RISK FACTORS FOR OSTEOPOROSIS BETWEEN MALES AND FEMALES IN TROPICAL REGION.

Giulia Sestini[1], Gabriel Antonio Cabriott Dumbra[1], Mariana Storino Conte[1], Patrícia da Silva Fucuta[2], Felipe Colombelli Pacca[3], Daniela Vichiato Polizelli Roma[4], Tamara Veiga Faria[5].

1. Academic of the Medical Course of Ceres College, FACERES. São José do Rio Preto, SP, Brazil.
2. Prof. Dra. of the Medical course at Ceres College, FACERES. São José do Rio Preto, SP, Brazil.
3. Prof. Me. of the Medical course at Ceres College, FACERES, São José do Rio Preto, SP, Brazil.
4. Prof. Ma. Rheumatologist of the Medical course at Ceres College, FACERES, São José do Rio Preto, SP, Brazil.
5. Prof. Dra. of the Medical course of Ceres College, FACERES, São José do Rio Preto, SP, Brazil.

Institution: CERES COLLEGE (FACERES) - São José do Rio Preto - SP - Brazil.

Abstract:

Introduction: With the gradual increase in life expectancy, the study of chronic diseases that affect the elderly population, such as osteoporosis, has become inevitable. Considering the representativeness of the city of São José do Rio Preto as a tropical region, it is necessary to analyze the risk factors for osteoporosis and its reflex in the Brazilian population. Due to lack of relative data of this population, the study was developed to identify the risk factors for osteoporosis among the genera of a developing tropical region and propose health actions for the community in order to minimize the impacts of this disease**. Methods:** The study was developed in São José do Rio Preto, through an Osteoporosis Prevention Campaign promoted by FACERES Colllege, to raise awareness and collect data, outlining an epidemiological profile of the disease. The IOF One-Minute Risk Test for Osteoporosis was used as an instrument. Data were analyzed by absolute and percentage frequencies. The associations between the variables of interest were evaluated from the chi-square test and the level of significance was 5%. **Results**: Risk factors for osteoporosis in a tropical country population are more evident in females, however, they are increasing in both genders. Risk factors such as: exercise habit <10 min, low intake of milk and dairy products, low levels of vitamin D and low sun exposure are the main risk factors identified in the study. **Discussion**: After analyzing the data, and considering the need to propose health actions to the community in order to minimize the impacts of this disease, proposals were made for interventions in the community to reduce modifiable risk factors. **Conclusion:** The test allowed us to analyze the population of a tropical region and to reflect that measures such as: orientations, extensive disease

screening, calcium and vitamin D supplementation in foods and increased sun exposure should be taken to minimize the risk factors of osteoporosis and achieve, through prevention, the reduction of complications of the disease and consequent improvement of the quality of life.

Key – words: Osteoporosis, risk factors, gender, vitamin D.

Introduction

Over the next 43 years the number of individuals over 60 years old will be three times greater than the current one. In addition, the rate of life expectancy has been increasing gradually, making the study of chronic diseases that reach the elderly population, such as osteoporosis, inevitable [1].

Osteoporosis affects 10 million Brazilians, most of them over 65 years of age. One of the main causes of the disorder is the lack of vitamin D. The concentration of vitamin D in Brazilians was similar to that of places of latitude closer to Ecuador [2].

It is important to consider that a tropical country like Brazil has a low vitamin D diet, whose main sources are fish with a high fat content. These are found in the cold regions of the northern hemisphere, where despite the lower incidence of sunrays, there is higher consumption of fish, as well as supplementation of milk with vitamin D [3-5]. In addition, vitamin D deficiency in postmenopausal women living in places with a humid tropical climate is not prevented by the abundance of sunlight [3-4].

Osteoporosis has a significant impact on the genders and the study of their risk factors is fundamental for prevention and treatment. Its risk factors can be classified into modifiable and non-modifiable factors. The major clinical interest in reducing the incidence of this disease and its complications are modifiable risk factors such as inadequate sun exposure, vitamin D supplementation and smoking [6].

In the context of a tropical and developing region, the city of São José do Rio Preto, in the interior of the state of São Paulo, has 52% of its population represented by women and no survey on the incidence of osteoporosis [7-8]. It shows a high socioeconomic level

through per capita income and great development in the health area, occupying the 8th place in the human development index, and a life expectancy at birth of 76.1 years [1-10].

