Original Research

THE APPLICATION OF FRAX VALUES TO DETERMINE THE DISTRIBUTION OF RISK FACTORS FOR OSTEOPOROSIS IN POSTMENOPAUSAL WOMEN

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ABSTRACT

Background: Osteoporosis is the most common bone disease in humans that causes a bone fracture occurring without trauma or after a minimum trauma as complication.
Aim: This study was to apply FRAX values to investigate the distribution of risk factors of osteoporosis in menopause in Palembang community.
Methods: Cross sectional approach was applied in this study in order to know the distribution of risk factors for osteoporosis in postmenopausal women at Sub District in Palembang, Sumatera selatan, Indonesia. The study population was women who reside in Sub District of Palembang. Samples are all postmenopausal women in that sub district of Palembang with ages between 50-79 years. The sub district was randomly selected based on the completeness of population data to facilitate the conduct of research, and then carried out questionnaires to women after that the data on risk factors will be incorporated into the FRAX score to earn the percentage Major Osteoporotic and hip fracture for the next 10 years.
Results: The value of major FRAX osteoporotic most often found in the percentage of <20% (108 people), while the value of FRAX hip fracture most often found in the percentage of <3% (90 people).
Conclusions: women will have a risk to get possibility fracture that can be occurred in the next 10 years. It is required counseling and provision of basic knowledge to the public about the various risk factors associated with the incidence of osteoporosis. This includes lifestyle, physical activity and sport

Key words: Osteoporosis, FRAX, Postmenopausal Women

BACKGROUND

Osteoporosis is the most common bone disease in humans and represents an important health care problem. It is an asymptomatic disease that causes a bone fracture occurring without trauma or after a minimum trauma as complication. The high incidence of osteoporosis worldwide and its main complication, osteoporotic fractures, also known as fragility fractures, have been recognized for more than 20 years.[1] The risk of osteoporosis in women is higher than in men.[2] The lifetime risk in women in the United States and Northern Europe of hip fracture at the age of 50 years is between 11% and 18%.[3] According to data from chapters of the Indonesian Osteoporosis Society (PEROSI), the prevalence of osteoporosis in 2007 reached 28.8 percent for men and 32.3 percent for women. This figure is also supported by the results of the data analysis of the risk of osteoporosis by Ministry of Health (MoH) Nutrition

Research in cooperation with Fonterra Brands Indonesia, published in 2006 and that 2 out of 5 people at risk of osteoporosis.[4] Indonesia research conducted by Darmawan in Semarang getting the prevalence of osteoporosis in women at 14.7%.[5] The incidence of osteoporosis reported by Roeshadi is 26 % and the highest in the age group 45-65 tahun.[6] Research by faridin obtained the prevalence of osteoporosis in men amounted to 23.3% and in women 32%.[7]

Usually, after menopause, in the next 10-year, the risk of osteoporosis will increase to 15%.[8] Some risk factors for osteoporosis are age, sex, weight, drugs, and combination of bone mass that is inherited by parents, lifestyle, and the pattern of heavy alcohol drinkers,[8] contribute to bone loss and fractures. Bone mineral density was significantly lower in women with alcohol intake of more than 30 grams/day compared to non-drinkers. Smoking has long been known as a factor affecting on osteoporosis. An analysis of 48 studies showed that the more women smoked, the higher the risk for fractures. Experts argue that genetic factors play a role 60-80% of bone mass while the environment affects 20-40%. Factor of nutrition and exercise are an important part of bone health. Both of these factors can be controlled. In addition, tiny body, anorexia nervosa, and the size of small bones, are essential risk factor.[9]

To decrease the higher risk of insidence, the management of osteoporosis is needed. However, the management of osteoporosis does not meet the expectation. One of the problems is the absence of state standards in initiating treatment to prevent fractures. Nowdays, actually, there is a gold standard and more accurate experiment to diagnose osteoporosis which is called Densitometer (Lunar) technology using DXA (dual-energy x-ray absorptiometry).[10] However, this tool is fairly expensive which is few hospitals are using this tool.[11] So, it tends in effective to reduce the number of ostoporosis insidence.

