

Journal of Bone Biology and Osteoporosis

Research Article

Detection of Osteoporosis in Postmenopausal Women by Singh's Index

Neeta Natu^{1*}, Shikha Yadav¹, Susmit Kosta², Anupama Dave³ and Ravindra Kumar²

¹Department of Obstetrics & Gynecology, Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India

²Central Research Laboratory, Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India

³Department of Obstetrics & Gynecology, M.G.M Medical Collage & MY Hospital, Indore, Madhya Pradesh, India

Received: May 05, 2015; Accepted: May 15, 2015; Published: May 20, 2015

Abstract

To determine the diagnostic value of risk factor analysis (age, duration of menopause, body mass index and physical activities) and radiological imaging (Singh index and cortical index of the femoral neck) in diagnosing osteoporosis in post-menopausal women, this study was cross sectional on 200 menopausal women without secondary risk factor for osteoporosis. They were classified proportionally using the Singh index. The Singh index and cortical index of the femoral neck were evaluated using femoral neck antero-posterior X-ray. Physical activities were measured using a Historical leisure activity questionnaire. 14% women were found osteoporotic whereas osteopenia was observed in 62.5% women. The score system algorithm was the best method for determining osteoporosis in post-menopausal women. If there is osteopenia, evaluation using DEXA is then required. However score system algorithm cannot be used to follow up the therapy.

Keywords: Postmenopausal; Singh's index; Osteoporosis

Introduction

Ageing is a physiological process. Ageing of bone and joints is manifested in form of fragility, senile kyphosis and osteoarthritis of knee joint, hip joint, number and cervical spine and various painful disorders [1]. Osteoporosis depicts ageing process of bones, it also equates fragility. Detection of osteoporosis beforehand is an important preventive tool. Measurement of osteoporosis in community depicts how much percentage of population is at risk of sustaining fragility fracture. Its early detection is extremely important for

prevention of fractures.

Osteoporosis has become a major health and economic problem in India. It is a systemic skeletal disease characterized by low bone mass and micro architect deterioration of bone tissue, with a consequent increase in bone feebleness and vulnerability to fracture [2-4]. This mutely progressing metabolic bone disease is widely prevalent in India, and osteoporotic fractures are a common cause of morbidity and mortality in adult Indian men and women. The common sites of fracture are the spine, wrist and hip.

***Correspondence:** Dr. Neeta Natu, Department of Obstetrics & Gynecology, Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India, Tel: +91 9993024003; E-mail: natuneeta09@gmail.com

Menopause an important milestone in the life of women and associated with fatigue and weakness, loss of bone mass at a greater rate about 3-5% per year of

total bone mass [5]. Most people affected are unaware that their bones are thinning until they experience a break or notice more gradual signs such as height loss or curvature of the spine. The bones most likely to break as a result of osteoporosis are the hip, wrist and the vertebrae of the spine.

There has been substantial discuss about the relation of bone mass measurement in the diagnosis of osteoporosis. But several recent studies have clearly shown that low bone mass is predictive of fracture. Various radiometric methods have been employed in the past to assess the amount of osteoporosis or existing bone mass [6-8]. Mass of spongy bone is measured in proximal end of femur by grading according to density and distribution of trabeculae in vertebrae by their biconcavity, compression fractures, prominence of vertical trabeculae etc. Cortical bone mass have been measured in femoral neck giving femoral cortical index and in right 2nd metacarpal giving metacarpal index.

Recent and more accurate method are Micro-radiography, video densitometry, photon absorptiometry and computerized tomography for mineral content. These all methods are highly precise, accurate, sophisticated but very expensive. Being expensive these are not easily available for general population.

The Singh index is an inexpensive simple method to evaluate bone density, commonly used to assess osteoporosis and is based on the radiological appearance of the trabecular bone structure of the proximal femur on a plain Anterio-Posterior (AP) radiograph [9]. The present study was carried out to detect osteoporosis in Post-menopausal women by Singh's Index with and correlate it with clinical symptoms.

Material and Methods

The present study was conducted on 200 women of postmenopausal randomly selected women from Gynecology OPD, tertiary care center of Indore (M.P.) during the period (July 2012 to March 2013). The concerned participants were examined and detailed history was obtained. Women with known case or suspected history of endometrial carcinoma,

endometriosis and genital cancer, breast carcinoma, venous thromboembolic events, including deep vein thrombosis, pulmonary embolism, and retinal vein thrombosis were excluded from the study.