Considering the representativeness of the city of São José do Rio Preto as a tropical region, it is evident the need to analyze the risk factors for osteoporosis and its reflex in relation to the Brazilian population. In addition to the lack of data related to this population, the present study was developed to identify the risk factors for osteoporosis between the male and female gender of a developing tropical region and to propose health actions for the community in order to minimize impacts of this disease.

Method:

The present study was carried out in the city of São José do Rio Preto-SP, where an Osteoporosis Prevention Campaign was carried out by Ceres College (FACERES). It was an event of awareness and data collection to contemplate the population of the city and region, outlining a profile of the disease. In order to use the data collected, the study was submitted for approval by the Research Ethics Committee (CEP) No. 1,445,235.

On October 23rd and 24t^{h}, 2015, during business hours in a shopping mall located in the central region of the city, with the support of 44 students, nutritionists, physiotherapists and rheumatologists, orientations were developed to prevent osteoporosis and consequently to improve the quality of life. The event was widely publicized in social networks and visual media in the region and was supported by the International Osteoporosis Foundation (IOF).

For the design of risk factors related to osteoporosis, the "New IOF One-Minute Risk Test" was used as instrument.

The one-minute screening for IOF osteoporosis risk factors is based on 19 questions that can be answered in one minute. Several studies have used the test as an awareness tool that inform possible risk factors for osteoporosis and allows early detection [1-15].

Data were analyzed by absolute and percentage frequencies. The associations between the variables of interest were evaluated from the chi-square test and the level of significance was 5%.

Results:

During the three days of the Osteoporosis Prevention Campaign, 400 respondents answered the questionnaire "New IOF One-Minute Risk Test". It was observed that 383 (96%) of the participants responded positively to at least one test question, indicating the presence of clinically proven risk factors for osteoporosis. The remainder, only 4% of the sample, did not present a positive response, presenting no risk factors.

The public that participated in the action was randomly selected from the population that passed in the place, pointing the median of 57 years of age. Males were ages between 15 and 104 years and females between 19 and 88 years. The median age was 55 years in women and 62.5 years in men.

The incidence of risk factors by gender showed that both sexes followed the same proportion of risk factors. The sample had a total of 260 women and 140 men, and of these, approximately 95% of both sexes answered affirmatively to at least one question of the test. Therefore, it was concluded that only 12 women (5%) and 5 men (4%) did not have a risk factor for osteoporosis according to the IOF test.

The analysis of the questionnaires confirmed that the diagnosis of osteoporosis continues to be more frequent in women than in men ($p < 0.000$ - chi-square test). The performance of bone densitometry is not frequent in both sexes, but when compared to women, the men performed more of this test ($p < 0.000$ - chi-square test).

Regarding the incidence of positive responses per question, it was observed that among the 19 questions of the "New IOF One-Minute Risk Test", those of number 3, 17, 16 and 19 were the ones that obtained the highest positivity index. These questions correspond respectively to the following statements: "Are you 40 years old or older?" (79.5%), "Is your daily exercise quota less than 30 minutes?" (43.5%), "Do you smoke or have you ever smoked? (36.75%) and "Do you get less than 10 minutes a day outdoors with part of your body exposed to the sun without eating foods or supplements rich in Vitamin D?" (33.50%) (Figure 1).

The majority of respondents in the 40-year age group were women (49.75% of women and 29.75% of men) (p = 0.046 - chi-square test). On the other hand, both genders were exposed to the risk factors of "not having the habit of practicing physical activities", (p = 0.657 - chi-square test), "not ingesting milk and derivatives" (p = 0.141 - test chi) and although they live in a tropical region, "solar exposure> 10 min" is not frequent (p = 0.807 chi-square test).

Variables	**Masculine (n=140)**	**Feminine (n=260)**	**P value (chi-square test)**
Age	62,5 anos	55 anos	
Clinical diagnosis of osteoporosis	6 (4,3%)	45(17,3%)	0,000
Bone densitometry	23(16,4%)	116(44,6%)	0,000
Previous treatment for osteoporosis	6(4,3%)	36(13,8%)	0,003
Current treatment for osteoporosis	4(2,9%)	27(10,4%)	0,007
Family history of osteoporosis (parents)	19(13,6%)	67(25,8%)	0,005
Kyphosis in parents	16(11,4%)	42(16,2%)	0,2
Age >40 years old	119(85%)	199(76,5%)	0,046
Post-fall fracture	35(25%)	48(18,5%)	0,129
Fall due to weakness	11(7,9%)	48(18,5%)	0,004
Change in hight after 40 years of age	24(17,1%)	67(25,8%)	0,050
BMI <19 Kg/m^2	9(6,4%)	11(4,2%)	0,336

