

Fragility fracture systems, Latin America perspective

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Abstract

Osteoporosis is a worldwide epidemic, affecting an average of 30% to 50% of those over 50 years of age in Latin America. Resulting from it is another epidemic, that of fragility fractures, which adversely affects morbidity and mortality of this population. Increasing in their incidence, fragility fractures are expected to occur in 1 in 3 women and 1 in 5 men over 50 years of age during their lifetimes.

Currently, there are diagnostic and management guidelines for fragility fractures in Latin American countries, especially those for hip and spine fractures. In general, in Latin America, the quality indicators and standards for the care of these fractures vary greatly according to the health system, being suboptimal in many situations.

The organization of health services is different in the different countries throughout Latin America. Common underlying characteristics, however, include the distinctions that exist in care between public and private medicine and the lack of economic resources directed to public healthcare systems from the national levels.

Several important changes have been implemented in recent years, with the collaboration between national organizations and international associations such as the Fragility Fracture Network and the International Osteoporosis Foundation, aimed at improving quality standards in care and rates of morbidity and mortality in patients treated through fragility fracture programs. The underregistration in these programs and absence of formal national registries also contribute to a lack of recognition of the size, scope, and severity of the problem.

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1. Introduction

Osteoporosis is a condition characterized by the reduction of bone mass and disruption of its architecture, resulting in an increased risk of fragility fractures in both men and women.^[1] These fractures are associated with higher health care costs, physical disability, impaired quality of life, and increased morbidity and mortality. Fragility fractures are also associated with a considerable increase in costs for health care systems. The condition currently affects more than 200 million people worldwide, with estimates that it afflicts between 30% and 50% of postmenopausal women.^[2] Approximately 40% of White women and 13% of men over the age of 50 will suffer an osteoporotic fracture of the hip, wrist or spine in their lifetime.^[3,4] Consequently, measures to diagnose and prevent osteoporosis and its complications represent a major public health concern.^[5]

2. Mexico

2.1. Introduction

In Mexico, 1 in 4 adults have osteoporosis or osteopenia.^[6] Life expectancy in the country is 75.4 years, and in 2050 is estimated to be 81.9 years. In that same year, the population is estimated to be 122 million inhabitants, of which 41 million adults (34%) will be in the range older than 60 years.^[7] Studies show a prevalence of osteoporosis both in men and women, with men showing reduced bone mass and osteoporosis in 39% at the spine and 44% at the hip, while it was reduced 59% in general in women.^[8] Currently, Mexico has 115/100,000 hip fractures in males and 225/100,000 hip fractures in females older than 50. The

prevalence of vertebral fractures in women older than 80 years has been documented at 27.8%.^[8] In 2005, the incidence of hip fractures was estimated to be 21,000, and this number is expected to increase 431% by 2050, or 110,055 fractures with an estimated cost of \$4,088,772,523 United States Dollars (USD).^[9]

In the population aged ≥ 40 years, the prevalence of osteopenia and osteoporosis in Mexico was 32.8% and 8%, respectively in 2010. A total of 75,763 fragility fractures occurred that year. Costs of managing osteopenia and osteoporosis were \$154.9 million USD, whereas medical costs due to fragility fractures reached \$256.2 million USD. Therefore, the annual health care costs for these entities were \$411 million USD. Total costs were estimated to increase to 19.2% higher in 2015, and to 41.7% by 2020.^[10]

