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Research Article

Epidemiology of Orthopedic Trauma Admissions Over Year 2017 and First Quarter Year 2018 in the General Hospital H+ in Queretaro Mexico

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Abstract

Background

The dynamics of demography in México is changing and its population is aging. Osteoporotic and fragility fractures are diseases associated with aging and therefore its incidence is expected to grow accordingly.

Methods

we conducted a retrospective study of epidemiological data contained on medical records of 50 years and older patients with fracture admitted over a 12-month period at the Orthopedic Service from the General Hospital H+ in Queretaro Mexico. Descriptive and inferential statistics methods for distribution of patients according to gender and age group were used. Qualitative variables were presented by distributions of absolute and relative frequencies and distributions assessed by chi-square method.

Results

From 200 patients presented in the Emergency Unit, 49 patients were admitted in Orthopedic Service. Data of 49 medical records showed the most common age groups was 50 to 59 (male 31.3% - female 30.3%). The more frequent factures were in upper limbs (male 37.5% - female 45.5%), lower limbs (male 25.0% - female 24.2%) and hip (male 18.8% - female 18.2%). Most common mechanism of trauma was fall (male 56.3% - female 69.7%) where no less than 50% of patients had pre-existing illness (systemic arterial hypertension, Diabetes Mellitus II, Obesity, Smoking and alcoholism) as predisposition factors to factures. Only two patients was diagnosed with OP using BMD and only one patient received treatment for OP.

Conclusion

The frequency of patients with the most common type and trauma mechanism of fractures admitted in the Orthopedic Unit was consistently increased in female than male gender and correlates with previous reports. It was noticed that exists a medical management of patients related to reliable diagnosis and timely treatment of fracture fragility and OP, not according to operative criteria issued by international health entities.

Abbreviations (if used)

OP (Osteoporosis), DXA (dual energy X ray absorptiometry), WHO (World Health Organization), IMSS (Mexican Institute of Social Security), BMD (bone mineral densitometry), IOF (International Osteoporosis Foundation).

Introduction

Similar to others world regions, the dynamics of demography in México is changing and its population is aging [1]. The current life expectancy at birth in México is the 76 years (increased 40 yrs the last 7 decades) and the population of the age group 60 years and over, will increase from 13 million (10%, in 2018), up to 32 million (21%, by 2050). At that time, the average life expectancy of Mexico will be 81 years. Consequently, and given that osteoporotic and fragility fractures are diseases associated with aging, their incidence is expected to grow accordingly. It is estimated that the current population of Mexico is 126 million habitants, of which 16% (20 million) is represented by people 50 years of age or older and 4.2% (5 million) by persons of 70 years or older. By the year 2050, it is estimated that 30% (45 million) of the population will exceed 50 years and 10% (16 million) will be 70 years or older, while the total population will reach 150 million [1].

Epidemiology of Osteoporosis and Fractures in Mexico

The osteoporosis (OP) and osteopenia rates in Mexico diagnosed by central dual energy X ray absorptiometry (DXA) according to the operational criteria for OP issued by the World Health Organization (WHO), have been reported in the literature. A performed study in 2000 discovered that exist a significant variation of the bone mineral density (femoral and lumbar spine of 4,460 women from urban areas between 20 and 69 years old)

in different geographic regions of Mexico [2]. A completed community-based study, carry out in 2003 including 400 women from the southeast of Mexico, showed a prevalence of vertebral fractures of 19.35%in women 50 years and older [3]. In 2006 a study was carried out in a sample of 408 men and 400 women with bone mineral density (BMD) performed by DXA, and revealed that in the lumbar spine 9% and 17% of men and women respectively had OP and that 30% and 43% of men and women had osteopenia respectively. At the femoral neck, OP was found in 6% of men and 16% of women, and osteopenia in 41%men and 56% of women in the same sample [4].

Epidemiological studies have reported the burden of hip and vertebral fractures in Mexico [5,6]. It was published in 2005 that 1 in 12 Mexican women and 1 in 20 Mexican men will undergo a hip fracture after the age of 50, being the life-time probability of 8.5% in Mexican women and 3.8% in Mexican men. Between the years 2000 and 2006, the age-specific incidence of hip fracture increased significantly both for men and women by 1% per year [7]. The numbers of hip fractures reported in 2005 were 29,732, 68% of which were found in women. Assuming no change in the age- and sex- specific incidence of hip fracture, the number of hip fractures was expected to increase markedly with time to 155,874 in 2050. However, assuming that the age-specific incidence continues the number of hip fractures in men and women would increase by a further 46% to 226,886 in 2050 [7]. In comparison to other countries, Mexico presents an intermediate rate of hip fractures being the highest rates recorded in Sweden, USA and the lowest rates in China and Turkey [8].