Corticosteroid use for more than 3 months	17(12,2%)	47(18,1%)	0,129
Rheumatoid arthritis	11(7,9%)	46(17,7%)	0,007
Thyroid disease	7(5%)	34(13,1%)	0,011
Alcoholism	18(12,9%)	10(3,8%)	0,001
Smoking	57(40,7%)	90(34,6%)	0,228
Physical exercises for <30min	63(45%)	111(42,7%)	0,657
Absence of milk and derivatives	34(24,3%)	47(18,1%)	0,141
Sun exposure <10min	48(34,3%)	86(33,1%)	0,807

Figure 1 - Incidence of affirmative answers by question of the IOF test split by gender.

We identified that the risk factor "smoking" was statistically equivalent for men (14.15%) and women (22.50%) with p = 0.0228 (chi-square test), and alcohol consumption remained more prevalent in men.

It was also evident that the alternative of less positivity during the research was number 7 - " underweight, or body mass index is less than 19 kg/m2". This risk factor was not identified in the study population. However, body mass index (BMI) >19 is frequent and similar between men and women (p = 0,336 - chi-square test).

Regarding the comparison of gender with the "presence of osteoporosis in parents", there was a significant difference (p = 0.005 - chi-square test) demonstrating that females had more family history of osteoporosis than males. However, there was no statistical difference between genders and presence of kyphosis (p = 0.200 - chi-square test) as well as post-fall fracture rate (p = 0.146 - chi-square test). In addition, women had a greater history of fall affected by weakness (p = 0.04 - chi-square test).

In the analysis of the question on "treatment for osteoporosis" we statistically confirmed that women were ($p = 0.003$ - chi-square test) and are ($p = 0.007$-chi-square test) treated for this disease more than men.

Comparison between genders confirmed that the risk factor "change in height in the course of life" occurred more in women (statistical difference represented by $p = 0.050$, chi-square test), such as the presence of rheumatoid arthritis ($p = 0.007$) and thyroid disease ($p = 0.011$).

In the individuals under 40 years of age (20.5%), a similar distribution to the general population was observed, but it was evident that questions 8 and 1 presented a greater expression in the responses of this group. Therefore, it was demonstrated that the risk factors "use of corticosteroid for more than 3 consecutive months" and "family history" gained prominence in this age group. However, there were no statistical differences between men (12.20%) and women (18.10%) who used corticosteroids ($p = 0.129$ - chi-square test) and this risk factor was not prevalent in the study population.

Discussion

The one-minute IOF test allowed the identification of differences between genders in relation to risk factors for osteoporosis. Women have continued to lead the number of cases of this disease and are increasingly acquiring risk factors. While men are increasingly exposed to them and therefore should be included in the screening for osteoporosis.

Considering that the population studied represents a tropical region, men and women would be exposed to three of the main risk factors: absence of regular physical exercise habits, low intake of milk and dairy products without vitamin D addition and little sun exposure.

For the data collection, the study site was fundamental. We chose a central area of the urban zone in which we could inform effectivly a large number of people. We found a heterogeneous population with an ideal age range for the application of the IOF test with median age of 55 years for women and 62.5 years for men

When compared to the recent Italian study, our sample showed a similar (Gaussian) distribution, evaluating female individuals between 17 and 97 years of age, with a median of 57.6 years and 22 and 92 years of males, the median being 62 years. However, most of the studies opted for patients over the age of 40 using appropriate sampling techniques [11 – 13].

The study showed that the vast majority of respondents answered at least one question positively, noting that osteoporosis risk factors are increasingly common in tropical regions, with only 4% of all responses negative. Women represented the highest number of positive responses, being more exposed to risk factors.

Compared with results obtained in a Chinese study, in the year 2016, 62.67% of participants answered affirmatively to at least one answer and were defined as a group susceptible to osteoporosis and fractures. However, 37.33% of the participants did not obtain positive answers on any of the questions. Thus, the number of positive responses in the IOF Test was significantly higher in men when compared to women [13].