2.2. National guidelines and standards

In a study conducted in Mexico of 838 patients (665 women, 79.4%), 589 (70.3%) had a hip fracture, 173 (20.6%) had a distal radius fracture, and 76 (9.1%) had a vertebral fracture. Only 28 (3.3%) had a previous diagnosis and were on a pharmacological treatment for osteoporosis and 11 (1.3%) received their diagnosis while hospitalized. Following the fractures in those anatomic regions at 1 and 3 years, 144 (17.1%), 71 (8.4%), and 96 (11.4%), respectively, received a pharmacological treatment, 195 (23.2%), 65 (7.7%), and 45 (5.3%) supplementations with vitamin D and calcium, and 16 (1.9%), 16 (1.9%), and 21 (2.5%) a non-pharmacologic treatment. No significant differences in treatment prescriptions were found after a second or third fracture.^[5] This study quantifies the high frequency of failure to diagnose and treat osteoporosis in patients with fragility fractures. Measures should be established to reduce the growing gap between osteoporosis diagnosis and treatment after a fragility fracture.^[11] According to earlier projections, about 3 million people >50 years were to have osteoporosis in 2020.^[12]

In the year 2021, multiple societies, collaborated to make a joint position statement on the treatment and stratification of patients with osteoporosis and fragility fractures. This work sought to establish a guide to identify and stratify the need for care at 3 priorities (A, B, C).

Priority A. Patients have a condition that puts the patient's life at imminent risk, is clinically unstable, or where a short delay would significantly alter their prognosis. Those patients require prioritizing immediate care and not deferring attention.

Priority B. These are clinically stable patients with a very high risk of fracture, in whom study and treatment should not be delayed, given the high morbidity and mortality associated with fractures and the possible need to require hospitalization for an incident fracture, although, if necessary, some interventions could be postponed for 1 to 2 months during the critical period of the pandemic.

Priority C. These are clinically stable patients, with no recent history of fragility fracture and no clinical suspicion of lifethreatening conditions in the short- or medium-term, in whom specific treatments or services can be deferred for some time until conditions allow, without negatively affecting the results as long as the patient's clinical conditions remain unchanged. It is essential to consider these factors even if the patient is already under osteoporosis treatment since compliance and duration of therapy may modify the probability of new fragility fractures in a short period (less than 12 months)

After stratifying the need of care, we could know which interventions should be done and which ones could be postponed for some time.^[13] These guidelines stipulate that during fragility fracture treatment, detection, and management, rehabilitation and fall prevention interventions are essential parts of management that should not be overlooked. In Mexico, the availability of a dual energy x-ray absorptiometric scan (DXA) scan is about 4/1,000,000 inhabitants, and only 25% of these are in the public health service.^[8] During the coronavirus disease 2019 pandemic restrictions and due to the limited access of DXA scans in Mexico, the diagnosis of osteoporosis can be preliminarily made based on clinical and radiographic findings in some patients. Laboratory tests should be performed before starting osteoporosis medication.^[13]

Since 2008, the fracture risk assessment tool (FRAX) tool has been used to measure the absolute risk of fracture. FRAX uses a combination of risk factors for osteoporosis, to estimate the 10-year risk of fracture. One of the advantages of the tool is that it is readily available, designed for both genders starting from 40 years of age, and it can be used in the absence of densitometry. FRAX is available in 5 countries in Latin America: Argentina, Chile, Colombia, Ecuador, and Mexico.^[8,14] Of note, in Mexico, there are general guidelines for the clinical management of osteoporosis, but not of fragility fractures.

2.3. Organization, successes, and barriers

The healthcare system in Mexico is comprised of 2 medical sectors: the public health sector, comprised of the Secretaria de Salud and Instituto Mexicano del Seguro Social (IMSS), and the private health sector. The public health sector is supported through government funding; however, only 2.5% of the Gross National Income is dedicated toward public health.^[15] According to Clark et al^[10] in 2008, 54% of hip fractures were operated on at IMSS, 28% at Secretaria de Salud, and only 18% in the private sector.^[15]

In the field of fragility fracture management, the multidisciplinary team have proven useful. The first report of orthogeriatric units was in England in 1966, where 1 orthopedic surgeon and 1 geriatrician worked together and published their experience managing 100 hip fracture cases.^[9] México has started a transformation process to focus on the care of hip fractures. In the public healthcare sector, the GeriatrIMSS program, which cares for about 50% of the population, has pioneered these efforts.^[16] Reports in the literature documenting the outcomes of the work from Mexican orthogeriatric units are not yet published. Fall prevention and pharmacological treatment remain important aspects of the care in these programs.