Serum calcium and digital X-ray of both hip joints in AP view with 15 degree internal rotation was carried out in each woman for Singh grading study. All the radiographs were developed from same machine, by same radiographer and uniformly developed.

Women were scored from 0 to 5 (with 0 to none and 5 with extreme) according to their pain, physical, social and emotional functions. With 0 to none and 5 with extreme Mean score in each category were compared in three groups created according to Singh's Index.

Results

The mean age of women was 58.98 ± 10.2 years. Backache was the common complaint of 60% women participated in the study. More than 50% women having complaints of musculoskeletal symptoms, suggestive of postmenopausal women definitely having bone loss after menopause sets up. Minor group of population also had history of minor fracture in their lifetimes especially age above 60 years that is 15% of women in studied population.

In present study, osteoporosis was suspected in 14% of cases on the basis of Singh's grading (grade 1-3) and osteopenia (grade 4-5) was suspected in 62.5% of women and remaining 23.5% of women have Singh's grade 6 suggestive of normal bones.

Although 23.5% women had Grade-6, but we cannot consider them that they are not having osteoporosis changes as these patients had complaining for backache and joint pain. To be precise these patients have ongoing osteoporotic change which is not revealing by Singh's grade these point to be consider that Singh grading criteria is only suggestive for osteoporosis change in femur bone but accuracy in diagnosing the osteoporosis is not there.

We found a significant association of Singh's grading with index was used to assess patients with osteoarthritis

of the hip or knee using several parameters. Singh's grading 1, 2 and 3 were found 75%, Singh's grading 4 and 5 found 20% and Singh's grading 6 found 5% pain in walking, stair climbing and weight bearing morning and performance of social functions and the status of emotional function were also included.

We found a significant association of Singh's grading with age of women (P value < 0.0001) and but no association was found with serum calcium (P=0.056) (Table 1).

Singh's grading is a subjective tool, that marks inter

observation variation and intra observation variation. There was however wide overlap of bone densities between the grades. This is another drawback and difficulty faced during analysis of each X-rays by both the observers specially, grading 3 & 4 which is difficult to decide, this problem in Singh's grading again make it less accurate. If considering, Singh grade 4 as osteoporosis then only 37.5% in population study is showing osteoporosis and remaining 62.5% showing grade 5 and 6 are normal, it's definitely decreases the sensitivity and specificity because that population of women also having symptoms of osteoporosis. So, if considering WHO classification of osteoporosis and

Table 1: Relationship of Singh's grading with age and serum calcium level.

Singh's Grade	Age	S. Ca
1-3	71.7 ± 7.9	8.31 ± 1.01
4-5	58.9 ± 9.1	8.80 ± 0.97
6	51.6 ± 6.5	8.58 ± 1.09
P value	< 0.0001	0.056

Table 2: Correlation of pain, physical, social and emotional functions in 3 groups.

Functions	Singh's Grade			P Value
	1-3	4-5	6	
Pain				
Walking	4.21 ± 1.4	2.30 ± 2.8	1.32 ± 2.6	<0.0001
Stair Climbing	4.37 ± 1.8	3.34 ± 1.5	2.56 ± 1.2	<0.0001
Weight Bearing	4.34 ± 1.9	4.10 ± 1.7	3.47 ± 1.2	<0.0001
Physical Function				
Descending Stairs	3.65 ± 2.7	2.43 ± 3.4	2.41 ± 1.2	0.1195
Ascending Stairs	4.49 ± 2.9	4.83 ± 3.3	3.51 ± 3.9	0.078
Rising From Sitting	1.66 ± 3.7	1.30 ± 2.8	0.92 ± 3.5	0.497
Standing	1.34 ± 5.7	1.10 ± 2.3	0.34 ± 1.3	0.2254
Walking On Flat	1.18 ± 2.9	0.18 ± 3.4	0.15 ± 5.3	0.443
Social Function				
Leisure Activities	2.34 ± 4.9	2.12 ± 7.4	1.30 ± 4.0	0.7165
Community Events	3.45 ± 3.4	2.40 ± 1.0	2.20 ± 1.4	0.0037
Emotional Function				
Irritability	2.12 ± 1.9	2.00 ± 1.2	1.23 ± 2.0	0.0084
Depression	1.29 ± 2.0	1.14 ± 3.1	1.10 ± 1.0	0.9516
Stress	1.15 ± 0.4	0.34 ± 0.30	0.10 ± 0.20	<0.0001

classified grade 5, as osteopenia, these groups of women cannot be misdiagnosed and will be considered as silent disorder has set up and also sensitivity of Singh's index for detecting osteoporosis increases.