In this regard, there is an innovation instead of using Densitometer. Kanis JA created a a FRAX as a method to diagnose osteoporosis which has been accepted by WHO as a standard. This method is to determine the numbers based on age, height, weight, gender, history of fracture, history of hip fracture in the elderly, smoking habits, use of glucocorticoids medication, rheumatoid arthritis, secondary osteoporosis, habits of alcohol and bone mass density at the femoral neck BMD values (Bone Mass Densitometry), shown by the T-score or Z-score. This method provides information on the possibility of a fracture that occurred at the next 10 years as well as providing preventive therapy to prevent fractures. It is performed when the value of hip fracture (hip bone) is 3% or more and a major osteoporotic (bone such as bone arms, shoulders, and spine) is 20% or more .[12] This is initially based on the analysis of thousands of people included in several cohorts in Europe.[13] Likewise, since its publication this tool has undergone new adjustments and calibrations for different populations.[14] Some studies have also recently been published, in which the cases of fracture estimated or expected by the FRAX™ tool were significantly lower than the cases of incidental fractures actually observed in the 10 years of follow up.[15] In this study, the authors performed FRAX tool to investigate the distribution of risk factors of osteoporosis in menoupause in Palembang community.

METHODS

Descriptive method employed in this study with cross sectional approach in order to know the distribution of risk

factors for osteoporosis in postmenopausal women at Sub District in Palembang, Sumatera selatan, Indonesia. The study was conducted on 21 August 2011 to 15 September 2011. The study population was women who reside in Sub District of Palembang with ages between 50-79 years. The information from each chairman of the local neighborhood that the total number of women in that sub district with ages between 50-79 years as many as 111 people. Samples are all postmenopausal women in that sub district of Palembang with ages between 50-79 years. The subdistrict was randomly selected based on the completeness of population data to facilitate the conduct of research, and then carried out questionnaires to women aged 50-79 years in order to obtain data on risk factors for osteoporosis, after that the data on risk factors will be incorporated into the FRAX score to earn the percentage Major Osteoporotic and hip fracture for the next 10 years.

The number of samples to be researched was 111 people who were postmenopausal women in sub district Palembang with ages between 50-79 years the Exclusion criteria were women aged 50-79 years were premenopausal and postmenopausal women aged 50-79 years who refused to be given a questionnaire and postmenopausal women aged 50-79 years who could not be contacted. The data acquired risk factors for postmenopausal women through the provision of questionnaires and interviews.

Variables

The age of the respondent is present at the time of the study by looking at Identity Card. The height of the respondents was obtained by determine the Body Mass Index (BMI), History of fractures occurring spontaneously, or a fracture arising from trauma which daily life is regarded as a fracture. Parent fractured hip is whether there was a fracture of the hip that occurs in both parents of respondents. Smoking habit of the respondents is smoking continuously before the onset of osteoporosis. The respondents smoke cigarettes every day, at least in the first year, now or formerly repeatedly. Respondents who were exposed to oral glucocorticoids or has been exposed to oral glucocorticoids for more than 3 months at a dose prednisolone 5 mg per day or more or the same as the dose of other glucocorticoids. The rheumatoid arthritis criteria is respondents who have been diagnosed with rheumatoid arthritis clinically or laboratory guidance supporting the diagnosis of rheumatoid arthritis. Secondary osteoporosis is mean that if respondents had experienced severe diseases associated with osteoporosis. Including type 1 (insulin dependent) diabetes, osteogenesis imperfecta in adults, hypertiroid and untreated. Hypogonadism or premature menopause (<45 years), chronic malnutrition, or malabsorption and chronic liver disease. For the alcohol criteria is when the respondent drank alcohol 3 or more units of alcohol per day. Alcohol units are a somehow different in some countries, which is equal to 10 mg of alcohol in a standard pint (285 ml), the size of the liquor (30ml), a medium size glass of wine (120ml), or the size of the aperitif (60ml).