In 2012, the International Osteoporosis Foundation (IOF) launched the campaign "Capture the Fracture" (CTF) with the intention to diminish the actual gaps in postfracture care and secondary prevention.^[17] These models have been compared with those of traditional care and have proven not only to diminish refracture rates, but also treatment adherence, perceptions regarding quality of care, and mortality.^[17-19]

Recently, there has been a growing number of Fracture Liaison Services (FLS) in Mexico. Currently, there are 2 certified IOF silver level centers, 7 IOF bronze level centers, and 8 centers in development. The State of Jalisco additionally has initiated a project to create 13 care areas that will have coordination of fracture services.^[20] Unfortunately, to date, there has not been any governmental financial support to those projects.

With the increase of qualified and certified centers, the medical community in Mexico expects to decrease the economic and care burden of new fragility fractures, increase the number of functional and sustainable FLSs, and better advocate for prioritization of these models in the Mexican health care system.^[9] In 2018, in conjunction with 5 other international organizations, the Fracture Fragility Network (FFN) led the production of «Global Call to Action» that describes the key changes to endure the “tsunami” of the hip and other fragility fractures.^[21] Currently, there are 14 national FFNs (8 in the Asia-Pacific region, 4 in Europe, 1 in the Middle-East, and 1 in Latin America). A second Latin American FFN is being developed in Mexico.^[22] The FFN is now proposing the integration of these national FFNs.

2.4. Future direction

There is still much to do related to the prevention, management, and follow up of fragility fractures in Mexico. While fragility fracture care units have been established, the propagation of these centers, establishment of national guidelines, and creation of national hip fracture registries are still in need of further development. Fortunately, the development of registries is underway, which will assist in the understanding of the benefits of these programs, assisting in advocacy for their further development and funding. Barriers in the development of fragility fracture management include the establishment of protocols in centers for multidisciplinary management of patients, to include internal medicine, geriatrics, rehabilitation, occupational therapy, orthopedics and traumatology, to improve outcomes in patients that sustain fragility fractures. Additionally, centers that handle these types of patients pre- and post-fracture, and government funding are essential to significantly impact the growing number of patients with fragility fracture and osteoporosis.

3. Argentina

3.1. Introduction

Although in Latin America there is a predominantly mestizo population, in Argentina the racial composition is predominantly White, with a current life expectancy of 77 years, and an estimated life expectancy of 82 years by 2050. Therefore, osteoporosis constitutes a serious health problem that will increase in the coming decades.^[4] In Argentina, according to World Health Organization criteria, it is estimated that 2 out of every 4 women over 50 years of age have osteopenia and osteoporosis. Additionally, it is expected that by 2050 there will be 5.24 and 2.62 million women > 50 years of age with osteopenia and osteoporosis, respectively.^[23] Although the rate of fragility fractures is higher in osteoporotic patients, the absolute number is higher in patients with osteopenia.

In Argentina, the average annual rate for hip fractures is 298 per 100,000 women and 118 per 100,000 men > 50 years, with an average age of 82 for women and 79 in men and a ratio of 2.5 to 1. According to projections, it is estimated that these numbers will double by 2050.^[24–28] The Latin-American Vertebral Osteoporosis Study showed an overall prevalence of vertebral fractures of 16.2%. The risk factors identified as risk factors were a history of fracture and loss of height.^[29]

According to a study published in 2010, the estimated direct costs in Argentina for hip fracture care per case were around

\$3800 US dollars and for vertebral fracture care were around \$163 US dollars.^[3] A recent study estimated the combined direct and indirect costs were \$10,900 for a hip fracture, \$2000 for a vertebral fracture, and \$3100 dollars for a wrist fracture.^[30] Thus, the estimated annual cost to the health care system for osteoporosis-related fractures is approximately \$360 million US dollars.^[30]

