Arch Osteoporos
DOI 10.1007/s11657-010-0038-4

REVIEW

Epidemiology, costs, and burden of osteoporosis in Argentina, 2009

Francisco R. Spivacow · Ariel Sánchez

Received: 4 February 2010 / Accepted: 5 March 2010

Abstract
Summary Osteoporosis is a major public health concern for elderly subjects. Old age is a risk factor for fragility fractures; countries with aging population face a heavy burden of fractures and their consequences.
Introduction In 2009, the total population of Argentina was 40 million, with 10 million inhabitants aged >50 years. Population will grow 13% by 2050 and reach 53 million, but the elderly population will reach 19.5 million.
Discussion Local bone mineral density studies reveal that two out of four postmenopausal women have osteopenia, one has osteoporosis, and one has a normal bone mineral density. Around 3.3 million women will suffer from osteopenia in 2025 and 5.24 million in 2050. Although the rate of fragility fractures is higher in patients with osteoporosis, the absolute number of fractures is higher in osteopenic patients. In Argentina, the mean annual rate of hip fractures is 488/100,000 inhabitants aged above 50 years, with a 2.6:1 F/M ratio. Thus, over 34,000 hip fractures occur every year among the aged populationwith an average 90 such fractures per day.
Conclusion The Latin American Vertebral Osteoporosis Study found an overall 16.2% prevalence of vertebral fractures in Argentinean women aged 50 years or over. Hospitalization costs of hip and vertebral fractures in Argentina exceed 190 million USD per year. Consequently, the costs of osteoporosis for the public health system are staggering; however, the federal or the provincial governments of Argentina do not give the disease a high priority. To conclude, efforts for the prevention and management of osteoporosis are urgently needed.

Keywords Osteoporosis · Fractures · Epidemiology · Costs · Argentina

F. R. Spivacow
Sociedad Argentina de Osteoporosis (SAO),
Instituto de Investigaciones Metabólicas (IDIM),
Buenos Aires, Argentina

A. Sánchez (✉)
Asociación Argentina de Osteología y Metabolismo Mineral (AAOMM), Centro de Endocrinología,
Rosario, Santa Fe, Argentina
e-mail: asanchez@cimero.org.ar

Executive summary

Osteoporosis is a major public health concern for men and women aged 50 years and older. Fractures are the most serious consequence of osteoporosis, a disease in which bones become weak and more susceptible to fracture. Approximately 40% of Caucasian women and 13% of men 50 years and older will experience at least one clinical osteoporotic fracture at the hip, wrist, or spine in their lifetimes [1]. In addition to morbidity and mortality, osteoporosis and its resulting fractures are associated with significant economic costs related to hospitalizations, surgery, outpatient care, long-term care, disability, and premature death. Healthcare expenditures attributable to osteoporotic fractures in the USA were estimated to be 14 billion US dollars (USD) [2]. As improvements in life expectancy yield growing fracture-prone, elderly populations, the worldwide health and economic burden of osteoporosis are likely to increase in the future.

The countries with higher proportions of elderly population are currently facing a heavy burden of osteoporotic fractures and their consequences. The Argentinean population is expected to grow 13% by 2050, but the population aged 50 years and older, that is, the susceptible population, will grow by 20%. Secondly, fertility rates are falling: while the

Published online: 20 April 2010

present average number of children per woman is 2.3, it will fall to 2.0 within 20 years, and to 1.8 within 50 years [3]. This implies that by 2050 the number of economically active persons will not be enough to subsidize the health and retirement systems. Consequently, it is reasonable to assume that osteoporosis will pose a significant burden in Argentina in the coming years.

Key findings

- Old age is one of the strongest risk factors for fragility fractures; and in developed countries, hip fracture incidence peaks at the age range of 75-79 years
- Bone mineral density studies reveal that in Argentina, two out of four women ≥50 years have osteopenia, one has osteoporosis, and one is normal
- Over 34,000 hip fractures occur every year among the population ≥50 years old, with an average 90 such fractures per day
- The prevalence of vertebral fractures in Argentinean women aged 50 years or older is 16.2%
- Only ten diagnostic tools (bone densitometers) per million inhabitants are available in the country, in provincial capitals, and other large cities.

