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The global burden of musculoskeletal injury in low and lower-middle income countries

A systematic literature review

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Abstract

Background: While the global burden of musculoskeletal injury is increasingly recognized, few epidemiologic studies have specifically recorded its incidence or prevalence, particularly in low- and middle-income countries. Understanding the burden of musculoskeletal injury relative to other health conditions is critical to effective allocation of resources to mitigate the disability that results from trauma. The current study aims to systematically review the existing primary literature on the incidence and prevalence of pelvic and appendicular fractures, a major component of musculoskeletal injury, in low- and lower-middle income countries (LMICs).

Methods: This study conforms to the systematic review and traditional meta-analysis guidelines outlined in the PRISMA-P statement. Incidence rates were calculated as the occurrence of new fracture cases per 100,000 person-years, and prevalence as total fracture cases per population sample, reported as percentages.

Results: The literature search yielded 3497 total citations. There were 21 full-text articles, representing 14 different countries, selected for data extraction. Included studies reported a wide range of incidence and prevalence rates, with an overall mean fracture incidence ranging from 779 (95% CI: 483.0–1188.7) to 1574 (95% CI: 1285.1–1915.1) per 100,000 person-years.

Conclusion: Better understanding the unmet burden of musculoskeletal injury in LMICs is critical to effectively allocating resources and advocating for underserved populations. To address existing gaps and heterogeneity within the literature, future research should incorporate population-based sampling with broader geographic representation in LMICs to more accurately capture the burden of disease.

Keywords: global surgery, orthopedics, trauma

1. Introduction

The Global Burden of Disease and Risk Factors study (GBD), first published in 1990, sought to quantify the health effects of more than 100 diseases and injuries across 8 regions of the world. This was a landmark study that impacted global health research by providing estimates of mortality and morbidity by age, sex and region. This report found that injuries accounted for more than 15% of all ill-health in the world in 1990 and forecast this to increase to 20% by 2020.[1] The GBD update in 2010 corroborated this trend, with notable increases in both road injuries (6.2% increase from 1990 to 2010) and musculoskeletal disorders (84% increase from 1990 to 2010).[2] These findings suggest a significant, but nonspecific, global burden of both musculoskeletal disease and injury, resulting in repeated calls for action within the field of global orthopaedics.[3–6]

While the global burden of musculoskeletal disease and injury are documented by these studies, they are broadly defined. Musculoskeletal disease encompasses a range of conditions—including traumatic injuries, congenital anomalies, chronic back pain, arthritis, rheumatologic conditions, and others—each of which has varying incidence and cost of intervention.[7] Injury descriptions, on the other hand, often focus on mechanisms of injury (e.g., road traffic accidents, falls, interpersonal violence) rather than anatomical characteristics or outcomes. While this focus may assist in identifying areas for primary prevention, it does not adequately describe regional or country-income level differences in incidence or outcome, which would allow for more

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effective interventional treatment strategies. With optimal medical and surgical management in high-resource settings, many fractures, such as those of the femur, have limited to no long-term sequelae.[8] In low-resource settings, however, these same fractures are more likely to receive no treatment or substandard treatment due to numerous barriers to care, posing a risk for lifelong disability.[3,9] For such patients, a loss of physical ability can severely limit productivity or completely prevent their participation in work, leading to a host of problems for individuals, their communities, and their broader societies.[10]

The stark differences in outcomes following musculoskeletal injuries in countries with different resources highlight an important opportunity for improvement. Effective allocation of resources, including trauma systems, surgical training and infrastructure, and rehabilitation, requires an accurate quantification of the burden of disease in different economic conditions.

In order to determine the current understanding of musculoskeletal burden, the current study aims to systematically review the existing primary literature on the incidence and prevalence of pelvic and appendicular fractures, a major component of musculoskeletal injury in LMICs.