3.2. National guidelines and standards

The current National Guidelines for the diagnosis, prevention and treatment of osteoporosis were prepared by the Argentine Association of Osteology and Mineral Metabolism, and the Argentine Society of Osteoporosis, which were last updated in 2015.^[31] These guidelines specify the suspicion of osteoporosis with a documented loss of height of 3 cm or 4 to 6 cm (from the height in young adulthood), increased kyphosis, and a history of dorsal pain or low energy trauma. The presence of fracture allows for the diagnosis of osteoporosis.

The diagnostic criteria according to the results of the Bone Mineral Densitometry used are the same as those established by the WHO in 1994. Normal is established as a T-score up to -1 ; osteopenia <-1 to -2.5 ; osteoporosis <-2.5 and severe osteoporosis <-2.5 plus the presence of fracture. The diagnosis can be made in postmenopausal women and men >50 years if the T-score is less than -2.5 in the spine, total femur or femoral neck. The guidelines state that the spine should be evaluated, with the measurement of the vertebrae from L1 to L4 and the hip can be measured at the femoral neck or proximal femur (taking whichever value is lower), in any hip. They establish the usefulness of DXA for monitoring therapeutic efficacy and identifying nonresponder patients. The indication for obtaining DXA studies include the evaluation of patients without treatment for more than 2 years, after 1 year of starting treatment, and then every 2 years after care has been initiated. In exceptional cases (transplanted patients or those receiving corticosteroid treatment), bone density studies are indicated every 6 or 12 months, depending on the case. Additionally, the guidelines recommend the measurement of bone markers to evaluate fracture risk and response to treatment.

3.2.1. General measures for prevention. Prevention measures focus on the maintenance of an adequate lifestyle from adolescence and throughout adulthood, in an attempt to reverse modifiable risk factors. Recommendations include: calcium intake from the age of 50 (1200 mg/day), other nutrients such as protein (1 g/kg/day), and vitamins and minerals. For vitamin D administration, exposure to sunlight is recommended in summer for 15 to 20 minutes and in winter at noon 3 times a week. In addition, in women over 65 years of age, vitamin D supplementation with a recommended daily dose of 800 international units, corrected/day plus 1000 mg daily with food intake. These recommendations are observed following the analysis of serum levels below the accepted normal value of 1,25 dihydroxy vitamin D >30 ng/ml. It should be noted that these values of vitamin D decrease the risk of hip fracture, but not of vertebral fracture. They further improve muscle strength, balance, and the risk of falling. Another recommendation is the realization of physical activity, which constitutes a mechanical stimulus for the optimal adaptation of mass, architecture, and skeletal structure. Physical activity also generates a 5% reduction in the risk of falls. The current recommendation for elderly patients includes aerobic activity (walking 2000 m per day, progressively).

3.2.2. Fall prevention. The basis of decreasing fall risk is based on the annual control of the medication that patients receive, both in terms of administration and dosage. Among problematic medications are sedatives, hypotensives, hypoglycemics, and vision disorder medications. Other considerations include obstacles at home and pets. Physical exercises are recommended at least twice a week, under supervision as necessary.

3.2.3. Pharmacological treatment. Using the FRAX calculator adjusted for the country overall, a 10-year combined risk can be estimated. If greater than or equal to 20% risk for major osteoporotic fractures and/or greater than or equal to 3% or more for hip fractures, pharmacological treatment is recommended.

Initially, vitamin D levels should be normalized and calcium intake of 1g daily should be recommended. The recommendation is always to start with a single drug, preferably oral (ie, bisphosphonates). For severe osteoporosis and fractures, teriparatide is indicated.