Epidemiology of osteoporosis and fragility fractures in Argentina

General demographics

Although neighboring countries in Latin America show a very diverse ethnic composition, made up by a variable mixture of native Americans, black African descents, and whites, Argentina is an exception with predominantly white population [4]. In 2009, the total population of Argentina was slightly over 40 million, with about 10 million inhabitants aged 50 years or more. In this population, the male/female ratio is 1:1.2 with 4.6 million men and 5.4 million women. Population is estimated to increase to more than 53 million by 2050 with 19.5 million people aged ≥50 years old, but the gender ratio is expected to remain unchanged [3].

Old age is one of the strongest risk factors for fragility fractures; and in developed countries, hip fracture incidence peaks at the age range of 75-79 years [5]. Today, life expectancy at birth in Argentina is 77 years and will be 82 years in 2050 [3].

Prevalence of osteoporosis and osteopenia

Population-based studies of osteoporosis prevalence in Argentina, analyzing bone mineral density (BMD) with dual energy X-ray absorptiometry (DXA) in women aged above 50 years at two axial sites (lumbar spine and femoral neck) revealed that 25% have normal BMD, 50% have osteopenia, and 25% have osteoporosis [6]. As the estimated population of women aged 50 years or more will be 7.3 million in 2025 and 11 million in 2050 [7], it can be projected that around 3.3 million women will have osteopenia in 2025 and 5.24 million in 2050 (Fig. 1); the number of women with osteoporosis can be estimated around 1.65 and 2.62 million, respectively. Although the rate of fragility fractures is higher in patients with osteoporosis, the absolute number of fractures is higher in osteopenic patients [8–10].

Hip fractures

In Argentina, the mean annual rate of hip fractures, according to seven published studies, is 488/100,000 inhabitants (SD±86) aged above 50 years, with a 2.6:1 women to men ratio [11–17]. Thus, over 34,000 hip fractures occur every year among the aged population, with an average 90 such fractures per day [18]. Hospital-based studies in other Latin American countries (Colombia, Chile, Brazil, Mexico, Panama, Peru, and Venezuela) reported variable annual rates, between 40 and 362 hip fractures per 100,000 persons aged 50 years and more [19]. This disparity in incidence rates between Argentina and other countries in the region might be partly methodological in origin since most surveys in other countries have been based on hospital discharge or death diagnoses; and many hip fracture cases may have gone unreported. On the other side, longer life expectancy in Argentina explains a higher proportion of elderly people in our population, and thus a higher rate of hip fractures.

For Argentina, it can be calculated that in 2050, there will be more than 63,000 hip fractures in women and more than 13,000 in men [18].

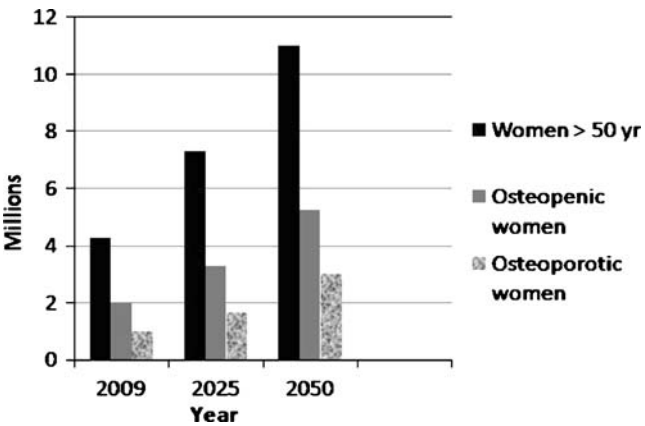

Fig. 1 Number of Argentinean osteopenic and osteoporotic women in 2009 and projections for 2025 and 2050 [7]

In the largest Argentinean published study so far, mean age of patients with hip fracture was 82 years for women and 79 years for men. Most fractures happened during the daytime and at home. More than 40% of patients had suffered previous fractures [13]. In a nationwide survey of 5,500 patients discharged from public hospitals during the year 2000, 1.1% had a diagnosis of hip fracture and patients operated on for this type of fracture had an in-hospital mortality rate of 5% [20]. In another study, in-hospital mortality was 10%, while 33% of fractured patients died during the year following the event [14]. In yet another study reporting data gathered from a managed care system, the mortality rate in the first year post-fracture was a low 9.1% [15]. Risk factors for hip fracture include cognitive impairment, previous falls, low calcium intake during youth, vitamin D deficiency, advanced age, and current low calcium intake [21].