2. Material and methods

2.1. Search strategy

The systematic review utilized in this study conforms to the systematic review and traditional meta-analysis guidelines outlined in the PRISMA-P statement.[11] The study was deemed exempt from institutional review board approval. Inclusion criteria were established a priori to minimize potential selection bias. The objective was to identify clinical studies with pelvic or appendicular fractures reported in low- and lower-middle income countries. The following criteria were implemented to find eligible clinical studies for the systematic review: a publication in a peer-reviewed journal and a primary source of original data; description of a pelvic or appendicular fracture, or a broader musculoskeletal injury that could include a pelvic or appendicular fracture; inclusion of a relevant quantitative measure of frequency or burden (incidence, prevalence, DALY, or QALY); and report of patients from countries that are classified as low- or lower-middle income by the 2018 World Bank List of Economies.[12]

2.2. Data sources

A comprehensive search was conducted in 6 academic databases in July 2018: EMBASE (www.elsevier.com/online-tools/embase); PubMed (https://www.ncbi.nlm.nih.gov/pubmed/); African Index Medicus (http://indexmedicus.afro.who.int/); Literatura Latino Americana em Ciencias da Saude (LILACS—http://lilacs.bvsalud.org/en/); Índice Bibliográfico Español en Ciencias de la Salud (IBECS—http://ibecs.iscii.es/); and Pan American Health Organization (PAHO—http://www.paho.org/). With the aid of a research librarian, a standardized search algorithm was developed using search terms in English and Spanish, modified for each database (Appendix A).

2.3. Study selection

Article selection and data extraction were conducted through DistillerSR, a systematic review software program (https://www.evidencepartners.com/). After running a duplicate detection scan in DistillerSR, 2 rounds of screening were performed to determine article eligibility: a title and abstract screening, followed by a full-text screening. Two researchers (D.M.C. and T.A.M.) independently evaluated the titles and abstracts of articles identified for possible eligibility (N = 3243). Remaining articles from this pool (N = 62) underwent a full-text screening, which were reviewed in duplicate to determine eligibility for inclusion. The reference list of each study was reviewed to find additional potential citations for full-text screening. Conflicts regarding article inclusion were resolved by consensus of reviewers that included senior authors (D.M.C., T.A.M., S.M., D.W.S., and T.M.). No publications were excluded based on language, with articles in English, French, Spanish, and Ukrainian (N = 21) included in the final review.

2.4. Data extraction

A data extraction form was created prior to selection and screening of publications. Data were extracted in duplicate (D.M.C. and T.A.M.) in order to verify accuracy. Extracted information included: country in which study was conducted; study population—number of participants, age, sex; study design—hospital or clinic-based convenience sampling, population-based sampling, or school-based survey; period of data collection; and injury characteristics—type of fracture (osteoporotic/fragility fracture, traumatic fracture, or other), fracture region (lower extremity, upper extremity, or pelvic), diagnosis, and type of quantitative measurement to describe the fracture (incidence, prevalence, DALY, or other).

Incidence rates were reported as the occurrence of new fracture cases per 100,000 person- years, and prevalence as total fracture cases per population sample, reported as percentages. Clopper-Pearson exact 95% confidence intervals were calculated for incidence and prevalence rates.

3. Results

The literature search yielded a total of 3497 citations (1271 from PubMed, 725 from EMBASE, 674 from African Index Medicus, 628 from LILACS, 199 from IBECS, and 0 from PAHO) (Fig. 1). There were 34 additional citations identified through manual review of included articles' references. After duplicate detection, 3243 unique citations remained. After title and abstract review, 62 articles were included in a full-text screen, and of those, 21 articles were selected for final data extraction.[13–33]

Fourteen different countries were represented among the 21 included studies (Table 1). Eight studies were performed in low-income countries, while 13 were conducted in lower-middle income countries. Nine studies used population-based sampling, 10 used hospital- or clinic-based convenience sampling, and 2 used school-based surveys. Ten articles reported incidence rates, while the other 11 reported prevalence. One study reported Disability-Adjusted Life Years (DALYs), in addition to prevalence.[31] Five studies included data specific to pediatric and young adult patients, and 7 studies included data specific to elderly patients. The remaining studies did not specify an age group. The manuscripts also differed in the type of fracture-related injury studied: 8 examined fragility fractures, 5 focused on acute fractures, 3 evaluated fracture malunion, and 5 did not specify the type of fracture included.