Processing and analysis of data

The way of processing data by calculating the data of risk factors such as age, body weight in kg (kilogram), height in cm, history of fracture, history of hip fracture in parents, smoking, drug consumption glucocorticoids, rheumatoid arthritis disease, the leading causes of secondary osteoporosis , and alcohol consumption were incorporated into the program in the form of percentage of the major FRAX osteoporotic and hip frakture

over the next 10 years. Examples of methods FRAX can be seen in the picture below.

Figure 1. WHO Fracture Risk Assessment Tool

RESULTS

This research was conducted by taking the data directly in postmenopausal women and risk factors at age 50-79 years in Sub District of Palembang. Retrieval of data obtained from the distribution of questionnaires to respondents. Fieldwork began on Monday, August 21, 2011 to 15 September 2011. Below are the results and discussion based on the issues and research purposes.

Table 1. The distribution of risk factors for osteoporosis in postmenopausal women in the population by age group in subdistrict Palembang (N = 111)

Age	Observed Counts	Percentage
50-59	60	54%
60-69	33	29.8%
70-79	18	16.2%
Total	111	100%

Respondents were divided into three age groups, there are 50-59 years, 60-69 years and 70-79 years. 111 respondents were obtained and majority of respondents aged 50-59 years with a percentage of 54%.

Table 2. The distribution of risk factors for osteoporosis in postmenopausal women based on Body Mass Index population group in Sub District of Palembang (N = 111)

IMT	Observed Counts	Percentage
Underweight	12	10.8%
Normal	71	64%
Overweight	23	20.7%
Obese	5	4,5%
Total Sample	111	100%

We obtained that a majority of the 111 respondents had a normal body mass index which is 64%. On the other hand, Overweight Body Mass Index is 20.7%, 10.8% Underweight and obese body mass index had the smallest percentage which is 4.5%.

Table 3. The distribution of risk factors for osteoporosis in postmenopausal women with the previous fracture population group in Sub District of Palembang (N = 111)

Previous Fracture	Observed Counts	Percentage
Yes	14	12.6%
No	97	87.4%
Total	111	100%

From the resulting data, 87.4% of respondents have no experienced with previous fracture. While only 12.6% of respondents who had experienced a fracture.

Table 4. The distribution of risk factors for osteoporosis in postmenopausal women with the history of parents fractured hip population group in Sub District of Palembang (N = 111)

Previous Fracture Hip	Observed Counts	Percentage
Yes	18	16.2%
No	93	83.8%
Total	111	100%

From the data of the 111 respondents, we found that the majority of respondents without history of hip fracture in older people with a percentage of 83.8%.

Table 5. The distribution of risk factors for osteoporosis in postmenopausal women based on current smoking population group in Sub District of Palembang (N = 111)

Smoking Behavior	Observed Counts	Percentage
Smoking	13	11.7%
Non Smoking	98	88.3%
Total Sample	111	100%

Total 11.7% of respondents who have a smoking habit. Otherwise, most of them do not smoke with a percentage of 88.3%.

Table 6. The distribution of risk factors for osteoporosis in postmenopausal women based on glucocorticoids consumption group in Sub District of Palembang (N = 111)

Glucocorticoid Consumption	Observed Counts	Percentage
Yes	40	36%
No	71	64%
Total	111	100%

From the 111 respondents, 36% of respondents were using the glucocorticoid various kinds for more than 3 months at a dose of 5 mg per day or more. Others respondents never use glucocorticoid drugs.

Table 7. The distribution of risk factors for osteoporosis in postmenopausal women of having Rheumatoid Arthiris disease group in Sub District of Palembang (N = 111)

Rhematoid Arthritis	Observed Counts	Percentage
Yes	36	32.4%
No	75	67.4%
Total	111	100%

Total of 32.4% of menopausal women who had suffered from rheumatoid arthritis with signs of pain, swelling and redness in the joints and is supported by a diagnosis from a doctor or clinical examination, such as ultrasound and the doctor's diagnosis. Although few of them who had experienced these signs but never do the examination or diagnosis by a doctor, so that by the method of FRAX, Those respondents are not included. Then as much as 67.6% of respondents had never suffered from rheumatoid arthritis.