Vertebral fractures

Although osteoporosis can be easily diagnosed and treated, studies have shown that it remains seriously under-diagnosed and under-treated [22]. It is estimated that only one out of three vertebral fractures comes to clinical attention [23]. The presence of vertebral fractures indicates an important risk factor for future osteoporotic fractures at the vertebral level as well as other anatomical sites.

Latin American Vertebral Osteoporosis Study, a radiological survey among Latin American women aged 50 years or older, found an overall 16.2% prevalence of vertebral fractures in Argentina [24]. Vertebral fractures increased with old age and in the population aged above 80 years, as many as one in four women had a prevalent vertebral fracture (Table 1). The study highlighted two significant risk factors for vertebral fractures: history of fracture and height loss. Hormone replacement therapy was associated with 35% lower odds of having a vertebral fracture; as well as physical activity, with 27% lower odds of having a vertebral fracture.

Table 1 Prevalence of vertebral fractures in 420 Argentinean women [24]

Age	Prevalence % (95% CI)
50-59	10.4 (4.5-16.4)
60-69	13.7 (6.9-20.5)
70-79	16.8 (9.9-23.6)
≥80	24.4 (15.6-33.3)
Overall≤79	13.8 (10.03-17.56)
Overall ages	16.19 (12.65-19.72)

CI confidence interval

Calcium and vitamin D status

Several surveys have detected insufficient calcium intake (averaging 500 mg daily) in the adult population [25]. Besides, despite good heliophany in most areas of the country, prevalence of deficient/insufficient levels of 25OHD (<20 ng/ml) in the elderly population is relatively high, not only in the south (87% of the population), but also in the mid (64%) and north (52%) regions [26]. The population living in Patagonia, the southernmost area of the country, is particularly at risk for hypovitaminosis D [27].

Overall economic and social cost of osteoporosis and fragility fractures

Cost and availability of diagnostic equipments

Regarding technical resources for diagnosing osteoporosis, there are ten axial bone densitometers per million inhabitants (DXA scanners). There are many computed tomography (CT) scanners in all large cities, but only 20 are used to perform central measurements of bone mineral density (quantitative computed tomography; QCT). This figure is an estimate based on information provided by commercial dealers of densitometers most frequently sold in Argentina. There are an undetermined number of quantitative ultrasound (QUS) devices in the country. There are four peripheral QCT (pQCT) equipments and one high-resolution pQCT, all of which are only used in research. The practice of bone densitometry is covered by third-party payers and the social security system (usually, one anatomical region per year). The average cost of a bone densitometry (with DXA or QCT) is USD 22 per anatomical region. QUS is not recognized as a reimbursable practice.

Most public health facilities lack densitometric equipment and the national welfare system for retired citizens and pensioners (PAMI) does not routinely cover bone densitometry. Requests made by primary care physicians must finally be audited and approved on a case-by-case basis.

The price of radiological vertebral fracture assessment (lateral radiographs of the dorsal and lumbar spine) is USD 66. A laboratory work-up to evaluate calcium/phosphate metabolism and bone turnover costs USD 60-70. The cost of a medical office visit ranges from USD 7-15 and USD 30-50, the former figures representing the medical fee within the managed care system, and the latter the fee in the private sector. Table 2 summarizes costs of osteoporosis diagnosis in Argentina.

Costs of osteoporotic fractures

Direct costs of treating an acute episode of hip fracture (hospital admission, surgical intervention, price of an

Table 2 Costs of osteoporosis diagnosis

Exams	Price in USD
Medical visit	7-15, managed care system; 30-50, private sector
X-ray assessment of dorsal and lumbar spine	66
Bone densitometry (DXA, QCT)	22
Laboratory exams (calcium/phosphate metabolism + bone turnover)	60-70

artificial prosthesis, and rehabilitation) were estimated at USD 5,500 in 2004. Table 3 shows the cost of hip fractures considering all cases registered in 1 year [18]; the number of vertebral fractures is an estimate based on the prevalence of such fractures among women aged 60 years or more [24].