Table 2 demonstrates the incidence rate of fracture-related injury in each study population, all reported per 100,000 person-years. Among the 12 studies reporting fracture incidence, only 2 studies conducted in Nepal and Sierra Leone reported the overall

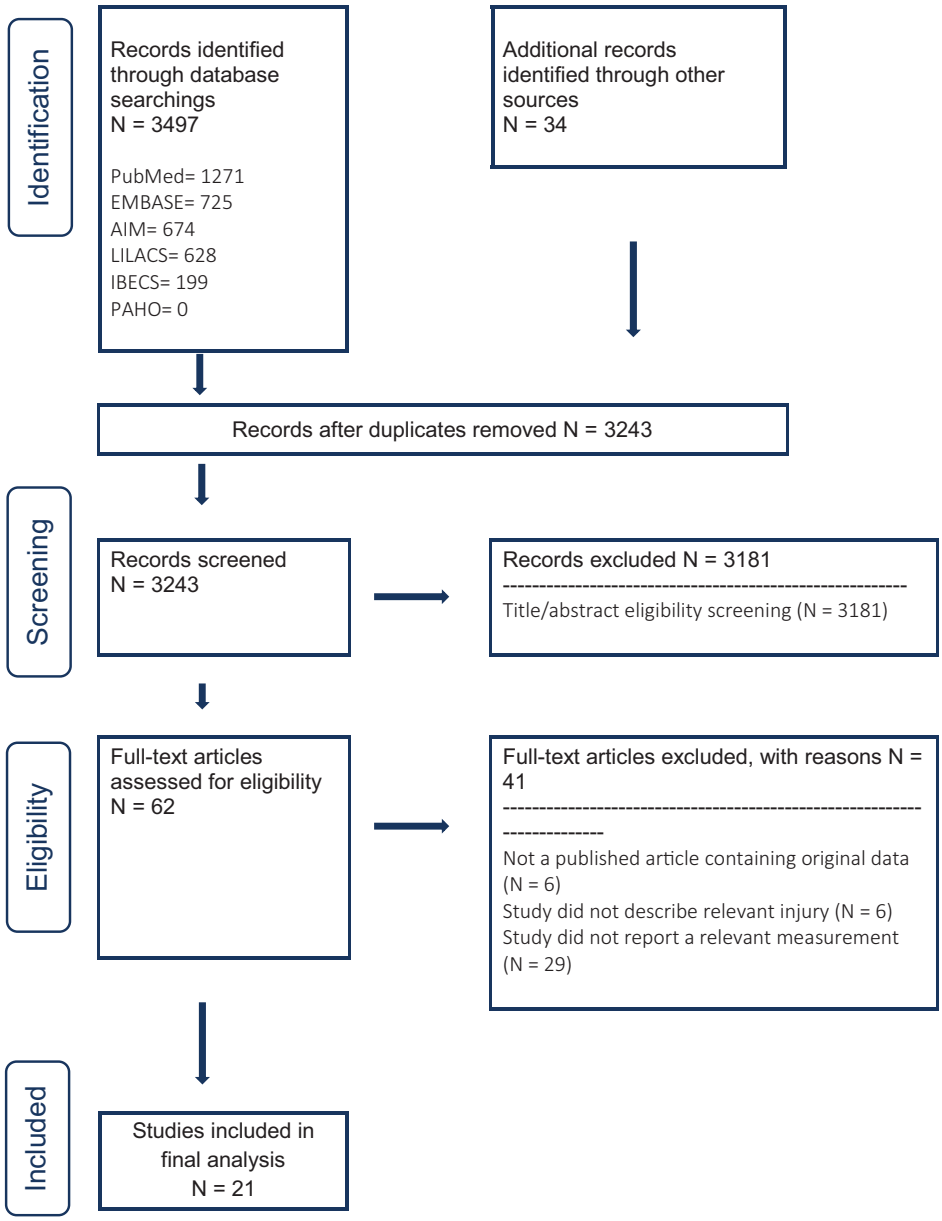

Figure 1. PRISMA flow diagram outlining the study selection process.

incidence of all fracture types. Using community-based surveys, these studies reported estimates of incidence of 779 (95% CI: 483.0–1188.7) and 1574 (95% CI: 1285.1–1915.1), respectively. The majority of other studies focused specifically on fragility fractures in older adults. The incidence of hip fracture ranged from 0.67 (95% CI: 0.22–1.56) in Nigeria to 132 (95% CI: 125.5–138.9) in India. Only 1 study from Nigeria reported the incidence of upper extremity fractures, estimating an incidence of distal radial fracture of 2.14 (95% CI: 1.22–3.48).