The prevalence rate of vertebral fracture for Mexicans over 50 years of age has been reported on 19.2% for women and 9.7% for men, being the highest for women between the countries includes in the LAVOS study [9] and similar to those reported for USA and China. In Mexican men, the increase of vertebral fracture rises with age from 2.0% in the age group of 50 - 59 years up to 21.4% in the age group of 80 years and over [10]. The vertebral fractures increase with the age in both genders, and as occurs in many others countries, the vertebral fractures are largely undiagnosed. The incidence of other fragility fractures in Mexico, reported in 2005 by the Mexican Institute of Social Security (IMSS) shown that wrist fractures were the most common reported fracture in persons aged 50 and older, followed by hip, humerus, and pelvis fractures [6].

The estimated cost of different types of fractures attended at a tertiary hospital of IMSS, reported in 2002 the acute treatment by case was US$ 3,333 for hip fractures, US$ 2,063 for forearm and hand fractures, and US$ 4,180 for knee fractures [11]. Estimated calculation of direct and indirect costs of hip fractures treatment have been reported by Clark, *et al.* where the medical cost of diagnosis and treatment (one year) for a patient with OP ranges from US$ 595 to US$ 2,236 [12]. In 2006, total direct and indirect costs reached during the acute event of hip fractures in Mexico (occurrence of about 22,000 hip fracture cases) were estimated to be more than US$ 97 million (US$ 4,365.50 per case) [12]. In addition, based on the type of institution where the patient receives medical attention, the average cost of acute treatment for a hip fracture ranges from US$ 1,613 (in public institution) to US$ 13,778 (in private hospital) [12]. In the Seguro Popular de Salud (SSA-Mexico) a publication estimated a direct medical cost of US$ 3,315 for acute treatment of hip fracture cases [13]. A combination of the proportional distribution of three Diagnosis Related Group (DRG) performed by Velasco-Murillo, *et al.* [14] with the most recent technical costs of these DRG at IMSS, showed the weighted average cost of a hip fracture in this institution during 2008 was around US$ 9,500 per case [15].

As a consequence of the aging and the associated increase in fragility fractures and OP, the current work aimed to review epidemiological data and the medical management followed in the General Hospital H+ from Queretaro Mexico, related to reliable diagnostic and timely treating of osteoporosis and fragility fractures in the age group of patients with high risk. With the data obtained, we suggest a campaign of awareness and training of the medical community, responsible for the diagnostic and treatment of fragility fractures and OP and consequently implement preventive actions for patient's care. The International Osteoporosis Foundation (IOF) website lists osteoporosis guidelines from around the world. The Latin America Guideline "Consenso Iberoamericano de Osteoporosis SIBOMM 2009" constitute an excellent reference for increase awareness of OP at levels of physicians, authorities and the general public and provide tools for early detection, diagnostic, and post-fracture treatment and management of OP [16].

Materials and Methods

We performed a retrospective study of patients admitted at the Emergency Service from the General Hospital H+ (private institute) in Queretaro Mexico, from January 2017 to April 2018. From the total of medical records integrated (correspondent to 200 patient's presentation) in this period, only those medical records correspondent to patients with fractures admitted in the Orthopedic Service were considered for this study. The epidemiological data of orthopedic patients admitted were recorded in a form with eight items: gender, age, location of injury, mechanism of trauma injury, medical treatment, bone mineral densitometry (BMD), mention and treatment for OP.

The patients were selected according to the age groups established by the WHO, as adult (19 to 59 years) and elderly (60 years or over), and were subsequently classified by decades and gender for analysis.

The location of injury was classified into upper limb fractures, lower limb fractures, hip, spinal bone and others. Mechanism of trauma injury was considered as the causing factor of fractures and included predisposition factors.

The distribution of patients according to gender and age group from a sample of 49 orthopedic patients was performed by descriptive and inferential statistics methods. Qualitative variables were presented by distributions of absolute and relative frequencies. The distribution of variables was assessed by the chi-square method with a significant level alpha = 0.05 for rejection of the null hypothesis. All statistical analysis was performed by a validated Excel Sheet (Microsoft Excel 2016).

Results

The analysis of patient presentations during the year from January 2017 through to April 2018 showed that of a total of 200 patients presented in the Emergency Service, there were 49 patients with fractures admitted under the Orthopedic Service. The average age of orthopedic patients was 62 (±13) years and the genre proportion was of 33:67 male to female. Hence the general prevalence of fractures obtained in this study was male 5% and female 16.5%.

From 49 medical records analyzed 16 (33%) were males and 33 (67%) were females (Table 1). In both male and female gender, the most common age group was 50 to 59 (31.1% male - 30.3% female). This difference between genders was not considered significant (X^2 p>0.05*).