Treatment is monitored through biochemical parameters of bone turnover at intervals of 3 to 6 months and the occurrence of a clinical and/or radiological fracture with annual radiographs of dorsal and lumbar spinal profiles. In addition bone mineral density studies are obtained at intervals of not less than 1 year. If there is no improvement, the general practitioner should refer the patient to a specialist. Nationally approved drugs for prevention include: anticatabolics: bisphosphonates, raloxifene, calcitonin, denosumab; anabolics: teriparatide; and mixed: strontium ranelate.

3.3. Organization, successes, and barriers

Treatments for osteoporosis have been shown to be effective in reducing the risk of fracture and consequently the associated morbidity and mortality of the condition.^[32] However, more than 75% of patients do not receive evaluation or treatment.^[33] In Argentina, although there are no national statistics, it has been estimated that mortality associated with hip fractures related to osteoporosis is 20%.^[34] On the other hand, it has been estimated that 30% to 50% of elderly patients who suffer from hip fractures return to their previous levels of activity, which represents another example of the indirect costs related to the fracture.

Regardless of bone mineral density, it is known that a history of a fracture at any site is an independent risk for future fractures. Approximately half of patients who suffer an osteoporotic fracture will have another fracture, usually within the first year.^[35] Compared to the general population, a woman with a hip, vertebral, or proximal humeral fracture has a 2- to 18-fold increased risk of a new fracture.^[36] As in other regions, Argentina has a significant percentage of patients who, after suffering a fracture, do not receive any type of treatment or do not adhere to it. This problem, in the secondary prevention of fragility fractures, was identified by the IOF and the American Society for Bone and Mineral Research that proposed FLS programs. FLS are multidisciplinary, systematic intervention programs aimed at facilitating treatment of fragility fractures.

Although FLS programs require an initial increase in costs for health systems related to the program itself (to pay for the evaluation and treatment of patients), multiple studies in different parts of the world have demonstrated their cost-effectiveness.^[37,34,35] A recent study estimated that in Argentina, if all patients over 50 years of age who presented

an osteoporotic fracture had been attended by an FLS, approximately 5200 fractures would have been prevented, saving the health system \$28.1 million per year.^[37] Argentina is in the early stages of the development of these types of interventions. At present, 9 centers (all over the country) are enrolled in the CTF program of the IOF. The different medical associations are defining the variables related to the secondary prevention of fractures and evaluation of patients with hip fractures due to osteoporosis.

The Argentinian health system is a mixed system of public, social security and private organizations, where the distribution of resources and accessibility throughout the country is unequal. In the vast majority of cases, it is difficult to determine the percentage of patients who receive and comply with primary prevention treatment for osteoporosis, access to studies, and the corresponding medication if needed, as well as the control of adherence to treatment over time. Similarly, in the event that FLSs are implemented to a significant degree in the future, given the way these programs work, there is hope that they will be able to benefit patients for secondary prevention, adherence to treatment and subsequent monitoring.

4. Brazil

4.1. Introduction

The Brazilian Fragility Fracture Network (FFN) was founded in April 2019 with the mission to optimize the multidisciplinary management of patients with fragility fractures, including the prevention of the next fracture (secondary fracture).^[38] This was the first regional nongovernmental network in Latin America. Just like in other countries, osteoporosis is a major burden in Brazil with an overall prevalence ranging from 6% to 33%, depending on the gender, skin color, climate condition, type of health system (public or private), among other variables.^[39] This poses a significant negative effect on the patients' quality of life, particularly after fragility fractures.^[40,39]