It is important to demonstrate that the IOF test objectively delineates the presence or absence of risk factors through affirmative responses. Therefore, it may be noted that the issues of greater relevance in this study were shown to be different from those assessed during a Ukrainian study using the same instrument in postmenopausal women. In Ukraine, it was observed that the most reliable factors were bone fracture after standing height fall, use of corticosteroids continuously and loss of more than 3 cm in height [12].

Based on the percentage of positive responses in each question, it is possible to evaluate that, following international tendencies, the predominant public is over 40 years old and that the most important risk factors (age, physical exercise, smoking and sun exposure / vitamin D) differ from European data, which can be understood by differences in the tropical region and the focus on gender [11-13].

Compared with the Italian study, steroids as a risk factor in the population under 40 years old appeared more expressively with 14.49% compared to 2.4% of Italians. The family histories were equivalent representing 10.14% and 7.4% respectively [11].

It is important to emphasize that in the present study the use of corticosteroids was more prevalent in the age group under 40 years and mainly in women, becoming an important risk factor in this public, necessitating appropriate prevention measures for the same group.

Comparing the data obtained by Cavalli and colleagues in 2016, the predominance of females in both age groups was found to be a risk factor "Age above 40 years", in Italy (70.3%), Brazil (49.75%). Given the randomness of both samples [11].

In relation to the "Smoking" factor there is inversion of prevalence, since the Italian is male (52.1%) [11], and the Brazilian one, as in a tropical region, is female (22.5%); we also highlight the evidence of increased smoking among women and the acquisition of one more risk factor for osteoporosis, possibly related to the demographic, cultural and population differences of each region or country.

In the "alcohol consumption" factor, we identified a male predominance. The most relevant data analyzed when compared to the European population is the sample over 40 years old, which has a much greater predominance of females, a fact that can be explained by the life expectancy [11-16].

In this analysis, when comparing gender and diagnosis of osteoporosis, it was observed a higher frequency in women. When compared with the Italian study, there was similar parameters [11]. It is understood, therefore, that the comparison of males and females showed a prevalence of the diagnosis of osteoporosis in females, due to the fact that they perform greater screening for the disease.

When comparing gender with the performance of bone densitometry and previous diagnosis of osteoporosis, both do not frequently perform the exam, but there is a higher prevalence of males. Thus, men are being tracked more in our region. In addition, during the literature analysis no references were found in similar studies that made the same type of comparison.

According to the Brazilian Ministry of Health, bone densitometry is not indicated for tracking because of cost and low specificity. Their indication would be according to the risk age group: women in the climacteric period and postmenopausal years, history of bone fracture after 50 years of age, radiological vertebral abnormalities, and adults with conditions associated with low bone mass[17].

The comparison between gender and previous treatment of osteoporosis was more recurrent in females as well as gender and current treatment of osteoporosis when compared to males. During a large literature review, no similar studies comparing previous or current treatment of osteoporosis with gender were found.

However, already in the analysis of gender with the presence of osteoporosis of the parents, we identified statistical difference between the genders showing that females showed a greater family history of osteoporosis in relation to male. However, in the Italian study of 2016, it was shown that the distribution between genders remained similar [11]. Such association demonstrates that family history has an influence on the disease, but that there is probably greater awareness among women about family morbidities, and that they consult more frequently and get more information about the consequences of osteoporosis. In the Italian study, kyphosis and fractures also did not present statistical differences between genders [11].

In the item "gender and age greater than 40 years" the study showed the prevalence of females. These data were equivalent to data found in tropical regions [11] and in the Mediterranean climate [18], representing respectively 70% and 83.7% of women.

In the present study, in the post-fall fracture question, there was no statistical difference between the genders; although among women there was a higher prevalence of weakness fall. However, a study representing the tropical region showed that there were no differences between gender and low-impact fractures and gender and the lack of knowledge of the diagnosis of the bone-fragility-generating disease. It is important to note that according to the monitoring panel of one of the main Brazilian tropical cities, the mortality rate due to falls between the ages of 30 and 59 years was 14.55%. In addition, we should consider as more relevant factors for 'low impact fracture': advanced

age, early menopause, sedentary lifestyle, poorer quality of life, higher phosphorus intake, diabetes mellitus, falls, chronic use of benzodiazepines and family history in first degree relatives of femoral fracture after 50 years. For men, the most relevant were: sedentarism, current smoking, poor quality of life and diabetes mellitus [7; 10; 18-19].