Table 8. The distribution of risk factors for osteoporosis in postmenopausal women based on Secondary Osteoporosis disease group in Sub District of Palembang (N = 111)

Secondary Osteoporosis	Observed Counts	Percentage
Yes	41	37%
No	70	63%
Total	111	100%

From 111 respondents, there are 37% who had experienced about symptoms of illness and the causes of osteoporosis. Mostly disease and symptoms which were suffered by respondents are diabetes mellitus and premature menopause, while 63% of respondents who had never experienced disease caused of osteoporosis.

Table 9. The distribution of risk factors for osteoporosis in postmenopausal women of consuming alcohol 3 or more units per day group in Sub District of Palembang (N = 111)

Alcoholic	Observed Counts	Percentage
Yes	2	1.8%
No	109	98.2%
Total	111	100%

Only 1.8% or 2 respondents who had consumed alcohol. Most of the respondents do not consume alcohol with percentage 98.2%

Table 10. Profile FRAX score in postmenopause Women in Sub District Palembang, N = 111

Osteoporotic	FRAX values percentage	Total of Respondents	Percentage
Major Osteoporotic	< 20%	108	97.3%
	≥ 20%	3	2.7%
Hip Fracture	< 3%	90	81.1%
	≥ 3%	21	18.9%

The study of 111 respondents had obtained risk factors for osteoporotic. These risk factors are adjusted according to FRAX's tool then calculated. The estimation will be obtained from the FRAX score for Major Osteoporotic and Hip Fracture during the

next 10 years. From the results of these calculations, the value of major FRAX osteoporotic most often found in the percentage of <20% (108 people), while

LIMITATION

On using of FRAX method there is no example for the races of Asia, especially Indonesia, so the race is used is the Chinese, because the Chinese are ethnically and genetically similar to Indonesia.[16] According to description of FRAX website epidemiological, China has the same rank with Indonesia with low ratings for the incidence of osteoporosis, ranked similarities tend to have similarities in terms of the risk factors.[12] The habits of both Chinese and Indonesian residents who frequently consume soy which contains phytoestrogens are causing many epidemiological for both China and Indonesia in terms of osteoporosis rank is slow.[17] When the study conducted, few of people would not available in location, so then we have to wait to confirm and to get the data.

In order to complete the questioner, the samples should read and write but many of them could not to do so. Both researcher and their families helped them to fill the answer through their instructions. The examination of femoral neck BMD (Bone Mineral Density) as one of the tools in FRAX in order to get the result is not included in the measurement because the investigation BMD by a DXA scan equipment costly and not all respondents have data. So the risk factors used are weight and height or by BMI.[18]

DISCUSSION

In this study, we used several questions depend on risk factor of osteoporosis in FRAX and to know the profile of its values in postmenopause. We are involving 111 elderly women with age between 50-79 years old. Many years ago

the value of FRAX hip fracture most often found in the percentage of <3% (90 people).

the reports had recognised the importance of other risk factors for new osteoporotic measurement in addition to reduce BMD dependency. It has modified the conception of BMD as the gold standard or add element for decision making in the management of osteoporosis in primary health care settings.

Our findings of distribution in group of age has similarities with the research done by Ilyas M and olgavivera B to 132 people who met the inclusion criteria were getting most of the respondents at the age of 50-59 years old who suffer from osteoporosis,[19] also for results was conducted by Tarawan VM, Akbar IB, and Purba A to 83 postmenopausal women who produce the characteristics of normal BMI category is ± 23.6.[20]