These costs for hip fractures were slightly lower than the figures of USD 4,500 in Uruguay or Venezuela, and USD 5,500 in Brazil, Chile, and Mexico; and considerably less than the cost in the USA (USD 8,500) [19].

Mean duration of hospital stay for a non-complicated hip fracture case is 4–5 days in the private sector and 6–7 days in public hospitals. It has been established that number of hospital days due to osteoporotic fractures are higher compared to many other diseases [28].

Vertebroplasty, a minimally invasive technique that permits the stabilization of a crushed vertebra after injection of bone cement, is increasingly used in large medical facilities for the treatment of acute vertebral fractures because the analgesic effect is almost immediate [29]. Also, improved vertebral body height, lesser kyphosis angle, and lesser wedge angle have been reported after the procedure [30–32]. This technique was introduced in Argentina around 1995.

There are only four centers—all in Buenos Aires—with the equipment needed to perform kyphoplasty (expansion of a partially crushed vertebra with a balloon, which is withdrawn in order to inject the acrylic cement).

The cost of vertebroplasty is USD 1,750 per vertebra, which includes computed tomography, but excludes anesthesia, admission (usually the procedure requires 1 day hospitalization), and ambulance transportation. The cost of kyphoplasty is approximately USD 10,500.[1]

[1] A controversy regarding the effectiveness of vertebroplasty in the treatment of vertebral collapses has followed the recent publication of two articles in The New England Journal of Medicine suggesting that this intervention might not be superior to local infiltration with anesthetics to alleviate pain [33–35]. Further consideration of this issue is beyond the scope of the present article.

Cost of medical treatment

Medications approved for the prevention and treatment of osteoporosis are calcium (carbonate, gluconate, lactate, citrate, pidolate, and phosphate), vitamin D_2 and D_3, calcitriol, calcitonin, estrogens, raloxifene, tibolone, several bisphosphonates (alendronate, risedronate, oral and intravenous (i.v.) ibandronate, oral and i.v. pamidronate, zoledronic acid), teriparatide, and strontium ranelate [6].

Medical prescriptions for osteoporosis represent only 1% of the Argentinean pharmaceutical market, which totals USD 37 million per year. Of all osteoporosis prescriptions, 41.6% correspond to calcium salts, and 55.8% to bisphosphonates. In the last 4 years, the prescription of calcitonin, estrogens, and other hormonal preparations has dropped 30%, while that of bisphosphonates has increased. Calcitonin is expensive, and is perceived by doctors as having limited effectiveness for the prevention and treatment of fractures. The drop in the number of prescriptions for estrogens could be due to the impact of the findings in the Women's Health Initiative and the Heart and Estrogen/Progestin Replacement Study II trials, indicating increased risk of breast cancer and cardiovascular disease after prolonged use. A similar decrease in hormonal preparations use among postmenopausal women has been documented in Europe and Latin America [36–38].

The average annual cost for the most frequently prescribed non-generic osteoporotic drugs (oral alendronate, risedronate, ibandronate, raloxifene, and intravenous pamidronate and ibandronate) is 367 USD (range 289-1,047 USD), including adequate calcium and vitamin D supplements. If we consider generics, the average annual cost decreases to 240 USD (range 190-945 USD). Finally, considering the most recent treatments (teriparatide, strontium ranelate, zoledronic acid), of which there are no generics in the market as yet, the annual costs are USD 10,300, 961, and 722, respectively. Costs can be 40% lower for patients with medical coverage. Medications are provided free of charge within the public health system and with sizable discounts (70%) or free for retired citizens and pensioners covered by PAMI. However, the bureaucracy in the latter frequently prevents effective and timely treatment with newer and effective drugs such as teriparatide or strontium ranelate. The eight most frequently

Table 3 Hospitalization cost of hip and vertebral fractures in Argentina (in USD per year)

	Expected cost per case	Number of cases	Total cost
Hip	3,800	34,000	129,200,000
Vertebral	163	382,100	62,282,300

prescribed anti-osteoporotic drugs are generics, representing 62% of the total monetary value and 68% of total units sold annually (Intercontinental Marketing and Statistics; Pharmaceutical Market).

The average monthly income per capita is 1,082 USD (United Nations, Human Development Index, 2009).