Prevalence data were reported primarily for sequelae of fracture such as malunion (Table 3), which ranged from 0.3 to 0.4% in adults compared to 0.1% in children. In contrast, the prevalence of acute traumatic injuries was much higher, ranging from 13.4 to 18.2% in adults in Nepal and Sierra Leone and 14.7% among children in Zambia. Only 1 study, in addition to incidence, reported Disability-Adjusted Life Years (DALYs) incurred due to musculoskeletal injury in Sierra Leone: 49.2 DALYs per 1000 persons, and Nepal: 11.6 per 1000 persons.[31]

4. Discussion

We conducted a systematic review of studies describing the epidemiology of musculoskeletal injury in low- and lower-middle income countries. We found a relatively small number of studies that specifically reported incidence or prevalence of fractures in the pelvic and appendicular skeleton from these settings. Among studies that were identified, many relied on hospital-based convenience samples that are unlikely to capture the true incidence of injury. In addition, most studies focused on low-energy fractures related to osteoporosis rather than high-energy trauma from road-traffic injury. This is despite the increasing recognition of the epidemic of road traffic injuries that disproportionately affects LMICs.[34–37] Only 3 studies reported the prevalence of malunion, and none reported the incidence or prevalence of nonunion.

Despite the dearth of epidemiologic data from LMICs, there have been recent reviews published regarding musculoskeletal injuries in high-income countries (HICs).[38,39] A 2018 study

Table 1

Description of included studies

Source	Location	Study type	Period of enrollment	Age [mean (SD)]	Age range	Sample size	% female
Abbas et al 2017[13]	Pakistan	Hospital or clinic-based convenience sampling	02/2014–11/2014	45	–	1000	0
Adebajo et al 1991[14]	Nigeria	Hospital or clinic-based convenience sampling	09/1988–08/1989	–	50+	746,700†	48.4
Allali et al 2010[15]	Morocco	Hospital or clinic-based convenience sampling	06–08, year not provided	58.9 (7.7)	–	356	100
Atijosan et al 2008*[16]	Rwanda	Population-based sampling	10/2005–12/2005	–	–	6757	55.7
Atijosan et al 2009*[17]	Rwanda	Population-based sampling	10/2005–12/2005	–	0–16	3526	–
Bayray et al 2012[18]	Ethiopia	Hospital or clinic-based convenience sampling	09/2009–08/2011	50 (12)	–	4,314,456†	51
Beck et al 2016[19]	Bolivia	School-based survey	2012	–	Approx. 12–16	3696	49
Chawla et al 2016[20]	Nepal	Population-based sampling	05/2014–06/2014	35.5 (19.6)	–	2695	46.8
Dhanwal et al 2013[21]	India	Hospital or clinic-based convenience sampling	01/2009–12/2009	58.2 (19.3)	50+	1,150,000†	58
El Maghraoui et al 2005[22]	Morocco	Hospital or clinic-based convenience sampling	01/2002–12/2002	70.7 (9.4)	50+	312,461†	55.3
El Maghraoui et al 2013[23]	Morocco	Hospital or clinic-based convenience sampling	01/2006–12/2009	74.2	50+	–	54.3
Elliott et al 2015[24]	Sierra Leone	Population-based sampling	01/2012–02/2012	25 (19.7)	0–100	3645	54
Krabbe et al 2003[25]	Zambia	School-based survey	–	16.9	13–21	355	57
Matheson et al 2011*[26]	Rwanda	Population-based sampling	10/2005–12/2005	–	0–60	6756	55.6
Povoroznyuk et al 2016[32]	Ukraine	Population-based sampling	01/2011–12/2013	–	40+	179,317	53.2
Povoroznyuk et al 2018[27]	Ukraine	Hospital or clinic-based convenience sampling	2011–2012	–	50+		–
Sellami et al 2006[28]	Tunisia	Population-based sampling	01/2003–06/2003	64.07 (9.31)	50+	1311	100
Shen et al 2003[29]	The Gambia	Hospital or clinic-based convenience sampling	01/1996–06/1998	6.8 (0.5)	0–14	85,000†	42
Smythe et al 2017[30]	Cameroon	Population-based sampling	08/2013–10/2013	–	–	3567	59.2
Stewart et al 2016[31]	Sierra Leone and Nepal	Population-based sampling	2012 in Sierra Leone; 2014 in Nepal	–	–	Sierra Leone: 3645 Nepal: 2,695	–
Zebaze et al 2003[33]	Cameroon	Hospital or clinic-based convenience sampling	08/1996–08/1998	–	50+	175,145†	37.4