In the case of previous fracture the values does not vary much with osteoporosis retrospective data collected in Unit Imunoendocrinology Integrated Laboratory, Faculty of Medicine of 1690 cases of osteoporosis, it turns out that they suffered a broken femur as many as 249 cases (14.7%).[21] Differences in the results of parents fracture hip's distribution from research conducted by Diaz MN, O'Neill TW, and Kitschy AJ to 12 816 men and women who generate 7.1% of the women whom their mother had suffered hip fractures. This difference occurs because the total respondents that obtained from studies Diaz were taken of sex men and women and the differences in sampling based on age, they were using the age of 50-75 years old.[22]

The percentage obtained in the distribution of risk factors of smoking behaviour in postmenopausal women is similar to research done by Rapuri PB et al

on 489 menopausal women who produced 54 (11%) of women.[23]

In this study, there were differences on the research conducted by RM et al said that the use of glucocorticoids in patients with osteoporosis have about 3-13 persen.[24] The different incidents contained in the number of respondents who have symptoms and diseases that require use of drugs such as rheumatism glukortikoid. Distribution value of rheumatoid arthritis (RA) is different from the research conducted by Picavet Hazes H and J of the 2338 samples in followed up for 6 months resulted to 4.6%. This difference occurs because of sampling based on age. Age taken from the age of 25.[25] The high number of distribution in this study due to the weak system of questionnaires used.

The value of the percentage distribution of risk factors for osteoporosis in postmenopausal women based on secondary osteoporosis in contrast to research conducted by Tannenbaum C et al on 173 menopausal women who produced 44% of respondents with secondary osteoporosis etiology. This difference occurs because the research conducted Tannenbaum C et al, 44% obtained from 173 postmenopausal women were asymptomatic (healthy) from history of the disease and treatment.[26]

The distributions of alcohol consumption different from the research conducted by Rapuri PB et al to 489 elderly women aged 65-77 years in Omaha, United States, which resulted in 148 (30.3%) of women alcohol drinkers.[27] This happens because alcohol drinker habits of American States States are higher than the Indonesian.

CONCLUSION

We found that, from 111 respondents, 3 women have *major osteoporotic* (bone such as bone arms, shoulders, and spine) score more than 20%

and 21 women have *hip fracture* (hip bone) score more than 3%. Its mean those women will have a risk to get possibility fracture that can be occurred in the next 10 years. It is required counseling and provision of basic knowledge to the public about the various risk factors associated with the incidence of osteoporosis. This includes lifestyle, physical activity and sport. In addition, it also necessary outreach to the community about what things that can lead to osteoporosis and how to avoid them, especially in terms of physical activity, drugs and drinking alcohol drinking habits. Each community participates actively in seeking a reduction in risk factors for osteoporosis by increasing self-awareness to change wrong habits to prevent the osteoporosis. Furthermore, FRAX method can be used to see the changes in risk factors in postmenopausal women at sub district Palembang, South Sumatera.

REFERENCES

1. Cummings S, Kelsey J, Nevitt M, O.Dowd K. Epidemiology of osteoporosis and osteoporotic fractures. Epidemiol Rev. 1985;7:178–208. [PubMed]
2. Kanis JA. Pitt F 1992 Epidemiology of osteoporosis. Bone 31(Suppl. 1):S7-S IS.
3. Melton LJ. Chrischilles EA, Cooper C, Lane AW, Riggs BL 1992 How many women have osteoporosis. J Bone Miner Res 7: 1005-1010.
4. Mithal A, Dhingra V, Lau E, The Asian Audit: Epidemiology, costs and burden of osteoporosis in Asia.*International Osteoporosis Foundation* 2009. http://www.iofbonehealth.org.
5. Darmawan J. Miscellanous Condition: Osteoporosis. In Rheumatic Condition in The Northern Part of Central Java.

An Epidemiological Survey, Semarang, 1989,173-8.

6. Roeshadi D. Osteoporosis Ditinjau dari Segi Aktivitas Seluler, dalam Naskah Lengkap Simposium Osteoporosis Up - Date. Denpasar, Bali, 7 November 1994, 1-13.

7. Faridin. Prevalensi dan Beberapa Faktor Risiko Osteoporosis di RSUP Dr. Wahidin Sudirohusodo Makassar, Makassar, 2001, 1-3.

