying cause was coded E10.5, E11.5, E12.5, E13.5 or E14.5, corresponding respectively to type 1, type 2, malnutrition-related, other specified and unspecified diabetes mellitus with peripheral circulatory complications. These four-character codes share the fifth position of the tenth revision, which designates the presence of peripheral circulatory complications, and they were summed into a single outcome for the main analysis. All diabetes deaths were defined as the sum of all codes E10.0 to E14.9 for the same period, and they served as the denominator for the share of diabetes mortality attributable to peripheral circulatory complications. The three countries were identified by their database country codes: 2310 for Mexico, 2130 for Colombia and 2120 for Chile. The study period was 2000 to 2023, the most recent year with complete data for the three countries. Population denominators were taken from the World Bank indicators of total population and population aged 65 years and over for the same years and countries, which provide mid-year estimates for every year of the series.(17)

Deaths were extracted by country, calendar year, sex and age group, with sex coded as male, female or unspecified. The three countries report deaths in two age formats of the database, one with single-year ages under 5 years and one with a combined group from 1 to 4 years; both formats were reconciled into five common bands, 0 to 44, 45 to 64, 65 to 74, 75 to 84 and 85 years and over, by summing the corresponding columns, so that the age comparison rests on identical boundaries in the three countries. Deaths with unspecified sex or unspecified age were rare and were excluded only from the sex- and age-specific calculations while remaining in the total counts. Annual deaths were summed and crude mortality rates per 100,000 population were computed for the whole period and for five-year periods: 2000 to 2004, 2005 to 2009, 2010 to 2014, 2015 to 2019 and 2020 to 2023.

Crude rather than age-standardized rates were used as the primary measure because the open international sources do not provide fine-grained age-specific population denominators for every year and country, and the crude rate is the measure directly comparable with the published national statistics of the three countries. The rate among persons aged 65 and over was added because most of these deaths occur at older ages and because this stratum has a well-defined denominator in the international sources, which allows a partial correction for the differing age structures of the three populations. Trends were summarized with the average annual percent change estimated from a log-linear regression of the annual crude rate on calendar year, with 95% confidence intervals derived from the standard error of the regression coefficient. Inspection of the annual series revealed a step decrease in recorded deaths in 2018 in Mexico and Chile and in 2019 in Colombia, a pattern consistent with changes in death certification and, later, with the COVID-19 pandemic rather than with a genuine and sudden fall in the underlying disease. The primary trend estimate was therefore computed over 2000 to 2017, the period of comparable certification, and the full-series estimate over 2000 to 2023 was retained as a sensitivity measure. The age and sex structure of deaths was described with absolute counts, percentages and the male to female ratio. Premature mortality was defined as deaths before age 65, and the rate per 100,000 among persons aged 65 years and over was computed as a complementary measure that limits the effect of population ageing on the crude comparison. Mean age at death was approximated from age-group midpoints. All analyses were performed with Python 3 using the pandas and numpy libraries, and the analysis script was executed twice to confirm that the resulting metrics were identical.

The three countries reported the four-character diabetes codes for every year of the study window, with no year missing for either sex. Colombia used the combined age format for the most recent years, which was accommodated in the age reconciliation described above. One death had unspecified sex and fewer than 30 deaths had unspecified age across the whole period, and neither affected the substantive conclusions. The total counts for each cause were checked against the

sum of the age-specific columns, and no duplicate records were found. Population denominators were available for every country-year, so the crude rates are free of missing denominators and no imputation was required.

The four-character codes were interpreted as deaths in which diabetes and a peripheral circulatory complication were jointly recorded, with the complication as the direct manifestation leading to death. This is not a measure of all deaths among people with diabetes, nor of all diabetic foot or amputation deaths, some of which will be coded under sepsis, cardiovascular or renal causes. The indicator therefore measures a specific and conservative subset of diabetes mortality, and its value lies in comparability across countries that share the same classification rather than in exhaustiveness. The share of all diabetes deaths represented by the codes was reported precisely to make this subset explicit to the reader.

RESULTS

Between 2000 and 2023 the three countries recorded 55,871 deaths from diabetes with peripheral circulatory complications. Mexico accounted for 34,458 deaths, Colombia for 13,032 and Chile for 8,381. The pooled total rose from 9,331 deaths in 2000-2004 to 14,929 in 2015-2019, before falling to 6,479 in 2020-2023.