* Data for Atijosan et al 2008, Atijosan et al 2009, and Matheson et al 2011 derived from the same national survey.
† Sample size represents broader population served by the hospital.

Table 2

Incidence of musculoskeletal injury in low- and lower-middle income countries

Country	Anatomical region	Diagnosis	Study design	Sample size	Overall incidence (per 100,000 person-years)	Incidence among women (per 100,000 person-years)	Incidence among men (per 100,000 person-years)
Youth							
Bolivia[19]	All regions	Broken bone or dislocated joint	School-based survey	3696	5925.3 (5185.7–6735.5)	3800.0 (2968.1–4784.2)	7957.6 (6775.5–9272.3)
The Gambia[29]	All regions	All fractures	Hospital-based convenience sampling	87,384*	77.4 (66.2–89.9)	–	–
Older adults							
Ethiopia[18]	All regions	All fragility fractures	Hospital-based convenience sampling	4,314,456*	285.9 (282.4–289.5)	–	–
Cameroon[33]	Lower extremities	Fragility hip fracture	Hospital-based convenience sampling	566,765*	10.5 (7.4–14.5)	11.7 (7.3–17.7)	9.2 (5.2–15.2)
India[21]	Lower extremities	Fragility hip fracture	Hospital-based convenience sampling	1,150,000*	132 (125.5–138.9)	159 (151.8–166.5)	105 (99.2–111.1)
Morocco[23]	Lower extremities	Fragility hip fracture	Hospital-based convenience sampling	–	79.3 (75.1–83.7)	85.9 (79.8–92.4)	72.7 (67.0–78.7)
Morocco[22]	Lower extremities	Fragility hip fracture	Population-based sampling	312,461*	48.0 (40.6–56.3)	52.1 (41.5–64.6)	43.7 (33.9–55.5)
Nigeria[14]	Lower extremities	Fragility hip fracture	Hospital-based convenience sampling	746,700	0.67 (0.22–1.56)	0.55 (0.067–2.00)	0.78 (0.16–2.28)
	Upper extremities	Distal radius fracture			2.14 (1.22–3.48)	1.94 (0.78–3.99)	2.34 (1.07–4.44)
Ukraine[32]	Lower extremities	Fragility hip fracture (femoral neck)	Population-based sampling	179,317	116.9 (103.9–131.0)	128.7 (111.3–148.1)	99.1 (80.6–120.5)
Ukraine[27]	Lower extremities	All lower extremity fractures	Hospital-based convenience sampling	–	516.6 (475.9–560.7)	540.1 (486.9–598.9)	493.1 (429.3–561.7)
All ages							
Nepal[31]	All regions	All fractures	Population-based sampling	2695	779 (483.0–1188.7)	–	–
Sierra Leone[31]	All regions	All fractures	Population-based sampling	6340	1574 (1285.1–1915.1)	–	–

* Sample size represents broader population served by the hospital.