8. Hadi E. Cara jitu cegah osteoporosis. 2005. Available from URL:http://pikiran-rakyat.com

9. Nancy E. Lane, M.D. Lebih Lengkap Tentang Osteoporosis, Petunjuk untuk penderita dan Langkah-Langkah Penggunaan bagi Keluarga. 2001, 17-30.

10. Adam JMF. Diagnosa Osteoporosis. Kursus dan Pelatihan Metabolisme Kalsium dan Osteoporosis. Perhimpunan Osteoporosis Indonesia (PEROSI), Makassar, 2002,26-31.

11. Dharmais. Densitometri Terbilang Mahal Harganya. Available from URL : http://www. Dharmais.or.id.

12. Internasional Osteoporosis Foundation IOF. FRAX - Information and Resources. Available from URL : http://www.iofbonehealth.org.

13. O'Neil TW, Marsden D, Matthis C, Raspe H, Silman AJ. Survey response rates: national and regional differences in a European multicentre study of vertebral osteoporosis. Epidemiology common health. 1995;49:87-93.

14. Leslie WD, Lix LM, Johansson H, Oden A, McCloskey E, Kanis JA. for the Manitoba Bone Density Program. Independent clinical validation of a Canadian FRAX tool: fracture prediction and model calibration. J Bone Miner Res. 2010;25:2350–8. doi: 10.1002/jbmr.123. [PubMed][Cross Ref]

15. Trémollieres FA, Pouillès JM, Drewniak N, Laparra J, Ribot CA, Dargent-Molina P. Fracture risk prediction using BMD and clinical risk factors in early postmenopausal women: sensitivity of the WHO FRAX tool. J Bone Miner Res. 2010;25:1002–9. [PMC free article] [PubMed]

16. Wibowo S. Aneka ragam etnik cina. Available from :http:///aneka-ragam.blogspot.com.

17. Farmacia. Cegah osteoporosis dengan fitoestrogen. Available from : http://www.majalah-farmacia.com/rubrik/one_news.asp?IDNews=473. 2007.

18. Kanis JA, et al (2008). FRAX and the Assesment of Fracture Probability in Men and Woman from the UK.Osteoporosis Int 19:385-397.

19. Ilyas M, Olgavivera B. Identifikasi Osteoporosis pada Berbagai Kelompok Umur Dengan Morfometri Femur dan Metakarpal di Makassar. Desember 2005;26 : 230- 234.

20. Tarawan VM, Akbar IB, Purba A. Hubungan Antara T-SCORE dan

Kadar Kalsium Darah Berdasarkan Lamanya Menopause untuk Menilai Osteoporosis. Bagian Ilmu Faal Fakultas Kedokteran Universitas Padjadjaran. Vol. 40. 2008.

21. Rahman I. Pidato pengukuhan guru besar tetap Ilmu Obstetri dan ginekologi. Jakarta 5 Juni 2004.

22. Diaz M.N. O'Neill.T.W. Silman.A.J. The Influence of Family History of Hip Fracture on the Risk of Vertebral Deformity in Men and Woman: The European Vertebral Osteoporosis Study. 1997. Vol 20;145-149.

23. Rapuri P.B, et al. Smoking and bone metabolism in elderly women. Bone Metabolism Unit and Cardiac Center, Creighton University School of Medicine, Omaha, NE, USA. 2000.

24. Sari R.M, et al. Patofisiologi Osteoporosis Sekunder Akibat Pemakaian Glukokortikoid. Vol 2, No 1 (2002).

25. Picavet H, Hazes J. Prevalence of Self Reported Musculoskeletal Diseases is High. 2003 july; 62(7): 644-650.

26. Tannenbaum C, et al. Yield of Laboratory Testing to Identify Secondary Contributors to Osteoporosis in Otherwise Healthy Woman. *J Clin Endocrinol Metab*. 2002;87:4431-4437.

27. Rapuri P.B, et al. Alcohol Intake and Bone Metabolism in Elderly Woman. 2000;72(5):1206-1213.