Although osteoporosis is underdiagnosed in both genders, the diagnosis in men is still precarious [20]. The prevalence of risk of fractures and osteoporosis is higher in women than in men. This is particularly due to differences in bone mineral density and bone size and strength between men and women. Although they fracture more, men tend to have worse prognoses. It is worth pointing out that guidelines for the lay population and for health professionals are fundamental for the correct tracking of the disease, and can reduce avoidable risk factors if they are identified [21].

In the height change item after 40 years, according to the answers obtained in our study, changes in height in the course of life occurred more in women than in men. As a result of this finding, the Brazilian study (2006) [18; 21] shows that despite several precautions to perform anthropometric measurements, these were not associated with a higher number of low impact fractures.

In the low BMI and gender, there were no statistical differences between the genders, in addition it showed that all the individuals evaluated had a BMI above 19 kg/m^2[19]. Such association was demonstrated by Robbins et. all when evaluating other large epidemiological studies. When compared to the Brazos study, there was no gender specific association to BMI. This fact can be explained by the progressive increase of obesity in the last 20 years [18].

Several mechanisms have been proposed to explain the possible beneficial effect of obesity on bone mass. Obesity constitutes a serious public health problem, due to its asymptomatic nature over the years and with a high probability of associated comorbidities and harmful to the formation of bone mass, therefore it is a proven risk factor for osteoporosis in current studies [18; 21-23].

In this study, the use of corticosteroids for at least 3 consecutive months did not demonstrate statistical significance between the genders agreeing with the other literature.

The study by Cavalli et. all showed statistically similar affirmative rates between genders, 11.8% female and 10.4% male, and of the patients who had previous fractures, 16% reported using the same therapy [11].

When comparing gender and rheumatoid arthritis, there were statistical differences between the genders, being more frequent in females. However, it is described in the literature, as the incidence of this disease in men and women appears with very similar percentages in both genders [11]. Such significance should be attributed to the random sampling of the survey, which consisted of a larger number of female public.

In addition, in relation to thyroid diseases, there was a relevant association between gender and thyroid disorders, being more prevalent in women, unlike that found in the study by Cavalli and Colleagues, where there was a similar frequency between both genders [11]. These results could be attributed to the very incidence of thyroid disorders and the fact that many men remain undiagnosed by their own negligence.

In the present study, as in the Italian study [11], there was prevalence of alcoholism in males. In this way we can consider that these data tend to be reversed in the future with the young population, where woman and men will be equally consuming alcohol.

The relation between smoking and gender did not present significant differences. However, it has been described by Cavalli and Colleagues that men have a higher smoking habit compared to women [11]. The reasons for the presented discrepancy are not very clear, but it is important to emphasize that in tropical regions, smoking in women is growing and thus adding to this gender another risk factor.

Cigarette smoking, on the other hand, is considered a moderate risk factor for osteoporosis, since among its chemical components, mainly nicotine, it acts to depress the osteoblasts [24]. In smokers, an average deficit of 5 to 10% in bone density was found, which is why some studies also associate cigarette smoking with an increased risk of fractures [25]. There is research that relates this fact not only to the elderly, but also to young men [26-27]. A Spanish study has shown that in healthy young men considered to be "heavy" smokers (more than 21 cigarettes / day) significant loss of bone mass was observed [28].

In the same sense, the item of regular physical exercise showed no statistical differences between men and women. These data are equivalent to the Italian and Brazilian studies, which described the inadequate time of physical activity as a prevalent risk factor in their studied population [11-20].

Another finding obtained by the present study shows that most men and women do not do adequate intake of milk and dairy products. In contrast, in the study by Cavalli et. only 15.8% of the study participants avoided milk and dairy products, being 25.6% women and 15% men, demonstrating the opposite pattern to our study [11]. This result can be explained by economic and sociocultural reasons added to the fact that diets lacking lactose are increasingly frequent in populations of tropical regions.

In the analysis, it was also possible to identify that although the interviewees lived in a tropical region, there were no differences between genders and the majority of them had sun exposure below10 minutes a day. This result agrees with works of tropical region. However, in a Mediterranean climate region study, only 24.3% of the participants had sun exposure <10 minutes. This is due to sociocultural reasons in developing countries, where there may be less knowledge from lay population about the benefits of sun exposure at appropriate times, associated with modern living standards and violence, where more vehicles are used for locomotion instead of walks, and more physical exercises are done indoors than in the outdoors, providing lack of daily solar exposure [11].