Table 3

Prevalence of musculoskeletal injury in low- and lower-middle income countries

Age	Country	Anatomical region	Diagnosis	Study design	Sample size	Number of cases	Overall prevalence [% (CI)]	Prevalence among women (%)	Prevalence among men (%)
Youth									
	Rwanda[17]	All regions	Fracture malunion	Population-based sampling	3526	3	0.09 (0.02–0.25)	–	–
	Zambia[25]	Upper and lower extremities	Supracondylar, radial head, radius/ulna, femur, tibia plateau, femoral condyles, tibia/fibula fractures	School-based survey	355	52	14.7 (11.1–18.8)	–	–
Older adults									
	Morocco[15]	Upper and lower extremities	Peripheral fractures	Recruitment of healthy volunteers via advertisements in local hospital	356	43	–	12.0 (8.8–15.9)	–
	Pakistan[13]	Upper and lower extremities	Low trauma extremity fracture	Recruitment of healthy volunteers from orthopedic camps	1000	129	–	–	12.9 (10.9–15.1)
	Tunisia[28]	Upper and lower extremities	Femoral neck and proximal humerus fractures following minor trauma	Population-based sampling	1311	20	–	1.5 (0.9–2.4)	–
All ages									
	Cameroon[30]	All regions	Fracture malunion	Population-based sampling	3567	10	0.3 (0.1–0.5)	–	–
	Nepal[20]	Upper and lower extremities	Musculoskeletal disease of the extremities	Population-based sampling	2695	362	13.4 (12.2–14.8)	–	–
	Rwanda[26,16,17]	All regions	Fracture malunion	Population-based sampling	6756	26	0.4 (0.3–0.6)	–	–
	Sierra Leone[24]	All regions	Traumatic musculoskeletal problem	Population-based sampling	3645	664	18.2 (17.0–19.5)	–	–

evaluated the burden of acute trauma, using road traffic injuries (RTIs) as a surrogate marker.[39] They reported that there were 255 million DALYs in 2016 in HICs due to road traffic injuries. These data have been used to advocate both for injury prevention and trauma care systems. Using a similar methodology, Agarwal-Harding et al[40] used RTI data to estimate the global incidence of femur fractures at 15.7–45.5 per 100,000 person-years. Notably, they estimated the incidence of femur fracture was twice as high in LMICs compared to HICs. No studies that we identified can serve as a direct comparison because they were either too broad or focused specifically on low-energy fractures in older adults. Nonetheless, using the incidence of RTIs as a surrogate for injury rates likely remains the best available method in the absence of empiric data from these settings.

Osteoporotic fracture incidence has also been heavily studied in HICs, and an increasing number of resources have been dedicated as a result, including programs aimed at both prevention and treatment of fragility fractures.[41–43] Many of the studies identified in this review were similarly aimed at the increasing incidence of fracture among aging populations, which is increasingly affecting both HICs and LMICs. There did appear to be a lower incidence of hip fracture in Sub-Saharan African countries such as Nigeria and Cameroon compared to countries in other regions including India, Ukraine, and Morocco. Data

Figure 2. World map representing all LMICs that are (represented in dark gray) and are not (represented in light gray) included in this review.

from Sierra Leone demonstrating high overall incidence of musculoskeletal injury suggests that high-energy trauma predominates in this region, though existing data are not conclusive in this regard. We hypothesize that younger populations and higher incidence of road traffic injury lead to a greater proportion of high-energy musculoskeletal injury in low-income countries compared to middle-income countries. However, the existing data from LMICs identified in this review are insufficient to make this statement conclusively.

The present review also has multiple limitations. First, due to existing gaps in the literature, this review included 21 studies in the final report, representing only 14 of the 82 LMICs (Fig. 2). Moreover, 1 inevitable limitation in a systematic literature review is selection bias, including the potential omission of relevant studies due to limitations of the search strategy. In the present study, selection bias was minimized by conducting a comprehensive search using 6 different electronic databases with broad geographical representation, and by including both English and Spanish search terms. No studies were excluded based on language, with articles in English, French, Spanish, and Ukrainian included in the final review. However, it remains possible that articles archived in smaller databases, or those indexed in languages other than English or Spanish, were excluded from the present study. Another limitation is that many of these studies utilized hospital- or clinic-based study designs, in which incident fractures were only recorded if the patient sought medical care, significantly underestimating the number of individuals suffering from musculoskeletal injury. Further, the heterogeneity of the available data limits our ability to statistically compare the fracture burden between studies and to draw more broadly generalizable conclusions concerning the global burden of fractures in LMICs. There are multiple potential reasons for this variability, including differences in sampling methods, eligibility criteria, and statistical methods. We did not include studies reporting the incidence of spinal injuries or injuries that did not involve fracture (e.g., ligamentous injuries), and therefore cannot comment on their burden in LMICs. Finally, prevalence is difficult to interpret in these studies because many acute fractures heal uneventfully, while sequelae, such as nonunion or malunion may cause long-term disability.