The Brazilian Osteoporosis Study observed a strong association between poor quality of life and the presence of fragility fractures both in men and women over 40, with a higher incidence of chronic pain, decreased physical capacity, reduced social activities, decreased perception of well-being, and depressed mood compared to individuals without fractures.^[40] These authors suggest that thorough observation of clinical risk factors, both in men and women, may contribute to identify higher risk patients for osteoporotic fractures and that interventions aiming at specific risk factors, such as smoking cessation, regular physical activity, and prevention of falls, may help patients reduce their risk of fracture. In fact, Lopes et al identified that female gender, current smoking habits, and low hip bone mineral density were independent risk factors for osteoporotic fractures.^[41] In another Brazilian Osteoporosis Study, authors found a higher incidence of fractures in women living in metropolitan areas than in rural areas, and a tendency for a higher frequency of fractures in men from the Northeastern states of the country. However, there were no statistically significant differences between men from metropolitan areas and rural areas.^[40]

The reported incidence of fragility fractures in the Brazilian population varies according to the fracture site investigated, with the major sites being the vertebrae, proximal femur, distal radius, proximal humerus, and ribs.^[41-43,39] Overall, the age-adjusted annual incidence of fractures varies from 5.59 to 13 per 10,000 in women, and from 12.4 to 27.7 per 10,000 in men. In 2016,

Stolnicki and Oliveira demonstrated that about 10 million people had osteoporosis in Brazil, with a treatment costing and overall assistance of approximately R\$ 81 million for the Brazilian Unified Health System (Sistema Unico de SaUde).^[44] Despite the impact of osteoporosis and fragility fractures in Brazil, these authors highlighted that 80% of patients with fragility fractures are not evaluated or treated for osteoporosis or fall prevention to reduce secondary fractures. Of interest, Zamboni et al showed that less than 50% of orthopedic surgeons regularly investigated and performed secondary prevention against osteoporotic fractures after treating an elderly patient with a fracture.^[45] Finally, Brazil's Ministry of Health expenditures on drugs to treat osteoporosis represent approximately 10.9% of the overall total spending on high-cost medications.^[46]

4.2. National guidelines and standards

There is no defined guideline to either investigate or manage osteoporosis in Brazil. Moreover, there are no standardized treatment protocols for the prevention of secondary fragility fractures from the Brazilian Unified Health System. In addition, a few studies analyzing direct and indirect costs related to osteoporosis management and fragility fracture care have shown discrepant data between the public and private health systems in the country.^[47,48]

Given this, the FFN Brazil initiative has sought to form a team of multidisciplinary professionals who can create and disseminate the best multidisciplinary practices and health system models for the treatment of fragility fractures and prevention of the secondary fracture. Several studies from different parts of the world have shown that either the nonexistence or the lack of adherence to a specific protocol for the treatment of osteoporosis results in increased morbidity and mortality, suboptimal therapeutic efficacy, and higher health-related costs.^[49,50]

4.3. Organization, successes, and barriers

Global FFN reports that less than 50% of patients who suffer fragility fractures are evaluated for bone health, suggesting the implementation of a FLS as a model of care to reduce the treatment gaps seen with osteoporosis and fragility fractures.^[38] Cost-effectiveness analysis in different countries that implemented FLS models has revealed a high rate of fracture reduction, especially at the proximal femur.^[44,51–53] In Brazil, the Prevrefrat (Refracture Prevention Program) is a service aimed at treating patients who have already had fractures due to minor trauma (eg, fall from standing height) resulting from osteoporosis.^[44,54] Stolnicki and Oliveira reported that 450 patients were followed and 12 fractures occurred in a period of almost 4 years, demonstrating a reduction rate of more than 97% in subsequent fractures.^[44] Due to its actions (identification, evaluation, and treatment) and midterm outcomes, Prevrefrat is considered a type-A (gold) intervention.^[44,20] According to the CTF Steering Committee, there are 18 other FLSs in the country, 3 of these with an overall gold, 3 with silver, and 4 with bronze ratings, and 8 recently created FLSs. Like other countries in Latin America, there is no direct governmental funding for this or other FLS programs in Brazil currently.^[20]