Table 1. Deaths from diabetes with peripheral circulatory complications, by country and five-year period, 2000-2023.

Period	Mexico	Colombia	Chile	Total
2000-2004	4793	2263	2275	9331
2005-2009	6063	2622	1956	10641
2010-2014	9023	3605	1863	14491
2015-2019	9901	3571	1457	14929
2020-2023	4678	971	830	6479
2000-2023 total	34458	13032	8381	55871

Note: ICD-10 codes E10.5, E11.5, E12.5, E13.5 and E14.5. A step decrease in recorded deaths occurred in 2018 (Mexico and Chile) and 2019 (Colombia); figures for 2015-2019 and 2020-2023 should be interpreted with caution.

Crude mortality rates rose in Mexico and Colombia before 2018 and declined throughout the period in Chile. Between 2000 and 2017 the rate increased on average 5.70% per year in Mexico (95% CI 4.90 to 6.50) and 3.40% per year in Colombia, while it fell −3% per year in Chile. A step decrease followed, from 2,643 to 1,073 deaths in Mexico in one year and from 872 to 200 in Colombia.

Males accounted for 28,934 of the recorded deaths and females for 26,936. The male to female ratio was 1.16 in Mexico and 1.28 in Chile, whereas deaths in women exceeded those in men in Colombia, with a ratio of 0.79.

Table 2. Crude mortality rate per 100,000 population from diabetes with peripheral circulatory complications, by country and five-year period, 2000-2023.

Period	Mexico	Colombia	Chile	Total
2000-2004	0.9	1.1	2.9	1.2
2005-2009	1.1	1.2	2.3	1.3
2010-2014	1.5	1.6	2.1	1.6
2015-2019	1.6	1.5	1.6	1.6
2020-2023	0.9	0.5	1.1	0.8

Note: Rates per 100,000 inhabitants. Discontinuity after 2018-2019 as in Table 1. Source: Elaborated from the WHO Mortality Database and World Bank population estimates.

Table 3. Deaths from diabetes with peripheral circulatory complications by sex, 2000-2023.

Country	Male (n)	Female (n)	Total (n)	Male:female ratio	Male (%)
Mexico	18488	15969	34457	1.16	53.7
Colombia	5746	7286	13032	0.79	44.1
Chile	4700	3681	8381	1.28	56.1
Total	28934	26936	55870	1.07	51.8

Note: One death with unspecified sex (Mexico, 2003) is not shown; totals in this table therefore sum to 55,870. Source: Elaborated from the WHO Mortality Database.

Deaths concentrated at older ages: ages 65 and over contributed 64.80% of deaths in Mexico, 74.20% in Colombia and 82.20% in Chile. The 45 to 64 band was the largest single group in Mexico, while the 75 to 84 band predominated in Colombia and Chile.

Type 2 diabetes coded E11.5 was the leading subtype in Mexico, with 21,134 deaths, and in Chile, with 3,241 deaths, whereas unspecified diabetes coded E14.5 predominated in Colombia, with 8,708 deaths. The peripheral circulatory complication codes represented 1.70% of all diabetes deaths in Mexico, 7.20% in Colombia and 9.70% in Chile.

Table 4. Deaths from diabetes with peripheral circulatory complications by age group, 2000-2023.

Age group (years)	Mexico	Colombia	Chile
0-44	1386 (4.0%)	286 (2.2%)	77 (0.9%)
45-64	10719 (31.1%)	3061 (23.5%)	1419 (16.9%)
65-74	9475 (27.5%)	3494 (26.8%)	2271 (27.1%)
75-84	8848 (25.7%)	3894 (29.9%)	2992 (35.7%)
85 and over	4002 (11.6%)	2278 (17.5%)	1622 (19.4%)
Total	34458	13032	8381

Note: Percentages are row proportions of each country's total. Age was unspecified in fewer than 30 deaths overall and is not shown. Source: Elaborated from the WHO Mortality Database.

Table 5. Deaths from diabetes with peripheral circulatory complications by ICD-10 subtype and share of all diabetes deaths, 2000-2023.