Table 1: *Distribution according to gender and age group of orthopedic patients treated at the General Hospital H+ Queretaro Mexico, from January 2017 to April 2018.*

AGE	MALE		FEMALE	
	N	%	N	%
40 to 49	4	25.0	6	18.2
50 to 59	5	31.3	10	30.3
60 to 69	3	18.8	6	18.2
70 to 79	2	12.5	8	24.2
80 to 89	2	12.5	2	6.1
90 to 99	0	0.0	1	3.0
Total	**16**	**100.0**	**33**	**100.0**
Font: medical records.				
p>0.05*				

In relation to the anatomical location of injury, from 49 medical records reviewed, 21 patients (33%) suffered upper limb injuries, 12 patients (20%) suffered lower limb injury and 9 patients (16%) suffered hip fracture (Table 2). Among the genre, the most common trauma causing admission was due to injury located in Upper limbs with 37.5% in male and 45.5% in female respectively. This difference between genders was not considered significant (X^2 p>0.05*).

Table 2: *Distribution of gender according to the anatomical location of injury of orthopedic patients admitted at the General Hospital H+ Queretaro Mexico, from January 2017 to April 2018.*

Location of Injury	MALE		FEMALE	
	N	%	N	%
Upper limb	6	37.5	15	45.5
Lower limb	4	25.0	8	24.2
Hip	3	18.8	6	18.2
Spinal bone	1	6.25	3	9.09
others	2	12.5	1	3.0
Total	**16**	**100.0**	**33**	**100.0**
Font: medical records.				
p>0.05*				

In reference to trauma mechanisms, 32 patients suffered a fall causing fracture, being that the most frequent cause with 56.3% male and 69.7% female (Table 3). This difference between genders was considered statistically significant (X^2 $p>0.05^*$). In the category of fall and others, no less than 50% of patients had pre-existing illness (systemic arterial hypertension, Diabetes Mellitus II, Obesity, Smoking, alcoholism) as predisposition factors to factures. Not informed category, were those patients who were only diagnosed and treated in the Emergency Service but then subsequently discharged from hospital.

Table 3. *Distribution of gender according to trauma mechanism of orthopedic patients treated at the General Hospital H+ in Queretaro Mexico, from January 2017 to April 2018.*

Mechanism of trauma	MALE		FEMALE	
	N	%	N	%
Fall	9	56.3	23	69.7
Car accident	4	25.0	0	0.0
Others	1	6.3	3	9.1
No informed	2	12.5	7	21.2
Total	**16**	**100.0**	**33**	**100.0**
Font: medical records.				
$P<0.05^*$				

Diagnostic and treatment OP

From 49 medical records reviewed, no more than five percentages (two patients) was diagnosed with OP using BMD and only one patient received treatment for OP (data not shown). This result suggests the reliable diagnosis and timely treatment of fracture fragility and OP were not performed in the most of patients and not according to issued criteria by health entities as IOF or WHO.

The Latin America Guideline "Iberoamerican Consensus of Osteoporosis SIBOMM 2009, listed in the website of IOF constitute an excellent reference for increase awareness of OP at levels of physicians, authorities and the general public and provide tools for early detection, diagnostic, and post-fracture treatment and management of fractures and OP (Table 4).

Table 4. *Resume of generalities of The Latin America Guideline "Iberoamerican Consensus of Osteoporosis SIBOMM 2009, listed in the website of IOF, presented as a guideline and recommendation for take account the risk factors for osteoporosis and risk factors for fractures (especially for FRAXTM methodology), the diagnostic evaluation tools and preventive actions and treatment for fractures fragility and osteoporosis, in the Iberoamerican region.*