After analyzing data, and considering the need to propose health actions to the community in order to minimize the impacts of this disease, proposals were made for interventions in the community to reduce modifiable risk factors. Thus, the IOF One Minute Questionnaire was used at the public medical center Santo Antônio, in São José do Rio Preto, used by Ceres College, to screen patients with risk factors such as: age greater than 40 years in both genders and / or women with climacteric symptoms, in order to assess their quality of life and the risks of complications from the disease. Subsequently, prevention and health promotion are carried out through physical activities with specialized professionals, groups to reduce harmful habits and guidelines for osteoporosis, associated with annual prevention campaigns. To this date, there are no

results of the population impact of group implementation and screening with the IOF questionnaire

Conclusion:

Risk factors for osteoporosis in a tropical country population are more evident in women, but it is increasing in both genders. The risk factors: physical exercise habit <10 min, low intake of milk and dairy products, low levels of vitamin D and low sun exposure are the four main risk factors that should be targeted in the prevention campaigns carried out in Brazil. Being a tropical climate country, with long periods of sun exposure in all seasons, it's absurd to say that one of its main risk factors is the absence of direct sunlight. The IOF rapid test proved to be a fast, easy-to-access and effective tool for collecting data from the population, but it has the failure of not ranking or scoring risk factors, which could better detail the disease and allow actions to fight against it. However, the test allowed us to analyze the population of a tropical region and let us reflect that measures such as: orientations, extensive screening of the disease in population at risk, adding calcium and vitamin D supplementation in general populations food and increased sun exposure, should be taken to minimize the risk factors of osteoporosis and achieve through prevention the reduction of complications of the disease.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Bibliographic references:

[1]United Nations – ONU. Department of Economic and Social Affairs, Population Division. *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables.* Working Paper No. ESA/P/WP/248. 201

[2] Tavares Russo L.A; De Gregório L.H; Lacativa L.G.S.; Marinheiro L.P.F. *Concentração plasmática de 25 hidroxivitamina D em mulheres na pós-menopausa com baixa densidade mineral óssea.* Arq Bras Endocrinol Metab. vol.53. São Paulo, 2009.

[3] Farias F.A.B. Prevalência de osteoporose, fraturas vertebrais, ingestão de cálcio, e deficiência de vitamina D em mulheres na pós-menopausa. Escola Nacional de Saúde Pública – Brasil. Tese de doutorado apresentada na Fundação Oswaldo Cruz, 2003.

[4] Alagol F; Shihadeh Y, Boztepe H. Tanakol R. Sunlight exposure and vitamin D deficiency in Turkish women. J Endocrinol Invest. , 23:173-177. 2000.

[5]Ganage –Yared M.H.; Chemali R.; Yaacoub N.; Asmar A. Hypovitaminosis D in a sunny country: relation to lifestyle and bone markers. *J* Bone Miner Res , 15:1856-1862. 2000.

[6]Portugal L.I.C.G. Osteopenia e Osteoporose: factores modificáveis e não modificáveis; Universidade Fernando Pessoa Faculdade de Ciências da Saúde. Cidade do Porto, 2012.

[7] Secretaria Municipal de Planejamento Estratégico, Ciência, Tecnologia e Inovação, 2017. Ciência, Tecnologia e Inovação. Conjuntura Econômica de São José do Rio Preto - 32.ed. São José do Rio Preto,2017.

[8]FIRJAN. Índice FIRJAN de Desenvolvimento Municipal. Dados ano base 2015. Disponível em: http://www.firjan.com.br/ifdm/consulta-ao-indice/ifdm-indice-firjan-de-desenvolvimento-municipal-resultado.htm?UF=SP&IdCidade=354980&Indicador=1&Ano=2013

[9]Azevedo Júnior R. Cenários para 2012. Editorial JC. Ed. 289 -300/2012 Disponível em: https://www.cremesp.org.br/?siteAcao=JornalCremesp&id=289

[10]Núcleo de Estudos em Saúde Pública CEAM/UnB. Perfil do município de São José do Rio Preto/SP: Análise do acesso e da qualidade da Atenção Integral à Saúde da população LGBT no Sistema Único de Saúde; 2016.