ICD-10 code	Mexico	Colombia	Chile
E10.5 (Type 1 diabetes)	542	569	142
E11.5 (Type 2 diabetes)	21134	3708	3241
E12.5 (Malnutrition-related diabetes)	739	45	107
E13.5 (Other specified diabetes)	7	2	27
E14.5 (Unspecified diabetes)	12036	8708	4864
Total E10.5-E14.5	34458	13032	8381
Share of all diabetes deaths (%)	1.7	7.2	9.7

Note: All diabetes deaths comprise ICD-10 codes E10-E14. Share is the proportion of total diabetes deaths coded with a peripheral circulatory complication. Source: Elaborated from the WHO Mortality Database.

Deaths before age 65 comprised 35.10% of the total in Mexico, compared with 25.70% in Colombia and 17.80% in Chile. In 2023 the rate per 100,000 among persons aged 65 and over was 6.30 in Mexico, 4 in Colombia and 4.90 in Chile.

Table 6. Premature mortality and mortality at older ages from diabetes with peripheral circulatory complications, 2000-2023.

Country	Deaths before 65 (n)	Deaths before 65 (%)	Deaths at 65+ (n)	Deaths at 65+ (%)	Rate per 100,000 at 65+ (2023)	Mean age at death (years)
Mexico	12105	35.1	22325	64.8	6.3	67.9
Colombia	3347	25.7	9666	74.2	4.0	71.5
Chile	1496	17.8	6885	82.2	4.9	74.1

Note: Premature deaths are those before age 65. The rate at 65+ uses 2023 population aged 65 and over. Mean age at death is approximated from age-group midpoints. Source: Elaborated from the WHO Mortality Database and World Bank population estimates.

DISCUSSION

This study set out to describe how mortality from diabetes with peripheral circulatory complications evolved in Mexico, Colombia and Chile and how age, sex and cross-country patterns compared. The three countries accumulated 55,871 deaths over twenty-four years, but the direction of the trend, the sex distribution and the age profile differed markedly among them, which indicates that this cause of death should not be treated as a single homogeneous problem across Latin America. The findings matter for clinical practice because they locate the mortality burden in different segments of the population in each country, and they matter for surveillance because they show that a routine four-character code can be assembled into a comparable regional indicator. The comparison also demonstrates that a specific cause-of-death code can generate policy-relevant stratification without linkage to individual clinical records, a practical advantage for countries with fragmented health information systems, and it offers a reproducible template that any country reporting the tenth revision could apply to its own mortality files.

The mortality endpoint examined here is the final stage of a well-characterized clinical cascade. Global meta-analyses estimate that a substantial proportion of people with diabetes develop a foot ulcer during their lifetime, that ulcers recur in the majority of patients after healing, and that ulceration is the principal pathway to major amputation.(3,8) Wounds that fail to heal impose a heavy human and economic cost, and once amputation occurs, survival is shorter than for many cancers, which is why mortality rather than incidence alone is the informative outcome for services.(4,7) In Latin America, where access to structured foot care is uneven, the burden of ulceration and amputation is concentrated in the same populations that show high diabetes mortality, so a cause-of-death indicator that captures the peripheral circulatory complication provides a complementary, population-wide view of a problem that hospital-based series can only sample.

The rising pre-2018 trends observed in Mexico and Colombia are consistent with the general trajectory of diabetes mortality described for the region in multi-country analyses of the Americas, which reported increasing diabetes death rates through the 2010s before a partial plateau.(5) The Mexican pattern also agrees with the excess premature mortality documented among adults with type 2 diabetes in Jalisco, where cardiovascular and metabolic complications accounted for a large fraction of years of life lost, and with the growth of diabetes-related major amputations registered over a decade in that country.(9,14) In Colombia the increase documented here parallels the stagnation of overall diabetes mortality and its association with educational and regional inequalities reported from death certificates and municipal spatial analyses.(10,13,18) The steady decline recorded in Chile is concordant with national data showing falling diabetes mortality between 1990 and 2020, attributed in part to earlier diagnosis and improved metabolic control.(11) Even so, the three countries started from different levels, and Chile remained above Mexico and Colombia on the crude rate for most of the period before converging by 2015 to 2019, which suggests that absolute risk and its direction of change can diverge within the same region. The convergence also coincides with the regional rise in obesity and high body-mass index documented for the Americas, which may have slowed the relative improvement of Chile while accelerating the Mexican and Colombian rates.(1) The incomplete cascade of diabetes care across the region, from diagnosis to treatment and control, provides a further explanation for why trends differ even among countries with comparable income levels.(2) The comparison of three countries with different baseline risk therefore illustrates that a single regional average would conceal the opposing trends that this indicator is designed to reveal.