In Argentina, large urban centers have bone densitometers and the practice of bone densitometry is now accepted by most health insurance companies, including many public social security institutions. Physicians are aware of osteoporosis as a disease and the importance of both preventing and treating it; several scientific societies regularly organize conferences, symposia, and courses on osteoporosis. With appropriate medical information about individual cases, the cost of anti-osteoporotic treatment is substantially or fully covered by health care providers, both public and private.

An optimistic view of the future suggests that over time the costs of diagnostic scanning should fall, and with generic drugs, so should the costs of treatment.

Fortified foods

The Argentinean Guidelines for the Prevention and Treatment of Osteoporosis recommend a daily calcium intake of 1.5 g, and a daily vitamin D intake of 800 IU [6]. Thus, to help prevent osteoporosis through nutrition, calcium- and/or vitamin D-fortified milk, yogurts, and juices exist in the market. Calcium-enriched milks contain 40% more calcium than standard milk. The addition of vitamin D is, however, low in fortified milk or juices containing only 40 IU/liter [39].

Actions taken by the government and scientific/patient national societies

There are no government-sponsored programs for prevention and/or treatment of osteoporosis. Scientific societies are active in improving public awareness about the disease. Every year, coinciding with scientific meetings and on World Osteoporosis Day, articles are published in newspapers, and there are interventions of specialists on radio and TV programs to explain the problem and recommend preventive measures. Besides, free peripheral densitometries are made available among men and women in order to identify people at high risk of osteoporotic fractures. The Argentine Society for Osteoporosis has helped organize an Association for Patients with Osteoporosis, which has become increasingly involved in spreading news about advances in prevention and treatment. Both the Argentine Association of Osteology and Mineral Metabolism and the Argentine Society for Osteoporosis organize annual training courses in densitometry for technicians and young physicians. Both associations jointly sponsored and published Guidelines for the Diagnosis, Prevention, and Treatment of Osteoporosis [40], which have been updated in 2007 [6].

Conclusions and future directions

We can conclude that the costs of osteoporosis for the public health system are staggering. However, the federal or the provincial governments have not made the disease a high priority. Efforts for the prevention of the disease are urgently needed; some recommendations follow:

(a) Physicians should be urged to identify patients at high risk of fragility fractures to promptly confirm the diagnosis of osteoporosis and to start treatment if necessary [6].
(b) Access to reimbursement of bone mineral density scans must be improved for people at high risk of fragility fractures, especially before any fracture event.
(c) Media campaigns to increase the awareness of prevention and treatment possibilities towards fighting against osteoporosis.
(d) Medical institutions should establish programs to ensure adherence of osteoporotic patients to the indicated treatment plans.
(e) Better nutrition for children, adolescents, pregnant women and the elderly; fortification of food with calcium and vitamin D. Priority should be given to these measures in geographic areas at high risk of hypovitaminosis D [39].
(f) Encouragement of adequate exercise programs for adults and the elderly.
(g) Better practices to produce practical, cost-effective strategies with measurable targets for reducing osteoporotic fractures must be implemented.
(h) Education starting in primary school and sustained in high school and the tertiary level.

Improved accessibility to diagnosis and proven therapies alone is not enough. Better education of policy makers, healthcare professionals, and the general public is necessary to reduce the incidence and burden of osteoporotic fractures.

Acknowledgments This review has been made possible by a subsidy from the International Osteoporosis Foundation

Disclosure None.

References

1. Harvey N, Earl S, Cooper C (2006) The epidemiology of osteoporotic fractures. In: Favus MJ (ed) Primer on the metabolic bone diseases and disorders of mineral metabolism, 6th edn. American Society for Bone and Mineral Research, Washington DC, pp 244–248