5. Conclusions

There are few studies reporting the incidence of musculoskeletal injury in LMICs, and available studies focus largely on fragility fractures in elderly populations despite the known high incidence of road traffic injury. Best available estimates of the overall incidence of musculoskeletal injury in LMICs range from 779 to 1574 per 100,000 person-years. Future research should incorporate population or community-based sampling with broader geographic representation in LMICs to more accurately capture incidence burden. Better understanding the unmet burden of musculoskeletal injury in LMICs is critical to better allocating resources and advocating for this underserved population.

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Appendix A: Search Strategy

African Index Medicus (http://indexmedicus.afro.who.int/)

fracture AND (incidence OR prevalence)

LILACS/IBECS/PAHO (http://search.bvsalud.org/portal/):

(tw:((fractura OR fracturas OR lesiones OR lesión OR condición OR condiciones))) AND (tw:((hueso OR esquelético OR ortopédico OR ortopédico OR ortopedia OR ortopedia OR 'sistema musculoesquelético' OR extremidad OR extremidad OR extremidades))) AND (tw:((incidencia OR prevalencia OR "años de vida ajustados" OR "año de vida ajustado por discapacidad" OR "carga global de enfermedad" OR "año de vida ajustado por calidad"))) NOT (pais_assunto:((brasil OR jamaica OR "America del Norte" OR "Costa Rica" OR "Trinidad y Tobago" OR "Antillas Neerlandesas" OR belice OR "Puerto Rico" OR "Santa Lucía"))) AND (instance:"regional") AND (fulltext:("1") AND db:("LILACS" OR "IBECS" OR "PAHO") AND limit:("humans") AND type:("article"))

EMBASE (www.elsevier.com/online-tools/embase):

(fracture/exp OR injury/exp OR condition:ti,ab OR conditions:ti,ab)
AND (bone/exp OR skeletal:ti,ab OR orthopaedic:ti,ab OR orthopedic:ti,ab OR orthopaedics:ti,ab OR orthopedics:ti,ab OR 'musculoskeletal system'/exp OR limb/exp OR extremity:ti,ab OR extremities:ti,ab)
AND
(Incidence/exp OR prevalence/exp OR "adjusted life years" OR 'disability-adjusted life year'/exp OR 'global disease burden'/exp OR 'quality adjusted life year'/exp)
AND (africa OR "latin america" OR "south america" OR uganda OR kenya OR mozambique OR swaziland OR zambia OR tanzania OR nigeria OR cameroon OR malawi OR ethiopia OR congo OR lesotho OR angola OR burundi OR "central african republic" OR chad OR rwanda OR sudan OR djibouti OR eritrea OR somalia OR comoros OR madagascar OR seychelles OR benin OR mali OR "burkina faso" OR "cape verde" OR gambia OR ghana OR liberia OR niger OR senegal OR "sierra leone" OR togo OR mauritania OR "Cote divoire" OR "ivory coast" OR "sao tome" OR afghanistan OR angola OR argentinaOR bangladesh OR Bhutan OR Bolivia OR "Cabo Verde" OR "cape verde" OR Cambodia OR Egypt OR "El Salvador" OR Georgia OR Haiti OR Honduras OR India OR Indonesia OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Laos OR Lao OR Micronesia OR Moldova OR Mongolia OR Morocco OR Myanmar OR Nepal OR Nicaragua OR Pakistan OR Panama OR Philippines OR "Solomon Islands" OR "Sri Lanka" OR Syria OR Tajikistan OR Timor-Leste OR Tunisia OR Ukraine OR Uzbekistan OR Vanuatu OR Vietnam OR "West Bank" OR Gaza OR Yemen OR "Papua New Guinea" OR Guinea OR Guinea-Bissau OR Zimbabwe OR low-resource OR low-income OR "developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing economies" OR "developing economy" OR LMIC OR LMICs OR "low and middle income" OR "lower middle income" OR "transitional country" OR "transitional countries" OR "resource poor" OR "austere environment" OR "austere environments" OR 'developing country'/exp)
AND 'human'/de