We found a significant association of pain with Singh's grading (Table 2). No association was found in social, physical and emotional functions with Singh's index.

Discussion

The menopause is a biological phenomenon in the process of ovarian ageing which occurs around the age of 50 in 50% of women, but in about 50% women of premature ovulation failure of surgical removal of ovaries menopause occurs at earlier age and suffer because of deficiency of hormone estrogen. Since life span of women continues to increase, most women will spend more than one-third of their life time in the postmenopausal period. Therefore, emphasis should be given to the early assessment of risk factor and detection of menopausal symptoms and long-term complications i.e., osteoporosis. Osteoporosis has been called the "silent disease". Most people affected are unaware. That their bones are thinning until they experience a break, or notice more gradual signs such as height loss or curvature of the spine.

In our study a semi quantitative method used to assess bone loss of the trabeculae morphology in femoral neck with Singh's index. Though DXA (Dual energy X-ray absorptiometry) is the best method for it as more accurate, high precision and less error but it is expensive and is not available in many primary health care centers. In the view of this problem in this study we have used Singh's index as a screening test to assess postmenopausal.

So in our study we used simplest, noninvasive, cost effective technique Singh's index to diagnose and measure degree of osteoporosis postmenopausal women. Because of many other accurate method there is no place of Singh's index in diagnosing osteoporosis but in places, where these facilities are not available getting X-ray for Singh's grading along with questioners to evaluate high risk cases can be a step toward in early screening in those women who can be benefit by

these preventive step. The sensitivity and specificity of Singh's index very low in using as first test, which is the major drawback of these tests.

Conflict of Interest

All authors have no conflicts of interest and publication ethics.

References

1. Riggs BL, Melton LJ 3rd (1995) The worldwide problem of osteoporosis: insights afforded by epidemiology. *Bone* 17: 505S-511S.
2. Karunanithi R, Ganesan S, Panicker TMR, Korath MP, Jagadeesan K (2007) Assessment of bone mineral density by DXA and the trabecular microarchitecture of the calcaneum by texture analysis in pre and postmenopausal women in the evaluation of osteoporosis. *J Med Phys* 32: 161-168.
3. Rachidi M, Marchadier A, Gadois C, Lespessailles E, Chappard C, et al. (2008) Laws' masks descriptors applied to bone texture analysis: an innovative and discriminant tool in osteoporosis. *Skeletal Radiol* 37: 541-548.
4. Chappard C, Bousson V, Bergot C, Mitton D, Marchadier A, et al. (2010) Prediction of Femoral Fracture Load: Cross-sectional Study of Texture Analysis and Geometric Measurements on Plain Radiographs versus Bone Mineral Density. *Radiology* 255: 536-543.
5. Finkelstein JS, Brockwell SE, Mehta V, Greendale GA, Sowers MR, et al. (2008) Bone mineral density changes during the menopause transition in a multiethnic cohort of women. *J Clin Endocrinol Metab* 93: 861-868.
6. Pitt MJ, Morgan SL, Lopez-Ben R, Steelman RE, Nunnally N, et al. (2011) Association of the presence of bone bars on radiographs and low bone mineral density. *Skeletal Radiol* 40: 905-911.
7. Maiti A, Roy S, Tibarewala DN (2011) An Approach of Bone Loss Estimation through Digital

Radiography. Int J Engin Sci Tech 3: 5194-5199.

8. Pramudito JT, Soegijoko S, Mengko TR, Muchtadi FI, Wachjudi RG (2007) Trabecular Pattern Analysis of Proximal Femure Radiographs for Osteoporosis Detection. J Biomed Pharma Engin 1: 45-51.
9. Karabulut Ö, Tuncer MC, Karabulut Z, Hatipoğlu

ES, Nazaroğlu H, et al. (2010) Evaluation of the Singh index and Femur Geometry in Osteoporotic Women. Central Euro J Medicine 5: 601-610.



Copyright: ©Neeta Natu. This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.