The state of osteoporosis care in Latin America was recently evaluated in Brazil, Mexico, Colombia, and Argentina. Using a scorecard, Aziziyeh et al found very poor osteoporosis management and postfracture care in these countries.^[55] In Brazil, these authors observed intermediate- to high-risk scores

for policy framework, service provision, and service uptake, reflecting a significant heterogeneity in and inadequacy of osteoporosis care provisions.^[55] In this study, the authors point out several barriers that contribute to poor care for osteoporosis in Brazil, as well as in Argentina, Mexico, and Colombia, which include their low per capita domestic product and absence of centralized health statistics.^[55] Currently, the Brazilian Ministry of Health's expenditure on the diagnosis and treatment of osteoporosis and the prevention of secondary fractures is very low compared to most European and North American countries. In fact, a few Brazilian studies have investigated cost-effectiveness strategies, all demonstrating a discrepancy between the provision of health care between the public and private health systems, with the first showing a marked lack of resources for the investigation, prevention, and management of osteoporosis.^[39,40,47,48] In addition, among medical doctors, there is a paucity of knowledge of and adherence to osteoporosis treatment and secondary fracture prevention.^[55,56] Although osteoporosis is considered a national health problem, opinion leaders believe that osteoporosis is not included in the National Health Program in Brazil, therefore, there is a lack of uniformity regarding the socioeconomic burden of osteoporosis and its potential risks.^[55]

4.4. Future direction

Osteoporosis is a major burden in Brazil with an overall prevalence ranging from 6% to 33%, posing a significant negative effect on the patients' quality of life, particularly after fragility fractures. Despite the impact of osteoporosis and fragility fractures in Brazil, up to 80% of patients with fragility fractures are not evaluated or treated for osteoporosis or fall prevention to reduce secondary fractures. Moreover, Brazil's Ministry of Health expenditures on drugs to treat osteoporosis represent approximately 10.9% of the overall total spending on high-cost medications. In this scenario, there is a clear need for urgent guidelines in Brazil focusing on large scale governmental and nongovernmental policy framework, service provision, and service uptake.

5. Colombia

5.1. Introduction

In 2019, the life expectancy in Colombia was 74.5 years for men and 80.0 years for women. It is estimated that the country's population in 2035 will be approximately 57,804,147.^[57] The proportion of individuals over the age of 65 years was expected to increase from 6.3% in 2005 to 9.1% in 2018, and this number has continued to increase every year. Estimates further predict that 55% of the overall population will be over the age of 40 by 2050. Jaller-Raad and colleagues calculated that the Colombian population aged 50 years and over will double between 2010 and 2035 and that over 80 years will triple. They predicted that the number of new cases will increase from 7920 in 2010 to 22,720 hip fractures in 2035. The remaining lifetime probability of sustaining a hip fracture by the age of 50 was 2.5% and 4.7% in men and women.^[58]

The prevalence of osteoporosis in Colombia calculated by Fernandez-Avila et al,^[59] and based on the National Health Registry between 2012 and 2018, was 2440 cases per 100,000 inhabitants over the age of 50 years. This number is lower than projected in previously published studies. The authors believed that the difference was possibly due to low rates of registration of osteoporosis patients as a main diagnosis in the National Registry.^[59]

A study in 2019 evaluated 111 patients with fragility fractures and showed that Colombian patients had little knowledge about osteoporosis and its relation to their fractures. A total of 20.7% had a previous history of osteoporosis and 14.4% had a previous fracture. However, 49.5% of the patients did not know what osteoporosis was, and 62.2% did not relate the condition with their fractures. One year following discharge, only 24.3% had had DXA scan performed and only 9.9% received any osteoporosis treatment.^[60]

In the study of Vallejo-Gonzalez et al, they found that 81.4% of the patients with fragility fractures at their hospital had a previous medical appointment with a doctor in the year before their fracture: 64.9% with a general practitioner, 33.3% with both a general practitioner and specialist, and 1.75% only with a specialist. Only 50% received fall-prevention recommendations. Between 65% and 97% of the patients had indications (according to different clinical guides) for osteoporosis screening, but only 11.4% had received screening and only 15% of those patients had received the correct treatment.^[61]