The abrupt fall in recorded deaths in 2018 in Mexico and Chile and in 2019 in Colombia cannot

be read as a genuine improvement in survival. Multiple-cause-of-death studies in Colombia and Brazil and in Switzerland have shown that certification practices changed during this window and that the COVID-19 pandemic displaced diabetes and other chronic conditions from the underlying cause on many certificates.(19,20) International analyses of monthly mortality found that recorded diabetes deaths fell or were displaced in several countries during 2020 and 2021 while excess all-cause mortality rose, which is the same pattern visible in the 2020 to 2023 period of these series.(21,22) The primary trend was therefore estimated only through 2017, and the post-2018 figures are best regarded as a lower bound of the true burden rather than as evidence of declining disease. Surveillance systems that monitor this indicator should treat the certification break explicitly and avoid reporting unadjusted year-on-year changes across it. The use of multiple-cause-of-death data or the linkage with hospital discharge records would mitigate this limitation in future updates, as the Colombian and Swiss examples demonstrate.(19,20)

The sex pattern separated Colombia from the other two countries. Male predominance in Mexico and Chile is in line with the excess of diabetes-related amputations and vascular complications generally reported in men, while the female predominance in Colombia mirrors the sex gradient documented in that country's diabetes mortality, where women have shown higher death rates over several decades.(13) Prediabetes and early-onset type 2 diabetes studies in Mexico and the Americas also describe sex-specific mortality risks that vary with age and glycemic status, which cautions against assuming a single sex pattern across the region.(23,24) The reasons for the Colombian inversion are not established, but they may combine a higher prevalence of diabetes in women, differential access to glycemic and foot care, and certification habits, and they deserve specific study rather than extrapolation from North American or European cohorts. The stability of the Colombian sex ratio across the twenty-four years of observation argues against a transient coding artefact and in favor of a genuine epidemiological difference, whereas the parity between the sexes in the pooled total underlines that regional summaries mask national specificities. Sex-disaggregated surveillance is therefore not an optional refinement but a necessary condition for interpreting this indicator correctly in the region.

The age distribution adds a second layer of contrast. Mexico showed the largest share of deaths before age 65, close to one third of the total, which agrees with the substantial premature mortality reported in Mexican cohorts and with the high proportion of amputations occurring in working-age adults in that country.(9,14) Colombia and Chile concentrated deaths at ages 75 and over, and the higher mean age at death in Chile is consistent with its older population structure. The difference in mean age at death, from 67.90 years in Mexico to 74.10 years in Chile, quantifies the same gradient and cannot be attributed to population ageing alone, because the distribution of deaths itself, not just of the population, differed between the countries. The higher rate among persons aged 65 and over in Mexico also shows that the Mexican excess is not an artefact of a younger population, since the gap persists when attention is restricted to the oldest stratum. The share of peripheral circulatory complications within all diabetes deaths was also lower in Mexico than in Colombia and Chile, which suggests that in Mexico a larger part of diabetes mortality is assigned to other complications or to unspecific codes, whereas in Colombia and Chile the peripheral circulatory complication is more frequently the recorded manifestation of fatal diabetes.

Several mechanisms can explain why this complication carries such a high fatality rate. Peripheral arterial disease in diabetes is typically diffuse and distal, which limits revascularization and promotes tissue loss, while sensory and autonomic neuropathy removes the protective warning of injury and impairs skin and bone healing.(3) Ulceration then provides a portal for deep infection and sepsis, and the metabolic stress of infection further destabilizes glycemic control and unmasks coronary and cerebrovascular disease, so that death often results from sepsis, cardiovascular events or renal failure rather than from the foot lesion itself.(4,25) This pathway is the same one documented in amputation cohorts, in which mortality after amputation remains very high, and it supports reading the four-character codes as a marker of advanced, multisystem vascular disease rather than as a purely local foot problem.(26,27)

These estimates are directly comparable with work from the United States, where the equivalent ICD-10 codes have been used to document disparities in peripheral circulatory complication-related mortality over a similar period.(15) The much larger absolute numbers in Mexico relative to Colombia and Chile reflect population size, but the higher share of all diabetes deaths coded with this complication in Colombia and Chile points to real differences in certification and possibly in the clinical presentation of diabetes. Death-certificate analyses of related endocrine causes have likewise shown that coding of diabetes complications varies across countries and over time, and methodological critiques of these cause-specific estimates warn against overinterpreting small year-to-year changes.(28,29) The consistency of the regional estimates with the United States series,

despite different certification systems, supports the face validity of the construct as a cross-national indicator. The distribution across subtypes is also informative, because the predominance of type 2 diabetes codes in Mexico and Chile reflects the epidemiology of the disease in those countries, whereas the predominance of the unspecified code in Colombia points to less specific certification that could either dilute or concentrate the true burden of the specific complication.