[11]Cavalli L, Guazzini A, Cianferotti L et all. Prevalence of osteoporosis in the Italian population and main risk factors: results of BoneTour Campaign. BMC Musculoskelet Disord;, 17: 396-397. 2016.

[12] Povoroznyuk V. V; Dzerovych N. I. Evaluation of the Validity of The IOF One-Minute Osteoporosis Risk Test For Postmenopausal Woman. Institute of Gerontology AMS Ukraine. Gerontologija. Arch Osteoporos.; 9(1): 15–20; 2008.

[13] Hong-Mei Z; Hui-Ling L; Wang X et all. Clinical value of self-assessment risk of osteoporosis in Chin *Med* J.2016; 11: 190-195. 2016. Online adress: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5329823/

[14] Jagarlamudi M, Umesh Rao V, Nitya K, Prathima P, Swati Rana A. Community based study on knowledge attitudes and practice of osteopororsis in women. Indo Am. j. pharm. res.2015.

[15] International Osteoporosis Foundation – IOF. One minute risk test. Osteoporosis & Musculoskeletal Disorders. Acess in 2017. Online Address: https://www.iofbonehealth.org/iof-one-minute-osteoporosis-risk-test.

[16] Report of the European Union Osteoporosis Consultation Panel. European Commission. Osteoporosis in the European Community: Action Plan - A report of the key next steps towards a Europe free from fragility fractures. European guideline. 2003. Online Address: https://ec.europa.eu/health/archive/ph_projects/2002/promotion/fp_promotion_2002_a1_04_en.pdf

[17] Ministério da saúde do Brasil. Secretaria de saúde. Portaria nº 224, 26 de março 2014. Anexo. Osteoporose. 2014.Disponível em: http://portalarquivos.saude.gov.br/images/pdf/2014/abril/02/pcdt-osteoporose-2014.pdf

[18] Pinheiro M.M; Ciconelli R.M; O Jacques N; Genaro P.S; Martini L.A; Ferraz M.B. O impacto da osteoporose no Brasil: dados regionais das fraturas em homens e mulheres adultos - The Brazilian Osteoporosis Study (BRAZOS). Rev. Bras. Reumatol. vol.50. São Paulo, 2010.

[19] Consenso Brasileiro de Osteoporose. Sociedade Brasileira de Reumatologia em associação com FEBRASGO. Rev. Bras. Reumatol., 2002. Disponível em : http://www.cidmed.com.br/pdf/osteoporose.pdf

[20]Peggy M; Cawthon M.P.H. Gender Differences in Osteoporosis and Fractures. Clin Orthop Relat Res 2011; 469(7): 1900–1905.2011.

[21] MartiniI L.A, De Moura E. C, Santos L C, Malta D.C, Pinheiro M.M. Prevalência de diagnóstico auto-referido de osteoporose. Rev. Saúde Púb.; 43(Supl 2):107-116. 2009.

[22] Robbins J, Schott AM, Azari R, Kronmal R. Body mass index is not a good predictor of bone density: results from WHI, CHS, and EPIDOS. J Clin Densitom;9(3):329-334. 2006.

[23] Felix, J. S, O planeta dos idosos, entrevista de Alexandre Kalache, coordenador do programa de envelhecimento e longevidade da OMS, São Paulo, Revista Fator, edição do Banco Fator, 2007.

[24] Laroche M, Lasne Y, Felez A et all. Osteocalcin and smoking. Rev Rhum Ed Fr, v. 61, p. 433-436. 1994.

[25] Hooper J. L, Seeman, E. The bone density of female twins discordant for tobacco use. N. Engl. J. Med., v.330, p.387-392. 1994.

[26] Morales-Torrres J, Gutiérrez-Ureña S. The burden of osteoporosis in Latin America. Osteoporosis Committee of Pan-American League of Associations for Rheumatology. Osteoporoses Int. 2004;15(8):625-632.2004.

[27] Froes N.D.T.C; Pereira E.S; Negrell W.Fi. Fatores de risco da osteoporose: prevenção e detecção através do monitoramento clínico e genético; Acta ortop. bras. vol.10. São Paulo, 2002.

[28] Ortego-Centeno N, Munoz- Torres M, Jodar E, Hernandez-Quero J, Jurado-Duce A, de la HigueraTorres- P|uchol J. Effect of tobacco consumption on bone mineral density in healthy young males. Calcif Tissue Int., v.60, p.496-500, 1997.