5.2. National guidelines and standards

Osteoporosis resembles a “ghost” disease; it is not viewed as important in the national statistics numbers, and the doctors, including orthopedic surgeons, and the patients, do not recognize the problem. Because of this, it is not seen as a public health problem by the policy-makers and there are no specific policies directed at the prevention and treatment of these fractures. Yet, the cost to operate on hip fractures is about \$2230 USD, vertebral fractures is approximately \$3000 USD, and a distal radius fracture is about \$600.^[62]

There are a variety of organizations dedicated to the improved management of these fractures. Sociedad Colombiana de Ortopedia y Traumatología which has developed various educational and advocacy activities for orthopedic surgeons has also worked to create new FLS centers. Also, Sociedad Colombiana de Tumores Oseos y Enfermedades Metabólicas had a participation in osteoporosis subjects. In the same way the Asociación Colombiana de Osteoporosis y metabolismo mineral, which was founded in 1996 by 1 rheumatologist, 1 endocrinologist, and 1 orthopedist surgeon now has 216 members from different specialties.

5.3. Organization, successes, and barriers

Aziziyeh et al, in 2019, published the calculated benefits after the FLS implementation in 4 countries, included Colombia. The number of FLS patients prevented from having a second fracture (hip, vertebral, wrist) was estimated at 2435 in Colombia, with a total number of 21,725 bed days saved and a cumulative costs savings of 16.1 million USD over 5 years (2019–2023).^[30]

Over the past 5 years, in collaboration with the IOF International and CTF program, 16 Hospitals have been engaged in an FLS project. Five centers are classified as bronze level, 4 as silver level, and 7 as blue level programs. Four cities had 10 of these centers: Hospital de San Jose, Hospital Universitario de la Samaritana, Hospital Universitario San Ignacio, Fundacion Santafe, Hospital San Blas, Hospital Clinica San Rafael, Hospital Santa Clara, Hospital Universitario del Valle, Hospital Hospital Universitario San Vicente Fundacion, and Hospital de Caldas. They collected 1699 patients ages between 50 and 101 years old, of which 1334 (76.5%) were females and 365 (21.5%) were males. Vitamin D insufficiency was diagnosed in 145/632 (22.9%) and only 35.6% had a

previous diagnosis of osteoporosis. Mortality was 9.3% at 1-year postfracture.^[63]

There are a variety of barriers to the implementation of FLS programs. The health system insurance often does not support follow up of or anti-osteoporotic medications for these fragility fracture patients. The country does not have a unique national registry, which further promotes the lack of awareness of the burden of this medical problem. Additionally, co-management models have not been implemented or improved in many hospital systems.

5.4. Future directions

The management of fragility fractures has been and continues to be a significant challenge in Colombia. Efforts to continue to raise awareness of, develop programs for, and create co-management models to treat fragility fractures needs to be a continued focus of the organizations promoting the management of this condition. Integrated teams of orthopedists, geriatricians, internists, and anesthesiologists need to continue to join forces to develop more FLS centers in public and private hospitals to treat osteoporosis and decrease the incidence of osteoporotic-related fragility fractures. Similar to other Latin American countries like Mexico, Argentina, and Brazil, local and regional registries will help define the severity of the problem in Colombia.

6. Conclusions

Osteoporosis and related fragility fractures continue to be a growing problem throughout Latin American countries. Countries in Latin America each have their own way to improve the care of fragility fractures and challenges to overcome. An increased awareness of the economic consequences by the government and private insurance funders, development of registries, organization of co-management collaborations and guidelines, and FLS will all aid in improvements of patients with these life-changing problems. In this context, medical associations should start working together to improve patient care and medical education in a large-scale way as the expected burden of osteoporosis is expected to rapidly increase as populations age.

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