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AND 'article'/it

PubMed (https://www.ncbi.nlm.nih.gov/pubmed/):

(((fracture[tiab] OR fractures[tiab] OR "Fractures, Bone"[Mesh]) OR ((injury[tiab] OR injuries[tiab] OR condition[tiab] OR conditions[tiab])
AND (bone[tiab] OR bones[tiab] OR skeletal[tiab] OR orthopaedic[tiab] OR orthopedic[tiab] OR orthopaedics[tiab] OR orthpedics[tiab] OR musculoskeletal[tiab] OR extremity[tiab] OR extremities[tiab])))
AND (incidence[tw] OR prevalence[tw] OR "adjusted life years"[tw] OR "adjusted life year"[tw] OR daly[tiab] OR dalys[tiab] OR "Quality-Adjusted Life Years"[Mesh] OR "Global Burden of Disease"[Mesh])
AND (africa[tw] OR "latin america"[tw] OR "south america"[tw] OR uganda[tw] OR kenya[tw] OR mozambique[tw] OR swaziland[tw] OR zambia[tw] OR tanzania[tw] OR nigeria[tw] OR cameroon[tw] OR malawi[tw] OR ethiopia[tw] OR congo[tw] OR lesotho[tw] OR angola[tw] OR burundi[tw] OR "central african republic"[tw] OR chad[tw] OR rwanda[tw] OR sudan[tw] OR djibouti[tw] OR eritrea[tw] OR somalia[tw] OR comoros[tw] OR madagascar[tw] OR seychelles[tw] OR benin[tw] OR mali[tw] OR "burkina faso"[tw] OR "cape verde"[tw] OR gambia[tw] OR ghana[tw] OR liberia[tw] OR niger[tw] OR senegal[tw] OR "sierra leone"[tw] OR togo[tw] OR mauritania[tw] OR "Cote d'ivoire"[tw] OR "ivory coast"[tw] OR "sao tome"[tw] OR afghanistan[tw] OR angola[tw] OR argentina[tw]OR bangladesh[tw] OR Bhutan[tw] OR Bolivia[tw] OR "Cabo Verde"[tw] OR "cape verde"[All Fields] OR Cambodia[tw] OR Egypt[tw] OR "El Salvador"[tw] OR Georgia[tw] OR Haiti[tw] OR Honduras[tw] OR India[tw] OR Indonesia[tw] OR Kiribati[tw] OR Korea[tw] OR Kosovo[tw] OR Kyrgyz[tw] OR Laos[tw] OR Lao[tw] OR Micronesia[tw] OR Moldova[tw] OR Mongolia[tw] OR Morocco[tw] OR Myanmar[tw] OR Nepal[tw] OR Nicaragua[tw] OR Pakistan[tw] OR Panama[tw] OR Philippines[tw] OR "Solomon Islands"[tw] OR "Sri Lanka"[tw] OR Syria[tw] OR Tajikistan[tw] OR Timor-Leste[tw] OR Tunisia[tw] OR Ukraine[tw] OR Uzbekistan[tw] OR Vanuatu[tw] OR Vietnam[tw] OR "West Bank"[tw] OR Gaza[tw] OR Yemen[tw] OR "Papua New Guinea"[tw] OR Guinea[tw] OR Guinea-Bissau[tw] OR Zimbabwe[tw] OR low-resource[tw] OR lowincome[tw] OR "developing country"[tw] OR "developing countries"[tw] OR "developing nation"[tw] OR "developing nations"[tw] OR "developing economies"[tw] OR "developing economy"[tw] OR LMIC[tw] OR LMICs[tw] OR "low and middle income"[tw] OR "lower middle income"[tw] OR "transitional country"[tw] OR "transitional countries"[tw] OR "resource poor"[tw] OR "austere environment"[tw] OR "austere environments"[tw] OR "third world"[All Fields]))
AND "humans"[MeSH Terms]