Classification OP according BMD	Risk factor for OP detection	Risk factors for fractures (FRAX)™	Diagnostic	Criteria for BMD measurements	Prevention of OP and Fractures	Treatment of OP
BMD T value or T-*score* **Normal: T > -1.0** **Osteopenia (low bone mass):** **T < -1.0 y > -2.49** **Osteoporosis:** **T < -2.5** **Osteoporosis severe or established:** **T < -2.5 + fragility fracture**	• Sex • Age • Race • Early menopause and estrogen deficiency • Weight and nutritional status • Previous fractures • Familial antecedents osteoporosis • Sedentary • Tobacco • Alcohol • High bone mass turnover • Corticoids • Organ transplant and loss bone mass • Diabetes • Nosocomial conditions and drugs associated with low bone mass	• Country of residence • Race • Age • Sex • Weigh • Size • Previous fractures • Familial antecedents • Corticoids • Rheumatoid arthritis • Tobacco • Alcohol • Secondary osteoporosis • Mass bone densitometry (T-Score)	• **BMD**: -Dual photon, low energy x-ray bone absorptiometry (**DXA**). -Quantitative bone ultrasound (**QUS**). -Quantitative bone X-ray computed tomography (**BQTc**). -Non-mineralized quantitative, dynamic bone. -Histomorphometry (**BHM**). • X-rays **Laboratory studies for osteoporosis:** • General laboratory. • Specific laboratory test. • Laboratory of mineral metabolism. • Bone remodeling laboratory.	• Women 65 years and over. • Postmenopausal women under 65 with risk factors. • Men with 70 years and over and under 70 years with risk factors for fractures. • Adults with fragility fractures. • Adults with nosocomial conditions associated with low bone mass or loss of bone mass. • Adults with drugs associated with low and loss of bone mass. • Any person who is being considered to indicate pharmacological treatment. • Any person in treatment, to monitor the effect of it. • Any person who is not receiving treatment and in which the evidence of Bone loss may lead to treatment. Women who interrupt the use of estrogen should perform a BMD of according to the indications listed above.	**Health diet and life style**: • Dairy products. • Other nutrients - Vitamins - Minerals - Proteins • Physical activity. • Sun exposure (vitamin D). • Cessation of smoking. • Prevention of falls. • Hip protectors.	• Bisphosphonates. • Calcitonin. • Hormone Replacement Therapy. • Fluorine. • Recombinant PTH. • Strontium ranelate. • Calcium. • Vitamin D. • Treatment of osteoporosis in special situations. • Anti-fracture efficacy of the available treatments.

Discussions

The 95% of admitted orthopedic patients received medical management not according to criteria issued by health entities as IOF, related to early and reliable diagnosis and timely treatment of fracture fragility and OP.

Probably this accounts why no more than two patients were diagnosed with OP using BMD and only one patient received treatment for OP (data not shown). Therefore, it is recommended to initiate a campaign of awareness and training of the medical community, for integral management of fragility fractures and OP and implement preventive actions to avoid the cascade of fractures in benefit of patients and lowering the high associated cost both in private and public institutions. No significant statistical differences ($p>0.05^{*}$, X2 test) were found between the different distribution of gender studied, very probably due to lower number of patients in the sample in study (except for the distribution of gender according to trauma mechanism).

However, qualitative data showed that frequency of patients in the most age group and with the most common type and trauma mechanism of fractures admitted in the Orthopedic Service was consistently increased in female than male genders (table 1-3); and these groups of results are congruent with previous reports by Johansson H *et al* 2011 [5] and Clark *et al* 2010 [6].

Hence, the more frequent fractures in both gender reported in this study (table 2) are similar with that previously reported by Clark *et al* 2010 [3] and the prevalence of fractures obtained in this study (5% in male and 16.5% in female) was close to the percentages of prevalence (male 9.8% - female 19.2%) reported for vertebral fractures by Clark *et al* 2009 [9,10].

Since the Mexican population is aging and its life expectancy increasing, it is expecting the incidence of OP and fragility fractures associated, to grow accordingly and represent an imminent threat to the Mexican health system in the near future [1].

This retrospective study shows intrinsic limitations related to the General Hospital H+ characteristics, as a private and general health institution, with approximately 200 patient presentation (at Emergency Service) during 2017 year and first quarterly in 2018 year, and not to be a specialized government health institution for orthopedic patients and medicine areas related with fractures and OP management.

We present the Iberoamerican Consensus on Osteoporosis 2009 as a guideline and recommendation for take account the risk factors for osteoporosis and risk factors for fractures (especially for FRAXTM methodology), the diagnostic evaluation tools and preventive actions and treatments inside the medical community of General Hospital H+ for increase the awareness and medical training on fractures fragility and osteoporosis management.

Conclusion

A noticeable finding in this study in that does not exists a medical management of patients admitted in the Orthopedic Service from General Hospital H+, related to early and reliable diagnosis and timely treatment of fracture fragility and OP, according to issued criteria by IFO Probably these conditions contributed

importantly to the increased fragility fractures associated to the high risk group of adults and elderly and the absence of patients diagnosed with OP observed in this retrospective study.

The frequency of patients with the most common type and trauma mechanism of fractures admitted in the Orthopedic Service of General Hospital H+ was consistently increased in female group and these results are congruent with previous epidemiological reports in Mexico.

Increased fragility fractures and OP represent an imminent threat for the health system in the near future as Mexican population continues to aging and its life expectancy continues to increase [1].

The Regenerative Medicine Center from Queretaro Mexico, present the Iberoamerican Consensus on Osteoporosis 2009 as a guideline and recommendation for take account the risk factors for osteoporosis and risk factors for fractures (especially for FRAXTM methodology), the diagnostic evaluation tools and preventive actions and treatments inside the medical community of General Hospital H+, in order for increase the awareness and medical training on fractures fragility and osteoporosis management.

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