2. Burge R, Dawson-Hughes B, Solomon DH, Wong JB, King A, Tosteson A (2007) Incidence and economic burden of osteoporosis-related fractures in the United States, 2005–2025. J Bone Miner Res 22:465–475
3. CELADE (2000) Latin America: population by calendar years and simple ages 1995-2005. Boletín Demográfico N° 66. ECLAC-CEPAL, Santiago, Chile
4. US Census Bureau, International Data Base, 2009
5. Johnell O, Kanis J (2006) An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int 17:1726–1733
6. Schurman L, Bagur A, Claus-Hermberg H, Messina OD, Negri A, Sánchez A (2007) [Argentine Guidelines for the Diagnosis, Prevention, and Treatment of Osteoporosis.] Actual Osteol 3:117-136; and Rev Arg Osteol 6(3):27-42 (double publication). Abridged English version available at www.iofbonehealth.org/health-professionals/national-regional-guidelines/evidence-based-guidelines.html
7. National Institute of Statistics and Census (INDEC). www.indec.gov.ar
8. Siris E, Chen Y-T, Abbott TA, Barrett-Connor E, Miller PD, Wehren LE, Berger ML (2004) Bone mineral density thresholds for pharmacological intervention to prevent fractures. Arch Intern Med 164:1108–1112
9. Wainwright SA, Marshall LM, Ensrud KE, Cauley JA, Black DM, Hillier TA, Hochberg MC, Vogt MT, Orwoll ES, The Study of Osteoporotic Fractures Research Group (2005) Hip fracture in women without osteoporosis. J Clin Endocrinol Metab 90:2787–2793
10. Freitas SS, Barrett-Connor E, Ensrud KE, Fink HA, Bauer DC, Cawthon PM, Lambert LC, Orwoll ES, Osteoporotic Fractures in Men (MrOS) Research Group (2008) Rate and circumstances of clinical vertebral fractures in older men. Osteoporos Int 19:615–623
11. Mosquera MT, Maurel DL, Pavón S, Arregui A, Moreno C, Vázquez J (1998) Incidence and risk factors in fractures of the proximal femur due to osteoporosis. Panam J Public Health 3:211–218
12. Bagur A, Mautalen C, Rubin Z (1994) Epidemiology of hip fractures in an urban population of central Argentina. Osteoporos Int 4:332–335
13. Morosano M, Masoni A, Sánchez A (2005) Incidence of hip fractures in the city of Rosario, Argentina. Osteoporos Int 16:1339–1344
14. Somma LF, Rosso GZ, Trobo RI, Barreira JC, Messina OD (2000) Epidemiology of hip fracture in Luján, Argentina (Abstract). Osteology 3:267
15. Claus-Hermberg H, Lozano Bullrich MP, Ilera V, Malter Terrada J, Pozzo MJ (2008) Incidence of hip fractures in women affiliated to the medical care system of the German Hospital, Buenos Aires. Actual Osteol 4:57–62
16. Bagur A, Rovai G, López Giovanelli J, Díaz M, Jacobo J, Nieva A, Pilili R, Plantalech L (2009) Incidence of hip fractures in Corrientes, Bariloche and Comodoro Rivadavia. Actual Osteol 5:81–87
17. Wittich A, Bagur A, Oliveri B, Cristofari A, Escobar O, Carrizo G, Oliveri B (2009) Epidemiology of hip fracture in Tucumán, Argentina. Osteoporos Int. doi:10.1007/s00198-009-1135-3
18. Spivacow FR (2001) Epidemiology of osteoporotic fractures. In: Zanchetta JR, Talbot J (eds) Osteoporosis, Fisiología, Diagnóstico, Prevención y Tratamiento. Editorial Médica Panamericana, Buenos Aires, pp 415–421
19. Morales-Torres J, Gutiérrez-Ureña S (2004) The burden of osteoporosis in Latin America. Osteoporos Int 15:625–632
20. Sequeira G, Kerzberg EM, Marconi EH, Guebel CG, Fernández MM (2003) Hip fractures in the Argentine Republic. Communication to the 37th Argentine Congress of Rheumatology, Buenos Aires
21. Masoni A, Morosano M, Tomat MF, Pezzotto SM, Sánchez A (2007) Association between hip fractures and risk factors for osteoporosis. Multivariate analysis. Medicina (B Aires) 67:423–428
22. Nguyen TV, Center JR, Eisman JA (2004) Osteoporosis: underrated, underdiagnosed and undertreated. Med J Aust 180(5 Suppl):S18–S22