The clinical relevance of the construct rests on its association with amputation and vascular disease. Studies of lower limb amputation show that mortality after amputation remains very high, that reamputation carries an additional risk and that peripheral arterial disease worsens survival independently of glycemic control.(25-27) The progression from minor to major amputation is frequent in patients with diabetes and peripheral arterial disease, risk scores have been developed to identify the patients at highest hazard, and revascularization is associated with better limb outcomes, which reinforces the value of preventing the peripheral circulatory complications counted in these series.(30-32) Glucose-lowering and cardiovascular therapies with favorable limb effects may also reduce this burden.(33,34) In Latin America specifically, the weight of diabetic foot and of major amputation is documented across countries, and dedicated triage systems, distal revascularization and control of foot infection have been proposed to reduce it.(7,8,35-37) Each death counted by these codes is therefore the terminal event of a preventable pathway, and the divergent national profiles imply that the entry point for prevention also differs across the three countries. The high recurrence of foot ulcers after healing further argues for sustained surveillance of the same patients over years, rather than single episodes of acute care, if the mortality endpoint is to be moved.

For podiatric and vascular services, the practical reading of these patterns is straightforward. In Mexico the younger age profile and the rise through 2017 argue for systematic foot screening of middle-aged adults with type 2 diabetes, early referral for revascularization and amputation prevention in secondary care. In Colombia the female predominance and the reliance on unspecified coding argue for improving the specificity of death certification and for targeting foot care programs at older women. In Chile the sustained decline suggests that a mature system of diabetes care can compress this mortality, and the remaining burden lies mainly in the oldest age groups, where multidisciplinary foot protection and end-of-life vascular decisions become central. These service implications align with the regional consensus on the preventive management of cardiovascular complications of diabetes and with the Latin American triage and revascularization initiatives already in place.(35,36,38) A comparable indicator, updated annually from the same open source, could serve as a simple dashboard for podiatric programs that need a population-level outcome against which to judge the effect of foot screening and ulcer prevention.

The main strengths of this study are the use of a single harmonized international database, the complete national coverage of deaths, a twenty-four-year period that allows trend estimation, and the explicit handling of the certification discontinuity. The main limitations are those inherent to death-certificate data: the underlying cause is assigned by different national coding systems, the fourth character is not always recorded, and the 2018 to 2019 break precludes a single continuous trend estimate. Taken together with the absence of subnational detail in the international database and with the socioeconomic gradients already documented in the region, these limitations recommend that future studies link these codes to hospital and amputation registries and to national mortality microdata, where regional patterns within each country can be examined.(10,39) As an ecological analysis, the study also cannot link the country-level patterns to individual risk factors or outcomes, and its findings describe and compare populations rather than predict the fate of any single patient, a boundary that should be respected when the results are translated into clinical decisions. In turn, the findings support risk stratification that prioritizes middle-aged adults in Mexico and older adults in Chile, and sex-specific prevention in Colombia, within integrated diabetic foot care programs guided by regional consensus on cardiovascular complications of diabetes.(38) Only by reading this specific cause-of-death group as a distinct and preventable endpoint can podiatric and vascular services be allocated where the mortality burden actually concentrates.

CONCLUSIONS

Mortality from diabetes with peripheral circulatory complications increased in Mexico and Colombia and decreased in Chile during the comparable period from 2000 to 2017, before a certification-related discontinuity that must be interpreted with caution. The sex profile favored men in Mexico and Chile and women in Colombia, and the age profile was younger in Mexico than in the other two countries. The share of all diabetes deaths represented by this complication also differed across countries, and these patterns should inform risk stratification and the organization

of diabetic foot prevention. Annual updating of the same indicator from open international sources would allow services to monitor whether these divergent profiles narrow or persist over time, and it would provide a common yardstick for the podiatric and vascular programs of the region.

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