23. Cooper C, Atkinson EJ, O'Fallon WM, Melton LJ 3rd (1992) Incidence of clinically diagnosed vertebral fractures: a population-based study in Rochester, Minnesota, 1985-1989. J Bone Miner Res 7:221–227
24. Clark P, Cons-Molina F, Delezé M, Ragi S, Haddock L, Zanchetta JR, Jaller JJ, Palermo L, Talavera JO, Messina DO, Morales-Torres J, Salmeron J, Navarrete A, Suarez E, Pérez CM, Cummings SR (2009) The prevalence of vertebral deformity in Latin American countries: the Latin American Vertebral Osteoporosis Study (LAVOS). Osteoporos Int 20:275–282
25. Ronayne de Ferrer PA (2007) Intake of dairy products in Argentina: Evolution and present situation. Actual Osteol 3:81-88. Available at www.aaomm.org.ar/Actualizaciones
26. Oliveri B, Plantalech L, Bagur A, Wittich AC, Rovai G, Pusiol E, López Giovanelli J, Ponce G, Nieva A, Chaperón A, Ladizesky M, Somoza J, Casco C, Zeni S, Parisi MS, Mautalen CA (2004) High prevalence of vitamin D insufficiency in healthy elderly people living at home in Argentina. Eur J Clin Nutr 58:337–342
27. Plantalech L (2005) Map of hypovitaminosis D in Argentina. Actual Osteol 1:11-16. Available at www.aaomm.org.ar/Actualizaciones
28. Kanis JA, Delmas P, Burckhardt P, Cooper C, Torgerson D (1997) Guidelines for diagnosis and management of osteoporosis. The European Foundation for Osteoporosis and Bone Disease. Osteoporos Int 7:390–406
29. Kobayashi K, Shimoyama K, Nakamura K, Murata K (2005) Percutaneous vertebroplasty immediately relieves pain of osteoporotic vertebral compression fractures and prevents prolonged immobilization of patients. Eur Radiol 15:360–367
30. Dublin AB, Hartman J, Latchaw RE, Hald JK, Reid MH (2005) The vertebral body fracture in osteoporosis: restoration of height using percutaneous vertebroplasty. Am J Neuroradiol 26:489–492
31. Trout AT, Kallmes DF, Gray LA, Goodnature BA, Everson SL, Comstock BA, Jarvik JG (2005) Evaluation of vertebroplasty with a validated outcome measure: the Roland-Morris Disability Questionnaire. Am J Neuroradiol 26:2652–2657
32. McKiernan F, Faciszewski T, Jensen R (2004) Quality of life following vertebroplasty. J Bone Joint Surg Am 86:2600–2606
33. Buchbinder R, Osborne RH, Ebeling PR, Wark JD, Mitchell P, Wriedt C, Graves S, Staples MP, Murphy B (2009) A randomized trial of vertebroplasty for painful osteoporotic vertebral fractures. N Engl J Med 61:557–568
34. Kallmes DF, Comstock BA, Heagerty PJ, Turner JA, Wilson DJ, Diamond TH, Edwards R, Gray LA, Stout L, Owen S, Hollingworth W, Ghdoke B, Annesley-Williams DJ, Ralston SH, Jarvik JG (2009) A randomized trial of vertebroplasty for osteoporotic spinal fractures. N Engl J Med 361:569–579
35. Weinstein JN (2009) Balancing science and informed choice in decisions about vertebroplasty (editorial). N Engl J Med 361:319–321
36. Huot L, Couris CM, Tainturier V, Jaglal S, Colin C, Schott AM (2008) Trends in HRT and anti-osteoporosis medication prescribing in a European population after the WHI study. Osteoporos Int 19:1047–1054
37. Farley JF, Blalock SJ, Cline RR (2008) Effect of the women's health initiative on prescription anti-osteoporosis medication utilization. Osteoporos Int 19:1603–1612
38. Lazar F Jr, Costa-Paiva L, Morais SS, Pedro AO, Pinto-Neto AM (2007) The attitude of gynecologists in São Paulo, Brazil 3 years after the Women's Health Initiative study. Maturitas 56:129–141
39. Sánchez A, Puche R, Zeni S, Oliveri B, Galich AM, Maffei L, Plantalech L, Poudes G, Bregni C (2002) Role of calcium and vitamin D in bone health (review). Rev Esp Enferm Metab Oseas 11:201–217 (Part I); (2003) 12:14-29 (Part II)
40. Schurman L, Bagur A, Claus-Hermberg H, Messina OD, Negri A, Sánchez A (2004) Argentine guidelines for the diagnosis, prevention, and treatment of osteoporosis. Rev Arg Osteol 3(3):4–5